A FOCUS ON PEDAGOGY

AMPS PROCEEDINGS SERIES 28.2

A Focus on Pedagogy: Teaching, Learning and Research in the Modern Academy

ARCHITECTURE_MEDIA_POLITICS_SOCIETY

Amps

INTRODUCTION

A Focus on Pedagogy: Teaching, Learning and Research in the Modern Academy

This publication is the product of the conference *A Focus on Pedagogy: Teaching, Learning and Research in the Modern Academy* held virtually 2022 based on the following call:

Today the education sector is going through what most commentators see as an unprecedented period of change. The assumption is that in the wake of COVID-19, many standard modes of teaching and learning have changed forever. While that is undoubtedly true and of fundamental importance, many aspects of what we do remains the same. Our need to publish, bring in research funding, and get positive student assessments have not gone away. The knowledge we need to impart, and the mindsets we seek to loosen or develop, remain as engrained as ever. Similarly, long established research areas are still to be explored. Whether it be the environment, learning psychology, social networks, creative practice or design thinking, what we research remains relevant and pressing.

In addition, despite the 'strangeness' of the change around us, some disciplines find themselves in unexpectedly familiar domains. The digital arts, media and communication studies are operating on platforms many see as natural. The proponents of distance learning are employing techniques they had been honing for years. Acolytes of educational technologies are perfecting platforms they have been developing for decades. The effect of the pandemic on our teaching and research then, is far from uniform or wholly negative. Set in this context, this conference reminds us that, in addition to the pandemic, there are other issues at play for educators and researchers today. Asking us to take a step back from the flux we have been in recently, it invites us to discuss both the radical realignments that have been necessary in recent times, and those aspects of our pedagogy that have continued unaffected by remote teaching. Bringing both sides of this coin together, the intention is to better grasp the tenor of teaching and research in today's changing, and increasingly hybrid, academy.

This publication captures the diverse responses that emerged from the event and the variety of ways academics internationally currently operate with today's education sector.

TABLE OF CONTENTS

THE CRITICAL REFLECTIONS OF A TEACHER-ARCHITECT AT THE UNIVERSITY OF PORTSMOUTH: TEACHER TRAINING IN ARCHITECTURAL EDUCATION

Author:
MARTIN W. ANDREWS

Affiliation:
UNIVERSITY OF PORTSMOUTH, UK

INTRODUCTION

I have not been trained to teach.

However, I teach, and I have been an architect-educator at the University of Portsmouth (UoP) for nearly twenty years.

Is my situation anomalous in architectural education (AE)?

The answer is, "No".

This situation is not unusual in AE, in fact it is the norm.

In 1995 Kevin Rhowbotham stated, "It is customary amongst practising architects to assume that those who have achieved some degree of experience are somehow automatically equipped to teach. Nothing could be further from the truth".[1]

Initially, I expressed an interest to my former tutors to review the work of undergraduate students for one-off, day-long studio assessments, known traditionally as the 'Crit'[2] while I was practicing as an architect in the public sector.

Almost two decades later, I transitioned from being a guest of Portsmouth School of Architecture (PSA), to being a full-time member of staff who sat on the School Executive Group, where I helped to make decisions which guided the future of the Department.

In this time, I learned how to teach through my own experiences of being taught, observation, intuition and from being mentored by colleagues.

Weaver et al. suggested, "Yet none of them is trained to be a teacher. Once upon a time they could perhaps have relied on memories of their own education, in which however hit-and-miss the tutoring, the student was carried along by the traditional design project".[3]

Weaver et al. went on to state that this situation needs to change because, "there has been increased pressure to account for the quality of provision and a move to professionalise teaching".[4]

This piece of reflective writing recounts my own personal journey that led me to become a full-time architect-teacher, the pitfalls and advantages that I have experienced along the way and the potentials for improving how teachers in AE are taught. The suggestions that I make here will are being further developed in the research and writing that I am undertaking as part of the Professional Doctorate in Education (EdD) at UoP.

A critical discussion of reflection and reflective practice in architectural education from the perspective of a teacher-architect

In 1991 Wooley stated, "we need a great deal more professional reflection on how architecture is taught in the studio and a sharing of ideas and experience by studio tutors."[5] As a part-time studio tutor at PSA, I was not encouraged to investigate models of reflection or reflective practice associated with AE. Woolley[6] suggests, "teaching within the studio system tends to be largely intuitive and little attempt has been made since the 1958 Oxford conference[7] to debate studio teaching methods. It is largely an amateur affair and it is frequently assumed that a practising architect, especially one that is a good designer, can, without any induction or training, immediately become an excellent studio teacher".

In October 2005 I was employed as a part-time hourly paid architecture studio tutor at UoP. It was not until I became a PSA pro-rata member of staff in 2008 that I was introduced to learning theories as part of my Higher Education Academy (HEA) Account of Professional Practice Fellowship claim.

In my experience, the work of Schön[8] is discussed in AE due to the specificity of his research in relation to the workings of studio design projects within Higher Education (HE). As an early-career teacher, I found that I could easily relate the work of Schön to my own teaching practice; I recognised Schön's model of Master-Pupil because this is how I was taught when I was learning to be an architect. It was a relatively straightforward process to take my own experiences and apply the same method of teaching to my own students.

The theories of Kolb[9] build on the work of Dewey[10] regarding experiential learning. Dewey and Kolb highlight the importance of students learning through doing and learning via experience. Kolb's[11] writing directly references how architecture students learn in HE. I have observed that these methods of learning are still the principle ways in which to educate students about the profession of architecture. Kolb's experiential learning model[12] interconnects education, work, and personal development; these elements make up the three key aspects most relevant to AE interconnecting the academy and practice. From 2008 to 2018, I ran an architectural practice within PSA providing opportunities for students to work on 'live' projects with 'real' clients where we used design competitions and design workshops to solve architectural challenges. The theories of Kolb and Dewey helped me to teach our students about the importance of the cyclical-iterative design process, as described in the Experiential Learning Cycle.[13]

More recently, I have been influenced by the work of Lave and Wenger. The approach described by Lave and Wenger[14] discusses the theory of situated learning through the case study analysis of five different types of apprenticeship models. The descriptions of how "Midwives", "Tailors", "Quartermasters", "Butchers" and "Non Drinking Alcoholics" are trained, through shared experience, hands-on learning and the use of storytelling and narratives[15] have many synergies with the training of architecture students. Lave and Wenger suggest that it is important to allow inexperienced students ("newcomers") to learn from experienced students ("old timers") through legitimate peripheral participation.[16] In a similar way, students who enter the first year of their architectural studies (situated on the outer edges of the school) can be considered as "newcomers"; they learn from, and are guided by, the more experienced students ("old timers") who operate at the centre of the learning environment as illustrated in Figure 1.
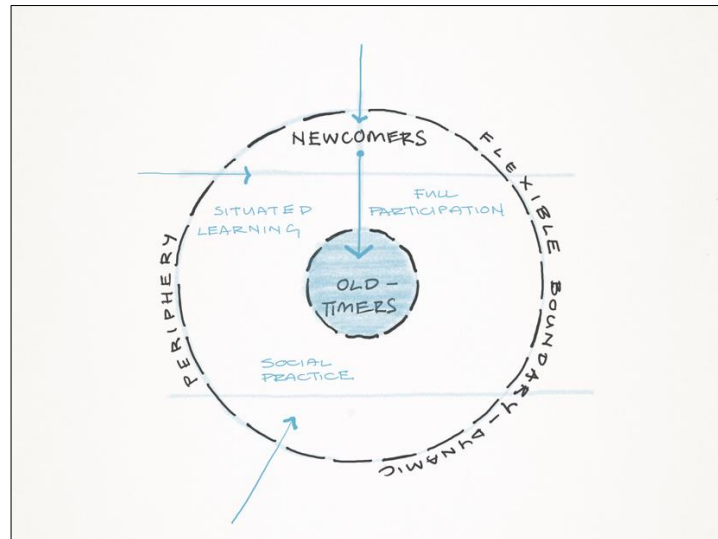
Figure 1. Legitimate Peripheral Participation (by Author).

In contrast to the theories of Schön, and building on the work of Dewey and Kolb, this model of teaching practice, using legitimate peripheral participation, places the student at the centre of the learning experience, rather than the teacher.

I have cycled through several phases of research and practice relating to teaching and learning while composing my Higher Education Academy (HEA) Fellowship and Senior Fellowship claims. These important moments to reflect on my teaching practice have led me to significantly change my approach to how I work with students, from Schön to Kolb and then to Lave and Wenger. I argue that these moments of reflection are too infrequent. If academic staff within Schools of Architecture are to maintain and improve their teaching practice it is critical to offer architect-educators' opportunities to pause, research and reflect upon teaching methodology more frequently.

A critical reflection on my journey to becoming a teacher-architect prior to beginning the Professional Doctorate in Education at the University of Portsmouth

As I continue to reflect upon the development of my own teaching methods, I have noticed that as an architecture student and later as an architect-teacher, I have been exposed to a number of different teaching styles. In the following paragraphs I will describe the teaching

styles of architect-educators who have influenced me the most at UoP. I have anonymised the identities of these academics:

'Academic A' introduced me to Edward De Bono's Six Thinking Hats[17] as a means of solving "wicked problems" as defined by Rittel and Webber.[18] The approach of 'Academic A' used De Bono's work to build high-self confidence and high confidence in a community of learners as described by the theories of Eric Berne.[19] This approach was used as a means of demystifying often complex language and design thinking related to architecture and design.

'Academic B' and 'Academic C' used performative teaching and performance teaching to engage student cohorts during formal lectures. This approach has been described by Naidu[20] as a praxis of engaged pedagogy. These Academics entertained their students by drawing in-front of their audiences using digital visualisers that showed their images on large projection screens. When these academics were not drawing 'live', they would walk amongst their students, placing them at the centre of their lectures.

'Academic D' taught design studios at PSA using didactic methods. 'Academic D' utilised a spoon feeding approach of 'do-as-I-say' teaching which replicated a form of the apprenticeship model of

architecture practice.[21] Students appreciated this straight-forward and uncomplicated approach to teaching, but as Sharma[22] suggests, didactics do not challenge students to the same extent as interactive and engaged methods and therefore, ultimately constricts a student's learning potential. Rapoport[23] reinforces Sharma's statement, "In effect the studio presupposes that apprentices learn from a master - it perpetuates the archaic master-apprentice system no matter how disguised".

'Academic E' used a version of the 'Dialogic Classroom' as described by Robin Alexander.[24] 'Academic E' valued the Socratic Method of discussion in the architecture studio[25] almost as much as drawing and followed Alexander's suggestion that, "talking to learn is almost as important as learning to talk".[26]

I have chosen to highlight five academics who have influenced my teaching practice most significantly in the past eighteen years. However, as a student, architect and then architect-teacher I have been influenced by many educators and colleagues in AE. The research that I undertook for my HEA Senior Fellowship claim, and more recently with the literature I have discovered as part of the UoP EdD Course, has led me to ask why teacher-architects are not taught to teach. As Professor Salama stated in a podcast with the architect-educator James Benedict Brown[27], "Very few educators are really into understanding the nature of delivery of instruction and teaching. They teach, they develop skills as they go, but I don't think they are engaged in theories of pedagogy or education."

The aim of my research for the EdD is to discover ways to develop a training programme for new and existing teacher-architects. This teacher training programme would be used to improve the teaching practice of architect-educators with the ultimate aim of enhancing the academic experience of students within Schools of Architecture.

The words of Nicol and Pilling[28] still ring true, twenty years after they were first written, "As well as helping teachers develop their teaching abilities there is also a need to cultivate in schools of architecture learning environments and attitudes that are consistent with and reinforce the professional skills that we wish to develop in students".

A critical reflection on my knowledge, skills and experience as a teacher-architect and my developmental needs related to the University of Portsmouth Professional Doctorate in Education (EdD)

My knowledge about the practice of being an architect and of being a teacher-architect is well developed; I have been educated and mentored by architect-tutors in Schools of Architecture and guided by architects in practice synchronously for over 25 years.

I have undertaken research as an architecture student, at both undergraduate and postgraduate levels, but I could not find time to engage properly in prolonged research and academic investigation since becoming an architect-educator. I had previously written extended dissertations and theses which required in-depth investigation and research. I am well organised and I enjoy working to set deadlines. I have published papers with colleagues in peer-reviewed journals, but I have not, until this point in time, found a topic that I am truly passionate about in AE. Joining the Professional Doctorate in Education has provided me with opportunities to undertake investigations into AE teaching practice which has the potential to improve my skills, and when this research is shared, the skills of my teacher-architect community.

Samuel[29] stated that architects do not value research and this prevents the profession from developing and growing. In order for change to happen, Samuel argues, architects, and by association architect-educators, need to generate new knowledge; "Architects will need to be very clear about what it is they know and it's value, expressed both qualitatively and quantitatively. They can only do this by building up a body of knowledge, the foundation of their claim to professionalism".[30]

My requirements for the Professional Doctorate in Education that I am studying are relatively simple; I need to make time to carry-out engaged research into AE. The EdD has helped me to develop a structural framework to undertake reading and writing and, because I have carefully chosen AE-related research topics, I have been able to apply the knowledge that I have acquired to my practice as an architect-educator.

CONCLUSION

For over sixty years, architect-educators have spent a significant amount of time examining, investigating, adapting, and refreshing the role and operation of the design studio in AE. In simple terms, this research can be said to conclude that although the design studio has many guises it has largely remained unchanged since it was first used in AE. Conversely, there has been very little research into developing training programmes to specifically support the operators of design studios in AE, namely architect-educators.

The literature review that I have undertaken for this essay spans over six decades. I have found papers and reports which highlight the importance of teacher training for architect-educators (see for example Teymur[31], Weaver[32], Nicol & Pilling[33], Weaver et al.[34], Roaf & Bairstow[35]). However, my literature review also shows that in that time only one school of architecture has developed an AE-specific teacher training programme (Weaver[36], Weaver et al.[37]).

As has been previously discussed in this article, the training of teachers in HE through the Advance HE Fellowship programme, and other similar incarnations, is not enough to satisfy the discipline-specific needs of teachers within AE.

Considering my own inculcation into the architecture academy as a novice teacher, I find myself asking a fundamental question, 'Are the current methods of support available to new architect-teachers enough to satisfy the needs of students who will be graduating into a constantly changing, complicated and litigious architectural profession?'.

My research leads me to believe that there is a significant knowledge gap in AE with regards to the provision of professional teacher training for architect-educators.

The articles that have already been written, and will be written, as part of this author's Professional Doctorate in Education at UoP, will be used to investigate this topic further.

NOTES

[1] Kevin Rowland Rhowbotham, Form to Programme: Speculative Examination of Architecture Concepts in Design and Teaching Practice, 1st ed. (London: Black Dog Publishing, 1995), p. 12.

[2] A 'Crit' is short for 'criticism' or 'critique' and involves a panel of assessors critiquing the project work of a student.

[3] Simon Pilling et al., "Preparation and Support of Part-Time Teachers Designing a Tutor Training Programme Fit for Architects," in Changing Architectural Education Towards a New Professionalism (Hoboken: Taylor & Francis Ltd., 2000), p. 267.

[4] Simon Pilling et al., p. 268.

[5] Tom Wooley, "Why Studio?," Architects' Journal 193, no. 12 (1991): p. 48.

[6] Tom Wooley, p. 47.

[7] "The 1958 Conference was organized by Sir Leslie Martin on behalf of the Education Committee of the RIBA [Royal Institute of British Architects] … In 1958 the organizing committee had several objectives: 1) The Conference should draw together as much relevant factual information as possible 2) The discussion should bring out as much informed opinion as possible from people interested in widely different aspects of Architectural Education 3) The discussion should be frank 4) If possible, some line of action should emerge" (Roaf & Bairstow, 2008, p. vi-vii).

[8] Schön Donald A, The Reflective Practitioner ([New York]: Basic Books, 1983); Schön Donald A, The Design Studio: An Exploration of Its Traditions and Potentials (London: RIBA Publications for RIBA Building Industry Trust, 1985); Schön Donald A, Educating the Reflective Practitioner (San Francisco, Calif.: Jossey-Bass, 1987).

[9] David A. Kolb, Experiential Learning: Experience as the Source of Learning and Development, 2nd ed. (Upper Saddle River, New Jersey: Pearson Education, Inc, 2015).

[10] John Dewey, Experience and Education (New York: Simon and Schuster, 1938), pp. 19-12.

[11] David A. Kolb, Experiential Learning: Experience as the Source of Learning and Development, 2nd ed. (Upper Saddle River, New Jersey: Pearson Education, Inc, 2015), pp. 180-181, 246, 279-280).

[12] David A. Kolb, pp. 3-4.

[13] David A. Kolb, p. 51.

[14] Jean Lave and Etienne Wenger, Situated Learning. Legitimate Peripheral Participation (Cambridge: Cambridge University Press, 1991).

[15] Jean Lave, pp. 59-87.

[16] Jean Lave, p. 56-57.

[17] Edward De Bono, Six Thinking Hats, 1st ed. (London: Penguin, 2000).

[18] Horst W. J. Rittel and Melvin M. Webber, "Dilemmas in a General Theory of Planning," Policy Sciences 4, no. 2 (1973): pp. 155-169, https://doi.org/10.1007/bf01405730.

[19] Bob Bates, Learning Theories Simplified, 1st ed. (London: SAGE Publications Limited, 2016), pp. 108-110).

[20] Maheshvari Naidu, "Engaged Pedagogy and Performative Teaching: Examples from Teaching Practice," International Journal of Educational Sciences 6, no. 3 (2014): pp. 459-468, https://doi.org/10.1080/09751122.2014.11890157, p. 459.

[21] Rolf Baltzersen, "Apprenticeship Model," Mentoring.pressbooks.com, 2020, https://mentoring.pressbooks.com/chapter/apprenticeship-model/.

[22] Neel Sharma, "What More Proof Do You Need?," BMJ 334, no. Suppl S3 (2007): p. 113, https://doi.org/10.1136/sbmj.0703113, p.113.

[23] A Rapoport, "Studious Questions," Architects' Journal 178, no. 43 (1983): pp. 55-57., p. 56.

[24] Bob Bates, Learning Theories Simplified, 1st ed. (London: SAGE Publications Limited, 2016), p. 246.

[25] Kostic, A. "Plato in the Architectural Studio." Theory by Design, 2012, 29–36. https://d1wqtxts1xzle7.cloudfront.net/58648920/G1_091_proof.pdf?1552937581=&response-content-disposition=attachment%3B+filename%3DPlato_in_The_Architectural_Studio.pdf&Expires=1600415384&Signature=Gotd-BNafUdxzgytNaP1jeL7YNCwSp-7H5j6fpvnYnW9sXZ-vz6~KGd6txQSmernHPrOPBUwPrQgfVjiUPKUHcjT34ymPmnVzISV7NQzw5vdpcU5RrmGgAIHOwb0shei6p8NNiUHYardmECPYQWW-m4NiuLJCGDqcKUQLrK7phm1ucBJd6M1teOd0hCll-OifwOWTzc9knjifWEtjjGdvEJo44-plf7TWqWFJMO96DIqqGFsQLFvcEJNeWrRNrkVO7GYrQ~aivSZps4cksL24OiolLIVEFRCYeA1FRyPxMGBg4cZGd3t0cwUle5HBGfCLZBhSxJlbcNcplc271YzPg__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA, p.32.

[26] Bob Bates, Learning Theories Simplified, 1st ed. (London: SAGE Publications Limited, 2016), p. 246.

[27] James Benedict Brown, "Episode 11: the Interview - Professor Ashraf M. Salama," The Arch. Ed. Podcast, July 1, 2015, https://podcasts.apple.com/gb/podcast/the-arch-ed-podcast/id955325717?i=1000347301470.

[28] David Nicol and Simon Pilling, Changing Architectural Education Towards a New Professionalism (Hoboken: Taylor & Francis Ltd., 2000), p.22.

[29] Alan Jones et al., "Three Pillars of Professionalism: Knowledge, Ethics and Professional Judgement," in *Defining Contemporary Professionalism For Architect's in Practice and Education*, 1st ed. (London: RIBA Publishing, 2019), p. 211.

[30] Alan Jones et al., p. 212.

[31] Necdet Teymur, *Architectural Education*, 1st ed. (London: ?uestion Press, 1992).

[32] Nicholas Weaver, "APT Atelier Principle in Teaching," in *APT Atelier Principle in Teaching* (University of Roskilde, Denmark: University of Roskilde, 1997).

[33] David Nicol and Simon Pilling, *Changing Architectural Education Towards a New Professionalism* (Hoboken: Taylor & Francis Ltd., 2000).

[34] Simon Pilling et al., "Preparation and Support of Part-Time Teachers Designing a Tutor Training Programme Fit for Architects," in *Changing Architectural Education Towards a New Professionalism* (Hoboken: Taylor & Francis Ltd., 2000), pp. 228-235.

[35] Susan Roaf and Andrew Bairstow, *The Oxford Conference* (Southampton: WIT Press, 2008).

[36] Nicholas Weaver, "APT Atelier Principle in Teaching," in *APT Atelier Principle in Teaching* (University of Roskilde, Denmark: University of Roskilde, 1997).

[37] Simon Pilling et al., "Preparation and Support of Part-Time Teachers Designing a Tutor Training Programme Fit for Architects," in *Changing Architectural Education Towards a New Professionalism* (Hoboken: Taylor & Francis Ltd., 2000), pp. 228-235.

BIBLIOGRAPHY

Bates, Bob. *Learning Theories Simplified*. 1st ed. London: SAGE Publications Limited, 2016.

Brown, James Benedict. "Episode 11: the Interview - Professor Ashraf M. Salama." The Arch. Ed. Podcast, July 1, 2015. https://podcasts.apple.com/gb/podcast/the-arch-ed-podcast/id955325717?i=1000347301470.

De Bono, Edward. Six Thinking Hats. 1st ed. London: Penguin, 2000.

Dewey, John. Experience and Education. New York: Simon and Schuster, 1938.

Kolb, David A. Experiential Learning: Experience as the Source of Learning and Development. 2nd ed. Upper Saddle River, New Jersey: Pearson Education, Inc, 2015.

Kostic, A. "Plato in the Architectural Studio." Theory by Design, 2012, 29–36. https://d1wqtxts1xzle7.cloudfront.net/58648920/G1_091_proof.pdf?1552937581=&response-content-disposition=attachment%3B+filename%3DPlato_in_The_Architectural_Studio.pdf&Expires=1600415384&Signature=Gotd-BNafUdxzgytNaP1jeL7YNCwSp-7H5j6fpvnYnW9sXZ-vz6~KGd6txQSmernHPrOPBUwPrQgfVjiUPKUHcjT34ymPmnVzlSV7NQzw5vdpcU5RrmGgAIHOwb0shei6p8NNiUHYardmECPYQWW-m4NiuLJCGDqcKUQLrK7phm1ucBJd6M1teOd0hCll-OifwOWTzc9knjifWEtjjGdvEJo44-plf7TWqWFJMO96DIqqGFsQLFvcEJNeWrRNrkVO7GYrQ~aivSZps4cksL24OiolLIVEFRCYeA1FRyPxMGBg4cZGd3t0cwUle5HBGfCLZBhSxJlbcNcplc271YzPg__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA.

Lave, Jean, and Etienne Wenger. Situated Learning. Legitimate Peripheral Participation. Cambridge: Cambridge University Press, 1991.

Naidu, Maheshvari. "Engaged Pedagogy and Performative Teaching: Examples from Teaching Practice." International Journal of Educational Sciences 6, no. 3 (2014): 459–68. https://doi.org/10.1080/09751122.2014.11890157.

Nicol, David, and Simon Pilling. Changing Architectural Education Towards a New Professionalism. Hoboken: Taylor & Francis Ltd., 2000.

Pilling, Simon, David Nicol, Nicholas Weaver, Dave O'Reilly, and Mary Caddick. "Preparation and Support of Part-Time Teachers Designing a Tutor Training Programme Fit for Architects." Essay. In Changing Architectural Education Towards a New Professionalism, 228–35. Hoboken: Taylor & Francis Ltd., 2000.

Rapoport, A. "Studious Questions." Architects' Journal 178, no. 43 (1983): 55–57.

Rittel, Horst W. J., and Melvin M. Webber. "Dilemmas in a General Theory of Planning." Policy Sciences 4, no. 2 (1973): 155–69. https://doi.org/10.1007/bf01405730.

Rittel, Horst W. J., and Melvin M. Webber. "Dilemmas in a General Theory of Planning." Policy Sciences 4, no. 2 (1973): 155–69. https://doi.org/10.1007/bf01405730.

"Royal Institute of British Architects Fulfilling Your CPD Requirements and Obligations as a RIBA Member." Architecture.com. Royal Institute of British Architects, 2020. https://www.architecture.com/education-cpd-and-careers/cpd/fulfilling-your-cpd-obligations.

Jones, Alan, Rob Hyde, Lorraine Farrelly, Signe Kongebro, and Flora Samuel. "Three Pillars of Professionalism: Knowledge, Ethics and Professional Judgement." Essay. In Defining Contemporary Professionalism For Architect's in Practice and Education, 1st ed., 210–13. London: RIBA Publishing, 2019.

Schön Donald A. The Reflective Practitioner. [New York]: Basic Books, 1983.

Schön Donald A. The Design Studio: An Exploration of Its Traditions and Potentials. London: RIBA Publications for RIBA Building Industry Trust, 1985.

Schön Donald A. Educating the Reflective Practitioner. San Francisco, Calif.: Jossey-Bass, 1987.

Sharma, Neel. "What More Proof Do You Need?" BMJ 334, no. Suppl S3 (2007): 113. https://doi.org/10.1136/sbmj.0703113.

Teymur, Necdet. Architectural Education. 1st ed. London: ?uestion Press, 1992.

Weaver, Nicholas. "Conference on Project Based Learning." In APT Atelier Principle in Teaching. University of Roskilde, Denmark: University of Roskilde, 1997.

TRACING THE INTENSIVE: ON ASSEMBLAGES, TECHNICITIES AND URBAN PEDAGOGIES

Author:
RAN PAN, STAVROS KOUSOULAS, PAUL CHAN

Affiliation:
DELFT UNIVERSITY OF TECHNOLOGY, NETHERLANDS

INTRODUCTION

Nowadays, emerging technologies continuously shift our understanding of human evolution as well as influence the understanding of architecture and the urban environment. With the heated discussion on terms such as the metaverse, emerging socio-technological attractors that incorporate state-of-the-art research in diverse trajectories gather the attention of scholars and experts in different fields such as artificial intelligence, blockchain and machine vision. Topics like these bring the discussion of digital, data-driven techniques in tension with conventional design practices. In architectural and urban design, the development of digital technologies enables a great variety of technical methods facilitating the extraction of certain aspects of urban life through qualitative and quantitative analyses and simulations. Such technologies, for example mapping, filmmaking, geographic information system (GIS), parametric modelling or VR/AR technology, are increasingly included in architectural and urban education.[1] However, the rapid growth of such technologies has also been questioned on whether it could enhance the very understanding of urban conditions or evoke our critical thinking about the dynamic, transient, and intensive encounters in the everyday activities of urban life.[2]

In this sense, this article aims to examine the relationship between technologies and urban life by embracing assemblage theory as derived from philosophers Gilles Deleuze and Felix Guattari.[3] From a cultural-technological perspective, it then highlights the significance of experience and sensibility in understanding urban life as an assemblage. Moreover, this article further gives some insight into the role of urban pedagogies in facing the complexity of urban issues in the cosmopolitan context. Echoing the previous discussion on technologies, it attempts to examine the potentiality of engaging transdisciplinary knowledge in architectural and urban education. Finally, it goes back to the broader concerns by raising an open-ended question: how digital literacy could produce a form of urban literacy, and how does lack of knowledge of the entanglements between architecture and digital technologies leads eventually to an impediment of understanding how urban life is influenced by both.

ASSEMBLAGE THEORY, TECHNICITIES AND COSMOPOLITAN URBANISM

Assemblage theory has increasingly been used in social sciences research due to its capacity to address indeterminacy, emergence, becoming and complex relationship in and among systems.[4] The concept of the assemblage was first introduced by philosophers Gilles Deleuze and Felix Guattari as the term *agencement* which refers simultaneously to the action of parts coming together and to the resulting ensemble.[5] An assemblage, in a general sense, is a whole "whose properties emerge from the

interactions between parts". [6] In other words, the "whole" and the "parts" are inseparable and irreducible. Different from a simplified understanding of unity, which defines the relations between the parts and the whole in advance of their emergence, assemblage theory allows the possible emergence, synthesis and emancipation of parts in a process of constant multiplicity. Assemblage thinking, thus, offers a new perspective to focus more on the system as embedded in time, in a dynamic and continuous intensive transformation amongst parts and eventually the incremental becoming of the whole. [7] As opposed to traditional system theories, assemblage theory has four main differentiating characteristics according to Manuel DeLanda's extensive interpretation in which the following examination is largely based. [8]

First and foremost, assemblage theory positions against reductionism and the totalizing point of view. While acknowledging the emergence of an assemblage from the interactions between the parts, one also needs to recognize the affordances and constraints acting on the parts from the formed assemblage. In this case, assemblage theory overcomes the simple top-down and bottom-up binary in the examination of a system. Speaking of the urban system, assemblage theory refuses to reduce a city directly and solely to the buildings, infrastructures or communities but allows us to think of these parts in a co-functioning way. In this sense, it challenges existing digital representations trends that extract functions of buildings as points of interest or reduce multiplicities of cities into mixed spatial distributions and simple spatial correlations. [9] It would also hardly be enough to focus on the complex interactions only *within* an assemblage. Rather, it would be better to see how the formed assemblages act *inwards* on the emergence and decline of such complex interactions. [10]

The second characteristic of assemblages is their historically-produced contingency. In other words, assemblages are not fixed nor given in advance. An assemblage is an individual entity that is formed by the parts while maintaining the parts in sustaining their coming together. As such, there is no pre-established hierarchy of assemblages but the actual and potential relations transforming between systems. Focusing on the urban system, within such assemblage, the actual and potential relations between humans and non-humans are constantly transforming. Particularly, everyday urban life, in this sense, would no longer be treated as a fixed setting or the mundane and the repetition of the same. Using Deleuze's terms, it would contain flows of intensities with surging capacities and potentials for emergence between the actual and potential urban relations. [11] Such intensities flow immanently, contributing to a transformative process and furthering the becoming of urban life. Therefore, it is a realm of intensities, lying between the actual and the virtual status of urban beings, requiring therefore more attention in the study of urban life.

Intensity or intensive quality refers to the strength level of pure force or energy; as such, it is related to what Deleuze see as productive differences. [12] Such differences are not the external differences between things but the difference within one and the same system, for instance, differences in temperature, pressure, etc. [13] A pertinent example to describe how intensity works is the state of water under different temperatures. The thresholds of intensity determine the phase of transitions of water between solid, liquid and steam. [14] The transition between different phases is the continuous and incremental experience from the virtual (real but yet to come) to the actual (real and already here). The intensity flowing between the transcendental principle of difference and repetition is thus the condition of emergence of anything new. [15] In a more spatio-temporal sense, Deleuze refers to the "larval subject" that is a subject "with no fixed identity", [16] it experiences the intensive foldings, migrations and transformations and contains huge potentials to co-evolve together with its environment and to "turn into a fully formed organism". [17]

Here, focusing on urban life, there are two insights from the concept of "larval subject" in the design of urban spaces. Thinking of urban design, the "larval subject" can link to the discussion of the determination in shaping architectural and urban spaces. An underdetermined design can largely afford

a greater range of actions in spaces and enable the multiplicity of architectural and urban experiences, whereas an overdetermined space tends to be one-way with limited experiential diversity and thus constraining the emergence of synergies in spaces.[18] In terms of the design method, a good example of the "larval" could be Koolhaas's Downtown Athletic Club.[19] According to the architectural historian Hans van Dijk, instead of using the Club's section as a corrective intervention, or say, ordinary and reductive use of a diagram, Koolhaas uses the section as a deliberate design device to engender the emergence of the susceptible and the unforeseen.[20] These two insights, one from the theoretical and one from the methodological, also link to the integration of technologies in architectural and urban design, which will be discussed later together with the third and fourth point.

The third and fourth characteristics of assemblage can be discussed together to address the current issues within the context of cosmopolitan urbanism. Cosmopolitanism, simply put, is "the attitude toward difference and thus the possession of a set of skills that allow individuals to negotiate and understand cultural differences".[21] As the difference and interactions are the central components of cosmopolitanism, it is natural to connect it to assemblage theory to gain a better understanding of cosmopolitan urbanism.

The third characteristic of assemblages challenges the conventional sense of scale, indicating that an assemblage can become part of or contain other assemblages. As such, assemblage theory offers a truly relational understanding across multiple scales with a focus on the complex and dynamic interactions between different systems.[22] In this sense, the individual would no longer be the undifferentiated entity in an already-given cosmopolitan urban system. Rather, as Gatsby's own social transformation is nested and reflects the socio-cultural transformation of American cosmopolitanism in the 1920s, the becoming of the individual as a "micro" system is associated with the becoming of a "macro" cosmopolitan system through complex and dynamic interactions.[23] Taking a step further, Guattari uses *ecosophy* to describe such transversal relations between the three ecological registers of environment, social relations and human subjectivity.[24] His discourse highlights the intertwinement between the mental development of how people imagine the world, the social development of how people practice as groups, and the environmental changes shaped by technological development.[25] Within the cosmopolitan context, such intertwinement of the three ecologies indicates that in order to gain a deeper understanding of cosmopolitics, one must *think* and *feel* with the triple dimensions, the psychic, the social, and the environmental together embedded in their everyday experience.[26]

The last point is that assemblages are formed and composed by heterogeneous parts. Hence, the examination of the urban system as an assemblage ought to excavate the co-functioning of different natures as a symbiosis that forms the assemblage, rather than applying or reducing the multiplicity into a one-rule-fits-all approach.[27] In this case, assemblage theory requires the inclusion, yet with critical consideration, of a wide range of materials that might matter for how we understand the city, including architecture and infrastructure, new and old technologies, software codes, or even literature, movies and so on.[28] Consequently, it becomes the locus of a truly transdisciplinary effort.

Especially in the digital age, the awareness of introducing transdisciplinary knowledge in urban studies is prevalently associated with digital technologies.[29] However, the so-called transdisciplinary engagement with technologies tends to treat technologies as the "end product".[30] In fact, technology should not be merely the deliverable or result; it is the co-evolving relations between technology and humans. Here one may refer to philosopher Gilbert Simondon and his concept of *technicity*.[31] According to philosopher Gilbert Simondon, technicity deals with how humans relate to and transform their environment through technology and how these relations transform all of them in their own – humans, technology and environment.[32] In other words, the evolution of technical objects tends to be a process of exteriorization of human biological functions, simulated and constrained by shifting environmental conditions, and itself constitutive of the psycho-social domain where norms and beliefs come to reinvest

these biological functions with cultural meaning. In this sense, the socio-political issues in cosmopolitan urbanism are also cultural-technological issues. As philosopher of technology Yuk Hui, argues, one can only understand cosmopolitics by understanding cosmotechnics.[33] Thus, the engagement of digital technologies as transdisciplinary knowledge in cosmopolitanism should aim at enhancing the sense-making in the experience of cultural-technological development.

FOCUS ON URBAN PEDAGOGIES

Turning to urban pedagogies, the discussion may start with the etymology of "education". Education derives from the Latin *educere*, *to lead out*. Education, therefore, is leading out of what is already established in the learner. According to cultural theorist Claire Colebrook, education is "not the imposition of some already given truth but the formation of those selves who must grasp the truth."[34] To her, instead of being a "pouring in" or simple conveyance of information, education or learning, is an exercise in the self-formation of "souls" or say micro-perceptions that are potentials for creating relations, response and perceptions.[35] Such self-formation starts from experience, moves beyond and turns into the recognition and intuition of one's own condition for experience. One can hardly learn to swim by replicating the movements of the swimming coach or feeling the waves in the same way as the coach responds; one must respond to the new waves and form the image through the experience and constant encounter with problems. In this sense, the role of education is to facilitate the cognition of experience and sense-making throughout the encounters with the world.

From the previous discussion on assemblage theory and urban life, one might find that experience plays a significant role in nearly every characteristic of assemblages and thus, stitches urban life together. First, the experience of the changing intensities of differences enables the transformation between the virtual and the actual. In urban design thinking, with a lower level of determination in the design of urban spaces, people can have a larger chance to not merely encounter and see but also *experience* the complexity and differences, and thus, stimulate people's mental engagement in becoming a part of urban life. In design methodology, the experience also plays a crucial role in producing design concepts. Instead of reinforcing pre-assumptions, thinking and experiencing the changes and transformation while using a deliberate design device helps engender the emergence of the potentialities, which are usually unforeseen. Secondly, in responding to the issues of cosmopolitanism, the social and mental experience of humans is associated with cosmopolitan issues on a larger scale. One can only feel and think about cosmopolitan urban issues only when one can links such thinking and feeling to social and mental experiences. Lastly, in terms of the heterogeneity, the integration of transdisciplinary knowledge enables us to feel and experience the diversity and the emergence of discourses about the non/in/trans/meta/posthuman and facilitates the understanding of complex interactions and the blurry in-between status within urban life "in assemblages that flow across and displace the binaries".[36]

Speaking of architecture and urbanism, past architecture and urban education are often dominated by numerous ways to produce ideologies and concepts with the manipulation of different materials, geometries, and semiotic elements, but perhaps overlook the basic medium of the discipline that is the field of experience itself.[37] The existing use of emerging technologies, to some extent, seal the expansion and transformation of experience and consciousness given by the intrinsic biological sensory and cognitive.[38] As argued by Richard Sennett, prescriptive smart technologies tend to "dumb down the citizens".[39] For education, the domination of simulation and visual qualities in "digital design" seems to undermine students' experience and sensibility of encounters, urban characters, and sensual attributes, such as soundscapes, smellscapes, tactilescapes, etc.[40] The current engagement of emerging technologies barely changes fundamental conceptualisations or the types of tasks in which planners and designers usually deal with, but solely changes the format they present.[41] Therefore, it is necessary to

review the role of actual experience and sensibility in urban life and bring urban education back to the "real world".[42]

In fact, sensibility is "ground zero".[43] In Colebrook's words: "Once we try to think the origin of all that is, the very ground of being, then we arrive properly not at the origin of sensibility, but sensibility as origin."[44] Sensibility, thus, is a crucial part in cognition. It is more than a process that only operates inside the body but rather distributes widely through lived experience across both natural and technical environments.[45] In this sense, the "embodied mind" or the 4EA approach, namely "embodied, embedded, enactive, extended, affective", embraces the systems of brain-body-world to understand cognition.[46] In addition, an embodied mind strongly resonates with assemblage theory and the three ecologies mentioned previously.[47] As such, it would be possible to adopt the 4EA approach to provide insight into a pedagogical sense in architecture and urban studies in order to bridge the gaps between urban structures, materials and cognition via lived experiences and sensibility from which those synthesized wholes of urban life emerge through artwork and education.[48]

Additionally, such sensibility can be enhanced throughout a variety of experiential knowledge. It includes both the augmentation of the sense through technologies, for instance human enhancement, but also an augmentation of sense through the cultivation of aesthetic and philosophical intuition — the latter currently declining due to the dominating trend of the former.[49] Such trend derives from the boundaries of disciplinarity, which obstruct the effectiveness of transdisciplinary collaborations and ultimately end up with a blunting or loss of certain senses.[50]Hence, echoing the previous discussion, the engagement of transdisciplinary knowledge is not only to bring different disciplinary knowledge together but also to experience and use the knowledge from other disciplines to challenge the pre-assumptions and cultivate the sensibility on multiple sides. For instance, in the video *Autopoietic Veering: Schizo Socius of Tokyo and Vancouver (2021)*, the moving-image gives an opportunity to re-order the fragmentation of time, memory and space, and generate a new order from the combination of scales-shifting, overlays, sounds, speed, colours and relations.[51] With such transdisciplinary technics, the sensibility is augmented. It becomes possible therefore to move beyond pre-assumptions and critically consider the use of materials and technologies. In a pedagogical sense, this film provides an appropriate instance to encourage the exploration of potentialities and, particularly within the context of the digital age, to gain a better understanding of technicities from a cultural-technological perspective.

Figure 1. Screenshot from the film *Autopoietic Veering: Schizo Socius of Tokyo and Vancouver (2021)*

CONCLUSION AND IMPLICATIONS

Very recently, Google released another new technology engaging machine learning in 3D mapping and modelling to provide high-end rendering and an immersive view for people to explore urban centres and buildings. Arguably, such technology will soon be introduced into architectural and urban education. However, before fully embracing the eye-catching technology, one might ask: would the technology encourage people's thinking of architecture and urban spaces? Would the rendered impressions assist people in exploring the heterogeneous potentials of urban life? To what extent do such fast-developed digital technologies contribute to the sensibility and the urban literacy derived from everyday life experiences?

Embracing assemblage theory, this article emphasizes the role of experience and sensibility in architecture and urban pedagogies. From a cultural-technological perspective, it highlights the following points as reflection. First, future urban pedagogies ought to see sensibility as ground zero in facilitating the formation of urban knowledge. To do so, the 4EA approach can be used to focus on the actual experience embedded in everyday urban life. Secondly, educators could facilitate the links between individual learners and encourage them to think and feel cosmopolitan urban issues within the diversity and heterogeneity of their interactions. For that, the critical inclusion of transdisciplinarity is necessary. Finally, and to achieve this, one needs to embrace a cultural-technological perspective that critically engages digital technologies and understands them as a constitutive and co-evolving progress of human individuation.

NOTES

[1] See Philip Speranza, "Using parametric methods to understand place in urban design courses," *Journal of Urban Design* 21, no. 5 (2015), https://doi.org/10.1080/13574809.2015.1092378.
Regina Mapua Lim, Laura Novo de Azevedo, and Jon Cooper, "Embracing the conceptual shift on new ways of experiencing the city and learning urban design: pedagogical methods and digital technologies," *Journal of Urban Design* 21, no. 5 (2015), https://doi.org/10.1080/13574809.2015.1071651.
Anne Vernez Moudon, "An alternative pedagogic model for doctoral research in urban design," *Journal of Urban Design* 21, no. 5 (2015), https://doi.org/10.1080/13574809.2015.1092377.
David Thomas and Justin B. Hollander, "The city at play:Second Lifeand the virtual urban planning studio," *Learning, Media and Technology* 35, no. 2 (2010), https://doi.org/10.1080/17439884.2010.494433.
[2] Kim Dovey, "On learning urban design," *Journal of Urban Design* 21, no. 5 (2016), https://doi.org/10.1080/13574809.2016.1220140.
[3] Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: capitalism and schizophrenia* (London : Athlone Press, 1987)
[4] Colin McFarlane, "Assemblage and critical urbanism," *City* 15, no. 2 (2011), https://doi.org/10.1080/13604813.2011.568715.
[5] Deleuze and Guattari, *A Thousand Plateaus: capitalism and schizophrenia*.
[6] Manuel DeLanda, *A New Philosophy of Society: Assemblage Theory and Social Complexity* (London, UK; New York, US: Continuum, 2006)
[7] Thomas Nail, "What is an Assemblage?," *SubStance* 46, no. 1 (2017).
[8] Manuel DeLanda, *Assemblage theory*, Speculative realism, (Edinburgh: Edinburgh University Press, 2016)
[9] Examples such as: Carlo Ratti et al., "Mobile Landscapes: Using Location Data from Cell Phones for Urban Analysis," *Environment and Planning B: Planning and Design* 33, no. 5 (2006), https://doi.org/10.1068/b32047. Also, in Yang Yue et al., "Measurements of POI-based mixed use and their relationships with neighbourhood vibrancy," *International Journal of Geographical Information Science* 31, no. 4 (2016), https://doi.org/10.1080/13658816.2016.1220561.
[10] See examples in Ran Pan and Elek Pafka, "Mapping the 'beat': the urban morphologies of Melbourne's evolving live music clusters," *Journal of Urban Design* (2020), https://doi.org/10.1080/13574809.2020.1819782. Also, in Stephen Wood and Kim Dovey, "Creative multiplicities: Urban morphologies of creative clustering," *Journal of Urban Design* 20, no. 1 (2015).
[11] Gilles Deleuze, *Difference and repetition*, 2nd ed., Athlone contemporary European thinkers, (London: Continuum, 2001)
[12] See p.255 in Deleuze, *Difference and repetition*.
[13] See p.222 in Deleuze, *Difference and repetition*.
[14] Manuel DeLanda, *Intensive science and virtual philosophy*, Transversals, (London ; New York: Continuum, 2002)
[15] See pp.240-241 in Deleuze, *Difference and repetition*.
[16] See p.215 in Deleuze, *Difference and repetition*.
[17] See p.202 in DeLanda, *Intensive science and virtual philosophy*.
[18] Kim Dovey, *Urban design thinking: a conceptual toolkit* (Bloomsbury Publishing, 2016)
[19] Rem Koolhaas, *Delirious New York: A Retroactive Manifesto for Manhattan*, 2nd ed. (New York: The Monacelli Press, 1994)
[20] See p.72 in Hans van Dijk, "Critical Project or the Project of Criticism?," in *The Architectural Annual 2003–2004*, ed. H. Bekkering and D. Hauptman et al. (Rotterdam: 010 Publishers, 2005).
[21] See p.4 in Jon Binnie et al., "Introduction: grounding cosmopolitan urbanism: approaches, practices and policies," in *Cosmopolitan urbanism*, ed. Jon Binnie et al. (London ; New York: Routledge, 2006).
[22] DeLanda, *A New Philosophy of Society: Assemblage Theory and Social Complexity*.
[23] F. Scott Fitzgerald, *The Great Gatsby* (New York: Ralph Ellison Collection, 1925)
[24] Félix Guattari, *The Three Ecologies* (London ; New Brunswick, NJ: Athlone Press, 2000)
[25] Hélène Frichot, *Creative Ecologies: Theorizing the Practice of Architecture* (London, New York: Bloomsbury Publishing, 2018)
[26] Isabelle Stengers, *Cosmopolitics I* (Minneapolis: University of Minnesota Press, 2010)
[27] DeLanda, *Assemblage theory*.
[28] Colin McFarlane, *Learning the city : knowledge and translocal assemblage*, 1st ed., RGS-IBG book series, (Malden, MA: Wiley-Blackwell, 2011)

[29] Shane Denson, *Discorrelated images* (Durham: Duke University Press, 2020)

[30] Megan Brown et al., "Seeking Northlake: Place, technology, and public as enabling constraints for urban transdisciplinary research," *Cities* 60 (2017), https://doi.org/10.1016/j.cities.2016.10.003.

[31] Gilbert Simondon, Cécile Malaspina, and John Rogove, *On the mode of existence of technical objects*, First University of Minnesota Press edition. ed. (Minneapolis: University of Minnesota Press, 2017)

[32] Stavros Kousoulas, *Architectural Technicities: A Foray into Larval Space* (London: Routledge, 2022)

[33] Yuk Hui, "COSMOTECHNICS," *Angelaki* 25, no. 4 (2020), https://doi.org/10.1080/0969725X.2020.1790828.

[34] See p. 35-36 in Claire Colebrook, "Leading Out, Leading On: The Soul of Education Nomadic Education: Variations on a Theme by Deleuze and Guattari," in *Nomadic Education: Variations on a Theme by Deleuze and Guattari*, ed. Inna Semetsky, Educational Futures (Leiden, The Netherlands: Brill, 2008).

[35] Ibid.

[36] See p.33-34 in Rosi Braidotti, "A Theoretical Framework for the Critical Posthumanities," *Theory, Culture & Society* 36, no. 6 (2018), https://doi.org/10.1177/0263276418771486.

[37] Andrej Radman, "Deep architecture: An ecology of hetero-affection " in *Architectural Affects after Deleuze and Guattari* ed. Marko Jobst and Hélène Frichot (Abingdon, New York: Routledge, 2021).

[38] Sanford Kwinter, "Game-Changing Rules," *Domus: Innovation* (2018).

[39] Richard Sennett, *Building and dwelling : ethics for the city* (New York, US: Farrar, Straus and Giroux, 2019)

[40] Rafael E. Pizarro, "Teaching to understand the urban sensorium in the digital age: lessons from the studio," *Design Studies* 30, no. 3 (2009), https://doi.org/10.1016/j.destud.2008.09.002.

[41] Ruth Potts, "Is a New 'Planning 3.0' Paradigm Emerging? Exploring the Relationship between Digital Technologies and Planning Theory and Practice," *Planning Theory & Practice* 21, no. 2 (2020), https://doi.org/10.1080/14649357.2020.1748699.

[42] Dovey, "On learning urban design," Journal of Urban Design 21.

[43] Andrej Radman, "Sensibility is Ground Zero: On Inclusive Disjunction and Politics of Defatalization," in *This Deleuzian century : Art, activism, life*, ed. Rosi Braidotti and Rick Dolphijn (Leiden: BRILL, 2015).

[44] See p.29 in Claire Colebrook, "Derrida, Deleuze and Haptic Aesthetics," *Derrida Today* 2, no. 1 (2009), https://doi.org/10.3366/E1754850009000360.

[45] John Protevi, "Deleuze and Wexler: Thinking brain, body and affect in social context," in *Cognitive architecture : from biopolitics to noopolitics : architecture & mind in the age of communication and information*, ed. Deborah Hauptmann and Warren Neidich (Rotterdam: 010 Publishers, 2010).

[46] Michael Wheeler, *Reconstructing the cognitive world: the next step* (Cambridge, Mass.: MIT Press, 2005)

[47] John Protevi, "One More 'Next Step': Deleuze and Brain, Body and Affect in Contemporary Cognitive Science," in *Revisiting Normativity with Deleuze*, ed. Rosi Braidotti and Patricia Pisters, Bloomsbury Studies in Continental Philosophy (London, UK; New York, US: Bloomsbury Academic, 2012).

[48] Marc Boumeester, "Reconsidering Cinematic Mapping: Halfway Between Collected Subjectivity and Projective Mapping," in *Urban cinematics: understanding urban phenomena through the moving image*, ed. François Penz and Andong Lu (Intellect, 2011).

[49] Yuk Hui, *Art and cosmotechnics* (Minneapolis, MN: e-flux books, 2020)

[50] Tatjana Leblanc, "Transdisciplinary Design Approach" (Creativity and HCI: From Experience to Design in Education, Boston, MA, Springer US, 2009).

[51] Masayuki Iwase and Joff P. N. Bradley, "Towards a Noncompliant Pedagogy of the Image: Reading Negentropic Bifurcatory Potentials in Video Images," *Video Journal of Education and Pedagogy* 6, no. 1 (2021), https://doi.org/10.1163/23644583-bja10020, https://dx.doi.org/10.1163/23644583-bja10020.

BIBLIOGRAPHY

Binnie, Jon, Julian Holloway, Steve Millington, and Craig Young. "Introduction: Grounding Cosmopolitan Urbanism: Approaches, Practices and Policies." In *Cosmopolitan Urbanism*, edited by Jon Binnie, Julian Holloway, Steve Millington and Craig Young, xi, 259 pages. London ; New York: Routledge, 2006.

Boumeester, Marc. "Reconsidering Cinematic Mapping: Halfway between Collected Subjectivity and Projective Mapping." Chap. 15 In *Urban Cinematics: Understanding Urban Phenomena through the Moving Image*, edited by François Penz and Andong Lu, pp.239-56: Intellect, 2011.

Braidotti, Rosi. "A Theoretical Framework for the Critical Posthumanities." *Theory, Culture & Society* 36, no. 6 (2018): 31-61. https://doi.org/10.1177/0263276418771486.

Brown, Megan, G. Odessa Gonzalez Benson, Roneva Keel, Eleanor Mahoney, Jennifer Porter, and James Thompson. "Seeking Northlake: Place, Technology, and Public as Enabling Constraints for Urban Transdisciplinary Research." *Cities* 60 (2017): 314-22. https://doi.org/10.1016/j.cities.2016.10.003.

Colebrook, Claire. "Derrida, Deleuze and Haptic Aesthetics." *Derrida Today* 2, no. 1 (2009): 22-43. https://doi.org/10.3366/E1754850009000360.

———. "Leading out, Leading On: The Soul of Education Nomadic Education: Variations on a Theme by Deleuze and Guattari." In *Nomadic Education: Variations on a Theme by Deleuze and Guattari*, edited by Inna Semetsky. Educational Futures, 35-42. Leiden, The Netherlands: Brill, 2008.

DeLanda, Manuel. *Assemblage Theory.* Speculative Realism. Edinburgh: Edinburgh University Press, 2016.

———. *Intensive Science and Virtual Philosophy.* Transversals. London ; New York: Continuum, 2002.

———. *A New Philosophy of Society: Assemblage Theory and Social Complexity.* London, UK; New York, US: Continuum, 2006.

Deleuze, Gilles. *Difference and Repetition.* Athlone Contemporary European Thinkers. 2nd ed. London: Continuum, 2001.

Deleuze, Gilles, and Félix Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia.* London : Athlone Press, 1987.

Denson, Shane. *Discorrelated Images.* Durham: Duke University Press, 2020.

Dovey, Kim. "On Learning Urban Design." *Journal of Urban Design* 21, no. 5 (2016): 555-57. https://doi.org/10.1080/13574809.2016.1220140.

———. *Urban Design Thinking: A Conceptual Toolkit.* Bloomsbury Publishing, 2016.

Fitzgerald, F. Scott. *The Great Gatsby.* New York: Ralph Ellison Collection, 1925.

Frichot, Hélène. *Creative Ecologies: Theorizing the Practice of Architecture.* London, New York: Bloomsbury Publishing, 2018.

Guattari, Félix. *The Three Ecologies.* London ; New Brunswick, NJ: Athlone Press, 2000.

Hui, Yuk. *Art and Cosmotechnics.* Minneapolis, MN: e-flux books, 2020.

———. "Cosmotechnics." *Angelaki* 25, no. 4 (2020): 1-2. https://doi.org/10.1080/0969725X.2020.1790828.

Iwase, Masayuki, and Joff P. N. Bradley. "Towards a Noncompliant Pedagogy of the Image: Reading Negentropic Bifurcatory Potentials in Video Images." *Video Journal of Education and Pedagogy* 6, no. 1 (2021): 1-27. https://doi.org/10.1163/23644583-bja10020. https://dx.doi.org/10.1163/23644583-bja10020.

Koolhaas, Rem. *Delirious New York: A Retroactive Manifesto for Manhattan.* 2nd ed. New York: The Monacelli Press, 1994.

Kousoulas, Stavros. *Architectural Technicities: A Foray Into Larval Space.* London: Routledge. 2022.

Kwinter, Sanford. "Game-Changing Rules." *Domus: Innovation* (2018): pp.12-15.

Leblanc, Tatjana. "Transdisciplinary Design Approach." Creativity and HCI: From Experience to Design in Education, Boston, MA, Springer US, 2009.

Lim, Regina Mapua , Laura Novo de Azevedo, and Jon Cooper. "Embracing the Conceptual Shift on New Ways of Experiencing the City and Learning Urban Design: Pedagogical Methods and Digital Technologies." *Journal of Urban Design* 21, no. 5 (2015): 638-60. https://doi.org/10.1080/13574809.2015.1071651.

McFarlane, Colin. "Assemblage and Critical Urbanism." *City* 15, no. 2 (2011): 204-24. https://doi.org/10.1080/13604813.2011.568715.

———. *Learning the City : Knowledge and Translocal Assemblage.* Rgs-Ibg Book Series. 1st ed. Malden, MA: Wiley-Blackwell, 2011.

Moudon, Anne Vernez. "An Alternative Pedagogic Model for Doctoral Research in Urban Design." *Journal of Urban Design* 21, no. 5 (2015): 690-701. https://doi.org/10.1080/13574809.2015.1092377.

Nail, Thomas. "What Is an Assemblage?". *SubStance* 46, no. 1 (2017): 21-37.

Pan, Ran, and Elek Pafka. "Mapping the 'Beat': The Urban Morphologies of Melbourne's Evolving Live Music Clusters." *Journal of Urban Design* (2020): 1-14. https://doi.org/10.1080/13574809.2020.1819782.

Pichai, Sundar, ed. *Google I/O 2022: Advancing Knowledge and Computing*, 2022.

Pizarro, Rafael E. "Teaching to Understand the Urban Sensorium in the Digital Age: Lessons from the Studio." *Design Studies* 30, no. 3 (2009): 272-86. https://doi.org/10.1016/j.destud.2008.09.002.

Potts, Ruth. "Is a New 'Planning 3.0' Paradigm Emerging? Exploring the Relationship between Digital Technologies and Planning Theory and Practice." *Planning Theory & Practice* 21, no. 2 (2020): 272-89. https://doi.org/10.1080/14649357.2020.1748699.

Protevi, John. "Deleuze and Wexler: Thinking Brain, Body and Affect in Social Context." In *Cognitive Architecture : From Biopolitics to Noopolitics : Architecture & Mind in the Age of Communication and Information*, edited by Deborah Hauptmann and Warren Neidich, pp.168-83. Rotterdam: 010 Publishers, 2010.

———. "One More 'Next Step': Deleuze and Brain, Body and Affect in Contemporary Cognitive Science." Chap. 2 In *Revisiting Normativity with Deleuze*, edited by Rosi Braidotti and Patricia Pisters. Bloomsbury Studies in Continental Philosophy, 244. London, UK; New York, US: Bloomsbury Academic, 2012.

Radman, Andrej. "Deep Architecture: An Ecology of Hetero-Affection ". Chap. 4 In *Architectural Affects after Deleuze and Guattari* edited by Marko Jobst and Hélène Frichot, pp.64-80. Abingdon, New York: Routledge, 2021

———. "Sensibility Is Ground Zero: On Inclusive Disjunction and Politics of Defatalization." In *This Deleuzian Century : Art, Activism, Life*, edited by Rosi Braidotti and Rick Dolphijn, pp.57-86. Leiden: BRILL, 2015.

Ratti, Carlo, Dennis Frenchman, Riccardo Maria Pulselli, and Sarah Williams. "Mobile Landscapes: Using Location Data from Cell Phones for Urban Analysis." *Environment and Planning B: Planning and Design* 33, no. 5 (2006): 727-48. https://doi.org/10.1068/b32047.

Sennett, Richard. *Building and Dwelling : Ethics for the City.* New York, US: Farrar, Straus and Giroux, 2019.

Simondon, Gilbert, Cécile Malaspina, and John Rogove. *On the Mode of Existence of Technical Objects.* First University of Minnesota Press edition. ed. Minneapolis: University of Minnesota Press, 2017.

Speranza, Philip. "Using Parametric Methods to Understand Place in Urban Design Courses." *Journal of Urban Design* 21, no. 5 (2015): 661-89. https://doi.org/10.1080/13574809.2015.1092378.

Stengers, Isabelle. *Cosmopolitics I.* Minneapolis: University of Minnesota Press, 2010.

Thomas, David, and Justin B. Hollander. "The City at Play:Second Lifeand the Virtual Urban Planning Studio." *Learning, Media and Technology* 35, no. 2 (2010): 227-42. https://doi.org/10.1080/17439884.2010.494433.

van Dijk, Hans. "Critical Project or the Project of Criticism?". In *The Architectural Annual 2003–2004*, edited by H. Bekkering and D. Hauptman et al., pp.68-75. Rotterdam: 010 Publishers, 2005.

Wheeler, Michael. *Reconstructing the Cognitive World: The Next Step.* Cambridge, Mass.: MIT Press, 2005.

Wood, Stephen, and Kim Dovey. "Creative Multiplicities: Urban Morphologies of Creative Clustering." *Journal of Urban Design* 20, no. 1 (2015): 52-74.

Yue, Yang, Yan Zhuang, Anthony G. O. Yeh, Jin-Yun Xie, Cheng-Lin Ma, and Qing-Quan Li. "Measurements of Poi-Based Mixed Use and Their Relationships with Neighbourhood Vibrancy." *International Journal of Geographical Information Science* 31, no. 4 (2016): 658-75. https://doi.org/10.1080/13658816.2016.1220561.

INTERDISCIPLINARY TEACHING APPROACHES IN ART AND DESIGN INSTITUTIONS

Author:
FATIMA SIDDIQI

Affiliation:
INDUS VALLEY SCHOOL OF ART AND ARCHITECTURE, PAKISTAN

INTRODUCTION

Working in the design sector amongst various professionals, one finds art learning is equated with design. Design and art have numerous parallels and overlaps. Art provokes conversation alongside emotion and to a varied degree is associated with problem solving, however designers have a methodical proposal i.e., plan and to some extent is data- driven.

Understanding the processes associated with Design itself, pre-design, conceptualization and post design leading to the potential outcome. Questioning ideas, resolving solutions and developing the cohesiveness amalgamation of various elements amongst the various design and art practices.

Speaking about the various disciplines taught in art/design institutions have expanded over time and has shed new developments and career path ways within these disciplines. Be it textile design, Architecture design, Communication design, Fine art and or Fashion design each one has similarities and overlaps within each other. All art forms have a deep connection that unites them through a common factor 'design'. Both art and design are created using organization tools, principles, visual elements and of course the use of the 5 senses humanity has been blessed with.

ART

To define art one can dwell upon many definitions. Plato defines art as a representational medium or mimetic (imitative). Mimesis definition basically explains that art is mimicry of reality that is happening around us. Mimesis, in basic theoretical principle is the creation of art. The word is Greek and means "imitation" (though in the sense of "re-presentation" rather than of "copying"). Plato and Aristotle spoke of mimesis as the re-presentation of nature.[1]

Second definition of Art is presented by philosophers such as Kant where they define art as a form of communication. According to Kant; art is "a kind of representation that is purposive in itself and, though without an end, nevertheless promotes the cultivation of the mental powers for sociable communication".[2]

Third definition of Art is considering it as "Significant Form". This term was coined by art critic Clive Bell to describe the idea that the form of an artwork or forms within an artwork can be expressive, even if largely or completely divorced from a recognizable reality. Clive Bell's theory of significant form was explained in his book Art published in 1914. He begins the book with the lines:' What quality is shared by all objects that provoke our aesthetic emotions?. The answer, according to Bell, is "significant

form' which he goes on to loosely describe as: 'lines and colors combined in a particular way, certain forms and relations of forms, [that] stir our aesthetic emotions".[3]

DESIGN

Merriam-Webster defines design as; "to plan and make decisions about (something that is being built or created) or to create the plans, drawings, etc., that show how (something) will be made".[4] Design means different things to different people. The word design is powerful. With it one thinks of creative activity, product, architecture, and in simpler terms closely examining the functionality of a particular product. Design has expanded its horizons over time and moved from the 'traditional concept to the more visual or tangible artifacts through the orchestrating interactions and experiences, and to transforming systems'https://www.designcouncil.org.uk/news-opinion/what-do-we-mean-design "Everybody designs who devises courses of action aimed at changing existing situations into preferred ones".[5]

Design can be seen in our daily life and mankind began the design journey ever since he started inventing tools centuries ago. Planning the events through the course of the day, rearranging interior spaces in our homes, redesigning the curriculum for more fluidity and improvements in teaching methods, all require design skills. Design is an iterative process that keeps improving through the course of time. Similar approaches take place when you are developing policies. When we bring in the aspect of innovation and design together, the implication is to find suitable solutions for the purpose of devising a desirable future.

Best 'fit' is most important in this part of the process. When one designs the user is at the center. "To design can mean to envision, to build, to devise or to style. Product development incorporates functional characteristics of a product and design includes all these.' Everything that feeds into the development of a product and its manufacturing; it embraces technology, functional performance, appearance and management of the design and development process".[6]

Society is becoming visually richer and more adventurous over time and technological advancements continue to build the scope of the visual arena. In these media rich times there is a bombardment of finely targeted niche products and services that focus on grabbing attention through the artistry of design disciplines.

A solid foundation of design fundamentals is vital to produce effective and appealing work to the eye. The baseline grid that you mostly find being used in graphic design being taught is similar to that scaffolding used in building construction which provides the foundation and is that guiding force to position the rest of the elements on a sheet with precision which would normally be impossible to achieve by a naked eye. 'Engineers such as Leonardo da Vinci were coming up with more ideas than they could realize, and others such as Galileo were laying the foundations for analytical methods that students now learn in engineering school.[7]

It is pertinent to understand the aspect and role of design but also to utilize it in the best way possible. Strong designs are products of artistry and innovation with solid ground work. The inter-link between art and design is centuries old, be it paintings of Leonardo that even inspire today's innovators or theories of Aristotle that inspire today's entrepreneurs. The link between art and design cannot be broken. Although one has to make sure that link is not forced upon. Design itself takes inspiration from art and art is a by-product of inspiration and communication. If art speaks volumes, then design amplifies that volume.

WHEN DESIGN MEETS ART

There is a debate amongst scholars on the connection between art and design. For many, art and design intersect in all forms. For others art and design can be two different entities and have no relation to each other.

Contrast between Art & Design

Scholars who treat art and design as two different subjects tend to argue that, Designers create a design to convey their message to the people to take an action like buying a product, opting for service, visit the location, etc., whereas an artist conveys his opinion or feelings in his art to share with others. Art is derived from internal and external experiences whereas designing is a solution to a problem. Art speaks differently to different people, whereas design delivers exactly the same message across the board. Art is treated like talent whereas design is a skill learned overtime. A piece of art is always up for debate, such as DaVinci's Mona Lisa but design is only spoken about if it fails to serve people. In the end Art is an act of freedom whereas Design is act of empathy.

Design is practical where it has to function. Art on the other hand has to provoke thinking and bring out the inner thoughts of a person but it doesn't have to function. The below table articulates difference between Design and Art.[8]

Design Is…	Art Is…
Solving a problem.	Raising a question.
A conclusive result.	An open debate.
Being an actor and interpreting a script.	Writing and performing your own story.
Dependent on a collective acceptance.	Independent, and only need inner approval.
The mind looking for solutions.	The voice of the soul.
An act of empathy.	An act of freedom.

Table 1. Difference between Art & Design

On the other-hand there are many scholars who think that design and art overlap and complement each other rather than being different from each other.

Similarities between art & design
Basic Similarities

It is evident that art is created on a fixed space. The most prominent examples can be seen on drawings and paintings which are constrained by the dimensions of the media on which the art is being designed. There are other types of art too such as sculptures which may not have inherent restriction on the size of the work but all those sculptures no matter how huge or small require a degree of planning so that it could be realized in the best way possible. In the similar way those digital products which are design based are also limited by the space that one can use. In most cases design is challenged across the level of space that it can use. This challenge persists on both art and design level. One cannot create a website content spread so widely that it far exceeds the display resolution of the intended target device(s). Therefore, we can state that the first and most obvious similarity between art and design is the use of space – and they both share similar goals too – to fill that space in the most effective way possible.

Similarities in Principle

Both art and design share numerous principles that are essential to the goals of the artist or designer. There are differences in the way many of these principles are implemented in art vs. design, which is the beauty of art; it inspires thought and provokes you to consider why a certain principle was used in the way that it was.

In the design world, many of those same principles are used out of necessity – for a purely functional purpose. Some of those principles are discussed in detail below:

Proportion

When it comes to working on a space the proportion of said space is of most importance. For an artist filling that space with the right dimensions and varying elements of depth is necessary to provoke the thought process that defines one's art piece. The proportion of space is identified by height, width and depth which lead to the more stylized effect that artists want to provide and portray in their art piece. Designers on the other hand try to be more realistic and take this approach to answer some questions that are customer centric in nature. The purpose to use the principle of proportion can be different for both artist and designer but the similarities on how they are being used show us that art and design are more similar than different.

Color

It is evident color is one of the most important tools that an artist can use. Through color one can identify emotions, mood, feelings and an artist's inner thought process. This leads art work, open to interpretation. Similarly, design makes enormous use of color too. But while artists have more or less free roam to use color as they please, designers are somewhat restricted in that their designs are usually intended to be visually appealing to a larger audience – color clash can be a valuable artistic technique, whereas it is universally abhorred amongst designers. Designers tend to use colors to provoke feelings like artists but their intentions are product driven. For example Yellow and orange are colors that make people feel hungry. The color red is associated with emotion and passion. So when one sees red combined with yellow and orange, they become passionately hungry.[9]

Scale

Scale is closely related to proportion and is used in similar ways in both art and design. Setting upper and lower bounds for the dimensions of elements used with in a design or piece of art work. It enables the person creating the work to more easily decide on an appropriate size for any new elements that are introduced later. Without scale, it is impossible to balance the elements of any artwork or design effectively.

It is clear that art can be a source of designing products that eventually are a household name. Steve Jobs was influenced by artists such as Pablo Picasso, musician Bob Dylan, and designers such as Dieter Rams but also from art and design movements such as the Bauhaus movement.[10] Thus one can say that his designer capabilities were inspired by artists who would challenge the status quo. Art and design not just overlap but they tend to inspire each other in many different forms. Although in discussion we can derive that they are more similar than different.

ART AND DESIGN LEARNING THROUGH PEDAGOGY APPROACHES

To understand art and design pedagogy approaches that can be implemented includes the studio model and various others. Pedagogical practices help students in learning how to create. This cultural model emerged from an ethnographic study of two professional schools of art and design.[11] The studio model was found to be general across art and design disciplines.[12] The central concept of the studio model is

the creative process, with three clusters of emergent themes: learning outcomes associated with the creative process, project assignments that scaffold mastery of the creative process, and classroom practices that guide students through the creative process. Creativity would be an important learning outcome in these schools and that professors' pedagogy would be designed to lead to creative learning outcomes.[13] One has to understand that creativity is the learning outcome of any art and design school. And if that's the case one has to ask what steps are being taken to cater that need. Creativity research presents four different conceptions of creativity: as a personality trait, as self-expression, as a moment of insight, and as a process of working.[14]

Paul Torrance had this idea that creativity can be taught and he himself created many creativity training programs.[15] There is some evidence of limited success in some of these programs[16] that help in development of creativity related cognitive skills. There are multiple other studies that do show how learning programs can help one become creative.[17] Some conclusive research that programs with long term initiative have seen success in learning creativity as compared to short term. This gives an idea that creativity although can be taught but it is not a skill that can be mastered in a shorter period of time, thus making it an iterative process.

Design on the other hand is defined as "the conception and realization of new things" that have utility or value for a user, client, or customer.[18] The major design disciplines are; advertising, architecture, communication design, foundations, graphic design, industrial design, two-dimensional design, typeface design, and typesetting. Research studies of design practice have revealed that design creativity is rarely linear.[19] The design process starts with an unclear goal in mind, the designer mostly works in a creative way allowing design to proactive to the changes that can occur while creating a design piece.[20] A design process model step-by-step may inadvertently communicate to learners that design is a set of linear steps to be followed regardless of the situation, which can make students less adept at switching design strategies when needed, transitioning among sub-problems within the larger design challenge,[21] or potentially less ready to deal with the ambiguities of ill-defined problems.[22] The major building blocks of the design process are its "spiral, cyclical" and "opportunistic" nature.[23] Design scholars have founded that the most recurring aspects of design begin with close observation, ideation and finding and describing a problem; goes through a process of testing through different mediums and only then it can be launched.[24]

Art cannot be defined in a single definition. For the purpose of this research and create a quantitative definition we are taking six basic activities that define art. They are illustration, painting, photography, printmaking, sculpture, and book making. The primary contrast to design is that in art there is no user, client, or customer; "art responds to personal, subjective criteria, but design products must perform for people" by accounting for "a wide variety of audience and user behaviors".[25] There has been limited research on art education, but it is clear that like design art is a non-linear process where ideas and images emerge from the process of working with materials.[26] It's remarkable to understand that there hasn't been any defined research on pedagogical practices that occur in classes at university level. There are many scholars who themselves, have noted that there hasn't been meaningful research in the field of art studies: "What disoriented us was how little attention was paid to the nuts and bolts of art teaching: the effectiveness and applicability of certain classroom strategies, coping mechanisms for the psychological toll of being a diligent instructor, ways to teach a subject that resists straightforward explication".[27]

INTERDISCIPLINARY LEARNING OF ART & DESIGN IN CREATIVE INSTITUTIONS

Interdisciplinary learning is a teaching approach that combines the curricular objectives and methods from more than one discipline focusing on a central theme, issue, problem or work. At creative institutions the focus on teaching and learning approaches is built such that students can transition from

school to the workplace and larger community. The curriculum is designed such that it meets the educational needs of a student.

The focus of creative institutions should be to provide an integrated learning of liberal arts courses that focus on development and application of reading, writing, creativity and design approaches along with employability skills. This would promote experiential learning and project-based learning. Today various teaching methods are being implemented to promote interdisciplinary learning throughout various departments. Such learning methods consist of Project based learning, Experiential learning and Inquiry based instruction combined with Student-led classrooms.

Project based learning is highly appreciated at creative institutions. Since it is clear that roots of project based learning are centuries old. Renowned philosopher John Dewey (1959) was the first one to coin the term project based learning. Dewey's theory regarding project based learning has been approved by many researchers in the field of academia. Keeping that in mind, institutions conduct most of their sessions on Project based learning where students are provided various real life situations where they have to bring the best of multiple disciplines to solve a problem. Students use their knowledge of Art, Design and Architecture to learn and understand various problems. Project based learning helps students to learn Active Construction, Situated Learning, Social Interaction and develop Cognitive Tools. Recycled Textiles is one of the most innovative and current courses that can be taught at most institutions as it gives a 360 degree view of working in an environment where real life situations are presented to students where they have to come up with innovative solutions by going through skills learnt through multiple disciplines. This year students were given an open ended assignment where they had the liberty to think and create through solution based learning with the use of limited resources. The implementation of sustainability approaches has also been emphasized significantly through this course learning. This led students to challenge their thinking capabilities, which resulted in multi-purpose utilitarian products that served multi functionality. Such as;

Jacket cum grocery bag.

Bag pack/Sleeping bag

Laundry basket/Planter

Experiential learning on the other hand is a method where students "learn by doing". It is a circular learning method which institutions implement in certain courses. Students are asked to take part in an activity where they "Experience" by engaging in the learning activity. The next step is "Share" where students are asked to share what they have learned and "Review" how the activity was performed. Once students have experienced, shared and reviewed their learning they are making connections of said learning with the practical world and relate those new skills to everyday life. Craft Documentation is one of the courses where experiential learning is encouraged amongst students where they engage both in theoretical learning alongside practical learning. The students carry out research in the RURAL / URBAN sector. To develop skills to document the origin, status of the craft through written and visual mediums i.e. notes, drawings, photography and film. This helps them reflect on their research and come up with ways to implement their research in the real world.

There are many other methods that help students learn and understand interdisciplinary skills that could help them in future. Sessions at creative institutions should inculcate inquiry based learning combined with student led classroom sessions. Which means that; students, are at the helm of learning, and innovation. This learning method combined with project based learning and experiential learning have developed multiple cognitive skills to counter real world problems. In today's world it is imperative that students shouldn't just be laced with technical skills but also impeccable social and communication skills which can help them tackle any challenge successfully. "Education is our passport to our future, for tomorrow belongs to the people who prepare for it today".[28]

CONCLUSION

From our discussion it could be thoroughly concluded that interdisciplinary learning has advantageous effects on students and their capabilities. We started our discussion from art and design. Where we discussed how creativity can be learned if enough time and effort has been put in. We also discovered that art and design are more similar than different and how they are directly proportional to each other. This lead to our understanding of importance of interdisciplinary learning and how it is imperative for institutions to make sure that their students should go through this learning process for more profound outcomes.

NOTES

1 https://www.britannica.com/art/mimesis. n.d.

2 Immanuel Kant. Critique of the Power of Judgment, Guyer translation, section 44, 46

3 Clive Bell. "Art." 1914

4 https://www.merriam-webster.com. May 8, 2011. https://www.merriam-webster.com (accessed January 7, 2022).

5 Anna Valtonen. "Approaching Change with and in Design." She Ji: The Journal of Design, Economics, and Innovation, 2020: 505-529.

6 Clive Rassam. Design and corporate success. England: The Design Council, 1994.

7 Henry Petroski. Invention by design. Cambridge: Harvard university press, 1997.

8 David Bravo. *https://blog.mynd.com/en/art-vs-design.* Feb 1, 2019.

9 Lisa. https://awgsalesservices.com/2016/04/21/color-psychology-in-food-marketing/. 04 26, 2016. (accessed 11 2021).

10 Nir Hindi. https://www.theartian.com/steve-jobs-the-artist/. Nov 19, 2015.

11 Robert K. Sawyer. "Teaching and Learning How to Create in School of Art and Design." *Journal of the learning and sciences*, 2017: 138.

12 Robert K. Sawyer. "Teaching and Learning How to Create in School of Art and Design." *Journal of the learning and sciences*, 2017: 138.

13 Robert K. Sawyer. "Teaching and Learning How to Create in School of Art and Design." *Journal of the learning and sciences*, 2017: 138.

14 Robert K. Sawyer. "Teaching and Learning How to Create in School of Art and Design." *Journal of the learning and sciences*, 2017: 138.

15 Paul E. Torrance. "Can we teach children to think creatively?" *Journal of creative behaviour* , 1972: 114-143.

16 Ginamarie Scott, Lyle E. Leritz, and Michael D. Mumford. "The effectiveness of creativity training: a quantitative review." *Creative Research Journal*, 2004: 361-388.

17 Raymond S. Nickerson. "Enhancing Creativity." *R. J Stenberg (Ed.), The hand book of creativity*, 1999: 392-430.

18 Nigel Cross. "Designerly ways of knowing ." *design Studies*, 1982: 221-227.

19 Nigel Cross. "Designerly ways of knowing ." *design Studies*, 1982: 221-227.

20 Erica R. Harvelson and Kimberly M. Sheridan. "Art Education And The Learning Sciences." *Robert K. Sawyer (Ed.) The cambridge handbook of learning sciences*, 2014: 624-646.

21 Johanne Strobel. "Compound Problem Solving: Insights from the workplace of engineering education." *Journal of professional issues in engineering education & practice*, 2011: 215-222.

22 Robin S. Adams, Jennifer Turns, and Cynthia J. Atman. "Educating effective engineering designers." *design studies*, 2003: 275-294.

23 Nigel Cross. "Modelling the design process." *Journal of engineering design*, 1992: 325-337.

24 Erica R. Harvelson and Kimberly M. Sheridan. "Art Education And The Learning Sciences." *R. K. Sawyer (Ed.) The cambridge handbook of learning sciences*, 2014: 624-646.

25 Meredith J. Davis, Bernard McMullan, Peter Hawley, and Gertrude Spilka. "Design as a catalyst for learning." *VA: Association for Supervision and Curriculum Development.*, 1997.

26 Marion Botella, Franck Zensasni, and Todd Lubart. "A dynamic and ecological approach to the artistic creative process of arts students: An empirical contribution." *Empirical Studies of the Arts, 29(1)*, 2011: 17-38.

27 Paper Monument. *Draw it with your eyes closed: The art of the art assignment.* NewYork, 2012.

28 Malcolm X. "The Autobiography Of Malcolm X." In The Autobiography Of Malcolm X, by Malcolm X. New York: Bantam Doubleday Dell Publishing Group, 1998.

BIBLIOGRAPHY

Adams, Robin S., Turns, Jennifer and Atman,Cynthia J. "Educating effective engineering designers." design studies, 2003: 275-294.

Bell, Clive. "Art." 1914.

Bravo, David. https://blog.mynd.com/en/art-vs-design. Feb 1, 2019.

Cross, Nigel. "Designerly ways of knowing ." design Studies, 1982: 221-227.

Cross, Nigel. "Modelling the design process." *Journal of engineering design, 1992: 325-337.*

Davis, Meredith J., McMullan, Bernard, Hawley, Peter, and Spilka, Gertrude. "Design as a catalyst for learning." *VA: Association for Supervision and Curriculum Development., 1997.*

Harvelson, Erica R. and Sheridan, Kimberly M. "Art Education And The Learning Sciences." *R. K. Sawyer (Ed.) The cambridge handbook of learning sciences, 2014: 624-646.*

Hindi, Nir. *https://www.theartian.com/steve-jobs-the-artist/. Nov 19, 2015.*

https://www.britannica.com/art/mimesis. n.d.

https://www.merriam-webster.com. May 8, 2011. https://www.merriam-webster.com (accessed January 7, 2022).

Lisa. *https://awgsalesservices.com/2016/04/21/color-psychology-in-food-marketing/. 04 26, 2016. (accessed 11 2021).*

Botella, Marion, Zensasni, Franck, and Lubart, Todd. "A dynamic and ecological approach to the artistic creative process of arts students: An empirical contribution." *Empirical Studies of the Arts, 29(1), 2011: 17-38.*

Nickerson, Raymond S. "Enhancing Creativity." *R. J Stenberg (Ed.), The hand book of creativity, 1999: 392-430.*

Monument, Paper. *Draw it with your eyes closed: The art of the art assignment. NewYork, 2012.*

Petroski, Henry. *Invention by design. Cambridge: Harvard university press, 1997.*

Rassam, Clive. *Design and corporate success. England: The Design Council, 1994.*

Sawyer, Robert K. "Teaching and Learning How to Create in School of Art and Design." *Journal of the learning and sciences, 2017: 138.*

Scott, Ginamarie, Leritz, Lyle E. and Mumford, Michael D. "The effectiveness of creativity training: a quantitative review." *Creative Research Journal, 2004: 361-388.*

Strobel, Johannes. "Compound Problem Solving: Insights from the workplace of engineering education." *Journal of professional issues in engineering education & practice, 2011: 215-222.*

Torrance, Paul E. "Can we teach children to think creatively?" *Journal of creative behaviour , 1972: 114-143.*

Valtonen, Anna. "Approaching Change with and in Design." *She Ji: The Journal of Design, Economics, and Innovation, 2020: 505-529.*

X, Malcom. "The Autobiography Of Malcolm X." *In The Autobiography Of Malcolm X, by Malcolm X. New York: Bantam Doubleday Dell Publishing Group, 1998.*

DOES ALL IMPACT COUNT?: HOW THIRD-MISSION POLICIES AND EVALUATION PRACTICES FURTHER DIVIDE TEACHING AND RESEARCH IN HIGHER EDUCATION

Authors:
ELDRIS CON AGUILAR[1] & JORRIT P. SMIT[1,2]

Affiliations:
[1]ERASMUS UNIVERSITY ROTTERDAM, NETHERLANDS
[2]CENTRE FOR SCIENCE & TECHNOLOGY STUDIES, LEIDEN UNIVERSITY, NETHERLANDS

INTRODUCTION

There is an ever-increasing call for universities to be relevant to society. 'Impact' is touted all over academia. Amid this discourse, universities are typically presented as centres for generating knowledge and research. Measuring, evaluating, and comparing the societal impact of different universities and research centres is now undertaken through various evaluation frameworks.[1] However, education and teaching are structurally underrepresented in these practices. Most of the assessment methods are based on publication metrics and case studies that do not particularly represent how or to what extent a university's teaching activities are useful in responding to societal issues.

In this paper, we thus explore the question of how the core teaching activities of universities are present in the emerging field of research-impact studies, whether this presence reinforces the divide between research and teaching, and how this divide may be bridged in an integrative manner. In conclusion, we argue that there is a need for developing a line of research on impact-driven education in order to appreciate the efforts taken by universities worldwide to adopt pedagogical models that rise to societal challenges.

TEACHING, RESEARCH, AND THE 'IMPACT AGENDA' IN THE NEOLIBERAL UNIVERSITY

The relationship between research and teaching is not a new topic of discussion, and it precedes the much more recent 'impact agenda'.[2] Rather, it has formed part of the continuous discussion on the mission of the modern university. Referring to Australian universities, Angela Brew has pointed out that more and more studies and university policies are focused on 'bridging the gap' between research and teaching.[3] The underlying assumption is that Higher Education (HE) consists of a 'split community'—of research and teaching academics, students, and support staff.

Building on this idea, Sin et al. have suggested that, globally, this 'separation' is an artefact of twenty-first-century neoliberal HE policies that prioritize resource allocation to research activities.[4] As citation metrics came to dominate 'research quality' in neoliberal audit culture, academic staff came under

increasing pressure to publish in highly ranked international journals, leaving less time and recognition for teaching activities.[5]

At the same time, public attention to the non-academic benefits of research has intensified in the last two decades.[6] In recent years, the so-called 'third mission' of the university has been placed at the centre of government and policy debates.[7] It is fundamental that universities can demonstrate their practical contributions to the knowledge economy on a global scale. Again, this seems to be the consequence of neoliberal government policies that demand evidence of the societal return on public investment in HE institutions.[8] This has led to the development of international and national evaluation frameworks to assess research and its impact on society.[9] Arguably, the focus initially veered towards 'economic' impact (cf. commercialization) but has recently shifted also to include the broader societal impact of scientific research.[10]

Thus, universities now face two challenges: on the one hand, a shift away from quantitative ranking regimes and, secondly, balancing this audit culture *in flux* with the imperative to connect with society.[11] Debbie Haski-Leventhal has stressed, for example, that "many universities still focus too narrowly on ranking, profits and graduate income, instead of on real societal impact".[12] Another way in which these developments are intertwined is that the assumption behind the focus on research productivity[13] – that there is a weak link between teaching and research activities – has (perhaps unintentionally) been translated to 'third-mission' policies: impact evaluation is typically limited to the societal impact of *research*.[14]

In this paper, we thus zoom in on this nexus of evaluation, because here we can see the result of further integration or separation between teaching, research, and impact. Therefore, more integrated evaluation might harbour the transformative potential to guide academic practices towards a more purpose-driven orientation. In the following section, we first review the treatment of teaching and education in various impact evaluation frameworks. Subsequently, we use one of the main findings of this analysis – the importance of a focus on *capacities* – to discuss an evaluation framework for impact-driven education, with which one of the authors has experimented in the context of Erasmus University Rotterdam.

The Divide of Research and Teaching in Impact Evaluation

Our main question in this section is, how do different assessment frameworks and evaluation methods for the societal impact of science deal with education- and teaching-related activities? Although the administrative separation between research and teaching limits the number of examples of integration in evaluation, we do find some potential approaches that pay attention to both fields.

Our analysis of impact evaluation methods builds on the previous research of one of the authors on the different conceptual groundings of various types of impact assessment.[15] In this review of eleven different methods of impact evaluation, a distinction is made between linear, cyclical, and co-productive interaction mechanisms; product, use, and benefit concepts of societal value; and the separation or integration of societal and scientific value. However, the review pays no particular attention to the inclusion of students, teaching activities, or educational contexts in impact assessment.

Method	Evaluation type and level of analysis	Original context	Are teaching, education, training, and students included as activities?	References
Payback Framework	Ex-post; summative. Programme	UK medical research	NO; only the potential educational benefits of research	(Buxton and Hanney 1996)
Science and Technology Human Capital	Ex-post; formative. Research group or programme	US STEM research	YES; focus on capacities rather than outputs; students included in the main unit of knowledge value collectives	(Bozeman, Dietz, and Gaughan 2001)
Public Value Mapping	Ex-ante & ex-post; formative. Programme or organization	US science policy	YES	(Bozeman 2003)
Monetization	Ex-post; summative. Programme or system	UK medical research	NO	(HERG and RAND Europe 2008)
Flows of Knowledge	Ex-post; summative. Programme	UK research-council funding	YES; capacity-building impact related to education; shaping educational programmes, textbooks; students as knowledge brokers	(Meagher, Lyall, and Nutley 2008)
SIAMPI	Ex-ante and ex-post; formative. Project, programme, or organization	Research institutes for the European Commission	NO, but education and training included as one 'product' within indirect interactions	(Spaapen and Van Drooge 2011)
Contribution Mapping	Ex-post; summative and formative. Project or programme	Global health sector	NO; only training of staff to make research possible	(Kok and Schuit 2012)
ASIRPA	Ex-post; summative. Programme or organization	French public agricultural research institute	NO; only training of users and stakeholders	(Joly et al. 2015; Matt et al. 2017)
Evaluative Inquiry	Ex-post; formative. Research group or organization	Dutch university Research assessment (SEP)	NO	(de Rijcke et al. 2019)
SEP	Ex-post; formative. Research unit (group, department, or faculty)	Dutch university research assessment	NO, because education is only defined as a type of impact, with respect to PhD education and as research use in education	(VSNU, KNAW, and NWO 2020)
REF / KEF	Ex-post; summative. Research group	UK university research assessment	YES in REF; YES in KEF	(Research Excellence Framework 2012; Johnson 2020)
NSF Broader Impacts (US)	Ex-ante; summative. Project or programme	US research funding	YES	(Holbrook and Frodeman 2011; Bozeman and Youtie 2017)

Table 1. Overview of approach to education and teaching in impact evaluation methods and assessment frameworks.

In table 1, we present the results of a discursive analysis of the literature describing nine different methods for evaluating the societal impact of research. At the bottom of the table, we have also added three national policy frameworks for impact assessment, to which we turn below. A first observation is that the majority (66%) of the evaluation methods do not pay specific attention to education, teaching, or students. These methods do mention some related terms, like training and educational impact or benefits. However, in such discourse, the relation between research and teaching is presented in a strictly linear fashion, in which new research results might bear effects on education, i.e., shape the content (and maybe form) of future education in that subject (for example, via textbooks). With respect to 'training', this is taken as a valid activity through which to achieve impact, either to spread results or to prepare staff for specific research. Although such trainings could include students, the methods are usually concerned with training professionals, users, and other stakeholders.

There seem to exist two types of rationale behind the methods that exclude education. On the one hand, some methods originated in research-intensive environments that were organizationally focused on scientific research outside of an academic context: for example, ASIRPA or Contribution Mapping.[16] On the other hand, other methods seem to reproduce an existing institutional distinction because they emerged in relation to a national accountability structure: for example, SIAMPI or Evaluative Inquiry.[17] Still, a handful of methods do explicitly include educational practices in their evaluation framework. In our analysis, Flows of Knowledge and Public Value Mapping (which builds on Science-Technology Human Capital) pay explicit attention to teaching and students.[18] Interestingly, these approaches share a focus on *capacities* rather than outputs, products, or benefits. Flows of Knowledge, for example, includes a 'capacity-building impact' as one of the potential impacts of research, for which they not only see research shaping educational programmes and resources, but also perceive students as (future) 'knowledge brokers': they are channels for knowledge exchange.[19] Similarly, in the public value and human capital approaches proposed by Barry Bozeman and others, students are intrinsically part of the main epistemic unit of evaluation, which they call 'knowledge value collectives':

One implication of S&T human capital is that teaching, mentoring, skill development, and "educational products" are not a by-product for evaluators, they are the core. The production of breakthrough (i.e. multiple use) scientific papers is the benchmark of a previously successful Knowledge Value Collective; the production of abundant human knowledge capital is evidence of the capacity to produce future, not easily imagined knowledge breakthroughs.[20]

Although these two methods provide some grounds for evaluating research and teaching in fruitful conjunction, the authors of these evaluation frameworks do not provide demonstrations of this. Therefore, these methods remain somewhat elusive, and the sense of a 'natural' separation between research (the main focus of their approaches) and education persists.

In addition, we have also briefly looked at three policy-assessment frameworks for the societal impact of science. Compared to the independently developed evaluation frameworks, these seem to devote greater attention and awareness to teaching and education. Both in the REF (for research) and KEF (for knowledge exchange, or engagement), pedagogical activities and transformations can also count as legitimate activities to include in impact evaluation.[21] Moreover, for Broader Impacts, the list of evaluative questions opens with 'How well does the activity advance discovery and understanding while promoting teaching, training, and learning?'.[22] Although the focus on teaching and education appears most marginal in the SEP, which includes education only as a potential sphere of impact, the evaluative protocol does call on the committee to 'reflect, where applicable, on the teaching-research nexus'.[23]

What we can take from this analysis is that a focus on capacities and an open concept of the actors involved in realizing societal impact (i.e., the epistemic collective)[24] may pave the way to overcoming any artificial boundary between research and teaching. *How* to do this remains to be elaborated,

however; for this, we turn to the next section, in which we have tried to operationalize these ideas in an evaluative approach to impact-driven education.

An Evaluation Approach to Impact-Driven Education: Educational Paradigms to Advance Societal Impact at the Core of the Curriculum

The call for a purpose-driven university has been widely embraced by universities around the world.[25] For this paper, we look at one case study, namely the Impact at the Core programme at Erasmus University Rotterdam (EUR).[26] In the Netherlands, universities have adopted policies and strategies with a more student-centred approach to learning. To name a few examples: students are given opportunities to reflect on their professional and personal responsibilities;[27] they are provided with tools to reflect on how their personal values influence their views of science, and how these values affect their professional practices;[28] and they are offered the chance to work with stakeholders outside the university using experiential service learning.[29]

The impact-driven education landscape depicts a reality in which universities are making efforts to connect with the public to contribute to positive changes in society. Approaches like challenge-based learning, experiential learning, problem-based learning, and transformative learning share the intention of bringing real-life problems into classrooms and connecting learning contents with societal challenges and external stakeholders.[30]

In our case study of the EUR, an evaluation framework was developed to assess the societal impact of academic education. To achieve this goal, one of the current authors – who is researching the 'impact' of impact education – reviewed the literature on evaluating impact research to identify methods that could be applicable to assessing the impact of academic teaching. However, as mentioned in the previous section, we have found that these evaluation frameworks pose limitations to further implementation, since they lack examples of how to include the societal impact of education.

To illustrate a framework that may allow us to understand the impact of impact education, figure 1 depicts the evaluation framework designed for the EUR programme Impact at the Core, which consists of two phases: 1) monitoring and evaluation, which is the phase we are currently working on; and 2) an impact evaluation, which consists in establishing the relationships between impact-driven education and the desired outcome – that is, student agency. The framework we developed for our evaluation follows evaluation methods that are implemented to assess educational programmes.[31]
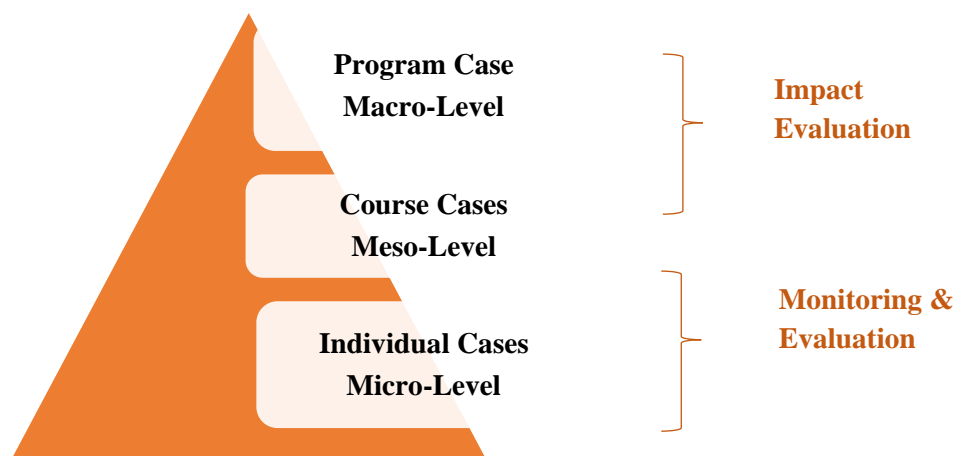
Figure 1. Evaluation Framework designed for Impact at the Core (EUR).

Some authors understand monitoring and evaluation (M&E) as a formative process evaluation that occurs during the implementation of the programme.[32] Monitoring consists in tracking progress in relation to programme strategy and goals. Monitoring and evaluation systems provide decision-makers with essential information to understand the '*so what?*' of a programme or policy, namely regarding what has been achieved in terms of outcomes and effects. To evaluate Impact at the Core, we adopted a monitoring and evaluation approach to monitor the course portfolio, which consists of pilot courses and courses designed with the full or partial collaboration of Impact at the Core. During the M&E, we focused mainly on gathering data and conducting a descriptive analysis of the results.[33] In this phase of the evaluation (M&E), the focus is on tracking how the programme is progressing in terms of the educational activities that have been planned as part of the agreement between the schools/faculties and Impact at the Core.

In fact, 'how do we know if what we are doing is actually making a difference in society?' is a key question in impact research.[34] This also translates to research on the impact of education. As a result, questions about causal relationships between variables are relevant when designing a framework to evaluate the impact of academic education. We propose that building a contribution story based on an iterative process of understanding monitoring and evaluation results vis-à-vis programme goals can help to assess the complexity of educational interventions based on evidence-based narratives.[35]

In the second phase of the evaluation, the focus is on impact evaluation. To this end, we have explored various methods that can be used to build a baseline from the results obtained during the M&E phase. For this second phase, we are particularly interested in understanding how the characteristics of impact-driven education play a role in contributing to students' understanding of their agency to create changes in society, that is their *impact capacity*.[36] This focus on impact capacity allows for establishing connections with current research efforts in evaluating the impact of research, such as the Flows of Knowledge framework, which includes a similar approach, according to which students are knowledge brokers. This corresponds to the approach that is being developed at Impact at the Core, in which impact-driven education contributes to activating students' agency in realizing their impact capacity to create change starting with their immediate environment.[37]

CONCLUSION

There is a noticeable gap between teaching and research in academic studies on the evaluation of societal impact. This separation follows a broader audit culture in academia, and HE's quest to strengthen the 'third mission' of a university does not self-evidently challenge this. However, we believe that for a truly 'purpose-driven' university, paying heed to the many connections between teaching, research, and impact is essential.

This could come about on the one hand, when researchers and evaluators working on impact-driven education learn from the challenges encountered by those working on research impact. From our analysis, it follows that attention to *capacities* and capacity building could be crucial in this respect. For example, the evaluation of teachers and students could focus on impact capacity by understanding the skills and knowledge they need to resolve real-life problems while working with external stakeholders. On the other hand, the many difficulties in 'measuring' impact should make us cautious in relying too much on (ex-post) evaluation for institutional processes, because such assessments inevitably reduce the complexity of (academic and societal) reality.

NOTES

[1] Some examples of efforts to evaluate and compare the societal impact of different universities and research centres can now be found in national frameworks (like the REF) and international rankings (like the THE Impact Ranking).

[2] Robertson & Bond note that, in the past fifty years, there has been an increased emphasis on research that underpins its relationship with teaching activities. The authors mention the imbalance of rewards between research and teaching as one of the factors contributing to this separation. In addition to this, the impact agenda has continued to accentuate this divide by prioritizing research contributions to non-academic audiences. Jane Robertson and Carol H. Bond. "Experiences Of The Relation Between Teaching And Research: What Do Academics Value?". Higher Education Research & Development 20 (2001). For an example of this from the UK see Katherine Smith, Justyna Bandola-Gill, Nasar Meer, Ellen Stewart, and Richard Watermeyer, *The Impact Agenda: Controversies, Consequences And Challenges* (Croydon: Policy Press, 2020), 13-26.

[3] Angela Brew, "Imperatives And Challenges In Integrating Teaching And Research", Higher Education Research & Development 29 (2010).

[4] Jung Cheol Sin, Akira Arimoto, William K Cummings, and Ulrich Teichler, *Teaching And Research In Contemporary Higher Education* (Dordrecht: Springer, 2014)

[5] Cris Shore and Susan Wright, "Audit Culture Revisited: Rankings, Ratings, and the Reassembling of Society," Current Anthropology 56 (2015).

[6] Katherine Smith, Justyna Bandola-Gill, Nasar Meer, Ellen Stewart, and Richard Watermeyer, *The Impact Agenda: Controversies, Consequences And Challenges* (Croydon: Policy Press, 2020); Mark Reed, Marie Ferré, Julia Martin-Ortega, Rachel Blanche, Ruth Lawford-Rolfe, Martin Dallimer, and Joseph Holden. "Evaluating Impact From Research: A Methodological Framework". Research Policy 50 no.4 (2021).

[7] The 'third mission' of a university refers to the connection or value of research activities to society, in addition to the first and second missions (teaching & research). The notion of the third mission derives from research activities and the circulation of the knowledge produced as a result with interested actors. Philippe Laredo, "Revisiting The Third Mission Of Universities: Toward A Renewed Categorization Of University Activities?," Higher Education Policy 20 (2007); Mette Præst Knudsen, Marianne Harbo Frederiksen, and René Chester Goduscheit, "New Forms Of Engagement In Third Mission Activities: A Multi-Level University-Centric Approach," Innovation 23 (2019).

[8] Rille Raaper and Mark Olssen, "Mark Olssen On Neoliberalisation Of Higher Education And Academic Lives: An Interview," Policy Futures In Education 14 (2015).

[9] Jorrit Smit and Laurens Hessels, "The Production of Scientific and Societal Value in Research Evaluation: A Review of Societal Impact Assessment Methods," Research Evaluation 30 (2021).

[10] Barry Bozeman and Jan Youtie, "Socio-Economic Impacts And Public Value Of Government-Funded Research: Lessons From Four US National Science Foundation Initiatives," Research Policy 46 (2017); Stefan de Jong, Jorrit Smit, and Leonie van Drooge, "Scientists' Response To Societal Impact Policies: A Policy Paradox," Science And Public Policy 43 (2015).

[11] The audit culture of academic research is linked to the quantity of publication outputs produced by academic researchers, which is embedded in the ranking regimes that have transformed higher education since the 1990s. For a more elaborated view of audit culture in the context of Australian universities see Anthony Welch, "Audit Culture And Academic Production," Higher Education Policy 29 (2016).

[12] Debbie Haski-Leventhal, *The Purpose-Driven University* (Bingley: Emerald Publishing Limited, 2020), 1.

[13] The research productivity of academic staff is linked to the rise in attention to knowledge circulation with a focus on outputs rather than outcomes; this focus is centred on the quantity of publications. Academic productivity, as noted by Ramsden 1994, is based on outputs – that is, quantity of publications per individual staff across different subjects.

[14] Rachel Spronken-Smith and Rebecca Walker, "Can Inquiry-Based Learning Strengthen The Links Between Teaching And Disciplinary Research?," Studies In Higher Education 35 (2010).

[15] Jorrit Smit and Laurens Hessels, "The Production of Scientific and Societal Value in Research Evaluation: A Review of Societal Impact Assessment Methods," Research Evaluation 30 (2021).

[16] Contribution Mapping was developed in the context of global developmental work while ASIRPA originates at a French agricultural research institute.

[17] In these cases, these methods related to the Dutch evaluation protocol for quality assurance in research (SEP).

[18] Laura Meagher, Catherine Lyall, and Sandra Nutley, "Flows Of Knowledge, Expertise And Influence: A Method For Assessing Policy And Practice Impacts From Social Science Research," Research Evaluation 17 (2008); Barry Bozeman, James S. Dietz, and Monica Gaughan, "Scientific And Technical Human Capital: An Alternative Model For Research Evaluation," International Journal Of Technology Management 22 (2001).

[19] Laura Meagher, Catherine Lyall, and Sandra Nutley, "Flows Of Knowledge, Expertise And Influence: A Method For Assessing Policy And Practice Impacts From Social Science Research," Research Evaluation 17 (2008).

[20] Barry Bozeman, "Public Value Mapping of Science Outcomes: Theory and Method" In *Knowledge Flows and Knowledge Collectives: Understanding the Role of Science and Technology Policies in Development,* ed. by Barry Bozeman et al. (Tempe: Consortium for Science, Policy & Outcomes, 2003). 33.

[21] Of course, in the UK there also exists a 'Teaching Excellence Framework'. Matthew Johnson, "The Knowledge Exchange Framework: Understanding Parameters And The Capacity For Transformative Engagement," Studies In Higher Education 47 (2020).

[22] Barry Bozeman and Jan Youtie, "Socio-Economic Impacts And Public Value Of Government-Funded Research: Lessons From Four US National Science Foundation Initiatives," Research Policy 46 (2017);

[23] VSNU, KNAW, & NOW, *Strategy Evaluation Protocol 2021–2027* (VNSU, KNAW and NWO, 2020).

[24] Angela Brew, *Research and Teaching: Beyond the Divide* (Basingstoke: Palgrave Macmillan, 2006).

[25] Debbie Haski-Leventhal, *The Purpose-Driven University* (Bingley: Emerald Publishing Limited, 2020).

[26] Impact at the Core is a programme at Erasmus University, part of its Strategy 24, which seeks to place societal impact at the core of the curriculum. For more information, see the programme website: https://www.eur.nl/en/impactatthecore.

[27] Heidi Muijen, "Corporate Social Responsibility Starts At University," Journal Of Business Ethics 53 (2004).

[28] Edwin Koster and Henk W. de Regt. "Science And Values In Undergraduate Education," Science & Education 29 (2019).

[29] Sherwin Husseinifard, Lennart Corleissen, and Lucas Meijs, "The I DO Project: Using Experiential Service Learning To Increase The Impact Of PIS," Journal Of Global Responsibility 13 (2021). An other example of student-oriented pedagogical approaches in the Netherlands is the introduction of problem-based learning to the medicine and health-science curriculum at Maastricht University. Henk van Berkel, Albert Scherpbier, Harry Hillen, and Cees van der Vleuten, *Lessons From Problem-Based Learning* (Oxford: Oxford University Press, 2010).

[30] Impact-driven education is an umbrella concept that refers to all educational pedagogies that seek to foster students' connections with society by introducing real-life problems into the classroom and involving external stakeholders in students' projects. Debbie Haski-Leventhal developed this concept in the context of the purpose-driven university.

[31] Linda Hutchinson, "Evaluating And Researching The Effectiveness Of Educational Interventions," BMJ 318 (1999); M. Wilkes, and J. Bligh, "Evaluating Educational Interventions". BMJ 318, (1999); Samuel Ball, "Evaluating Educational Programs," ETS R&D Scientific C And Policy Contributions Series (1979); Daniel L Reinholz and Tessa C. Andrews, "Change Theory And Theory Of Change: What's The Difference Anyway?," International Journal Of STEM Education 7 (2020).

[32] Meryl Sufian, Jo Anne Grunbaum, T.H. Akintobi, A. Dozier, M. Eder, S. Jones, P. Mullan, C.R. Weir and S. White-Cooper, "Program evaluation and evaluating community engagement" in *Principles of Community Engagement* (Washington, DC: US Department of Health and Human Services, 2011).

[33] This consisted of qualitative (QUAL) and quantitative (QUAN) analysis from the data we gathered though surveys, focus groups, and interviews with course participants, which include teachers, students, and external stakeholders.

[34] Catherine Althaus, Lisa Carson, Helen Sullivan, and Brigid van Wanrooy. "Research And Education In Public Sector Practice: A Systems Approach To Understanding Policy Impact," Policy Design And Practice 4 (2021), 309.

[35] A contribution story refers to the casual claim used to support how change occurs because of an intervention. The purposes of the contribution story are support the theory of change. John Mayne, "Contribution Analysis: Coming Of Age?," Evaluation 18 (2012).

[36] Impact capacity is a concept that the Impact at the Core program is still developing based on research carried out by the team. It proposes that impact-driven education enhances certain impact skills, which can contribute to students being aware and acknowledging their capacity to create different types of impact (societal,

environmental, and economic, to name a few examples) with the skills and knowledge learned during their academic education

37 For a more extensive treatment of Flows of Knowledge, see note 17. For our study on the impact of impact education, we are exploring the concept of students' agency and how this concept correlates with their impact capacity as a goal of impact-education strategies. Margaret Vaughn, "What Is Student Agency And Why Is It Needed Now More Than Ever?," Theory Into Practice 59 (2020).

BIBLIOGRAPHY

Althaus, Catherine, Lisa Carson, Helen Sullivan, and Brigid van Wanrooy. "Research And Education In Public Sector Practice: A Systems Approach To Understanding Policy Impact". Policy Design And Practice 4, no. 3 (2021): 309-322. doi:10.1080/25741292.2021.1977478.

Bozeman, Barry, James S. Dietz, and Monica Gaughan. 2001. "Scientific And Technical Human Capital: An Alternative Model For Research Evaluation". International Journal Of Technology Management 22, no 78 (2001): 716. doi:10.1504/ijtm.2001.002988.

Bozeman, Barry. "Public Value Mapping of Science Outcomes: Theory and Method" In *Knowledge Flows and Knowledge Collectives: Understanding the Role of Science and Technology Policies in Development 2,* edited by Bozemann Barry, Sarewitz, Daniel., Feinson, Stephen, Foladori Guillermo, Gaughan, Monica, Gupta, Aarti, Sampat, Bhaven, Zachary, Gregg, 3-48. Tempe: Consortium for Science, Policy & Outcomes, 2003

Bozeman, Barry, and Jan Youtie.. "Socio-Economic Impacts And Public Value Of Government-Funded Research: Lessons From Four US National Science Foundation Initiatives". Research Policy 46 no.8 (2017): 1387-1398. doi:10.1016/j.respol.2017.06.003.

Ball, Samuel. "Evaluating Educational Programs". ETS R&D Scientific C And Policy Contributions Series. (1979; reis; Educational Testing Service, 2011).

Brew, Angela.. "Imperatives And Challenges In Integrating Teaching And Research". Higher Education Research & Development 29 no.2 (2010) 139-150. doi:10.1080/07294360903552451.

Brew, Angela. *Research and Teaching: Beyond the Divide*. Basingstoke: Palgrave Macmillan, 2006.

de Jong, Stefan P. L., Jorrit Smit, and Leonie van Drooge. "Scientists' Response To Societal Impact Policies: A Policy Paradox". Science And Public Policy 43 no.1 2015: 102-114. doi:10.1093/scipol/scv023.

Buxton, Martin, and Steve Hanney. 1996. "How Can Payback From Health Services Research Be Assessed?". Journal Of Health Services Research & Policy 1 no.1 (1996): 35-43. doi:10.1177/135581969600100107.

de Rijcke, Sarah, Tjitske Holtrop, Wolfgang Kaltenbrunner, Jochem Zuijderwijk, Anne Beaulieu, Thomas Franssen, and Thed van Leeuwen. "Evaluative Inquiry: Engaging Research Evaluation Analytically And Strategically". Fteval Journal for Research and Technology Policy Evaluation 48 (2019):176-182. http://doi.org/10.22163/fteval.2019.386.

Haski-Leventhal, Debbie.*The Purpose-Driven University*. 1st ed. Bingley: Emerald Publishing Limited, 2020

Health Economics Research Group (HERG), Office of Health Economics, RAND Europe. *Medical Research: What's It Worth? Estimating the Economic Benefits from Medical Research in the UK*. London: UK Evaluation Forum, 2008

Henkel, Mary. "Academic Values And The University As Corporate Enterprise". Higher Education Quarterly 51 no.2 (1997): 134-143. doi:10.1111/1468-2273.00031.

Holbrook, J. Britt, and Robert Frodeman. "Peer Review And The Ex Ante Assessment Of Societal Impacts". Research Evaluation 20, no. 3 (2011): 239-246. doi:10.3152/095820211x12941371876788.

Husseinifard, Sherwin, Lennart Corleissen, and Lucas Meijs. "The I DO Project: Using Experiential Service Learning To Increase The Impact Of PIS". Journal Of Global Responsibility 13, no. 1 (2021): 21-28. doi:10.1108/jgr-03-2021-0027.

Hutchinson, Linda "Evaluating And Researching The Effectiveness Of Educational Interventions". BMJ 318, no. 7193 (1999): 1267-1269. doi:10.1136/bmj.318.7193.1267.

Johnson, Matthew Thomas. "The Knowledge Exchange Framework: Understanding Parameters And The Capacity For Transformative Engagement". Studies In Higher Education 47 no.1 (2020): 194-211. doi:10.1080/03075079.2020.1735333.

Joly, Pierre-Benoît, Ariane Gaunand, Laurence Colinet, Philippe Larédo, Stéphane Lemarié, and Mireille Matt. "ASIRPA: A Comprehensive Theory-Based Approach To Assessing The Societal Impacts Of A Research Organization". Research Evaluation 24 no.4 (2015): 440-453. doi:10.1093/reseval/rvv015.

Kok, Maarten O, and Albertine J Schuit. "Contribution Mapping: A Method For Mapping The Contribution Of Research To Enhance Its Impact". Health Research Policy And Systems 10 no.21 (2012) doi:10.1186/1478-4505-10-21

Koster, Edwin, and Henk W. de Regt. "Science And Values In Undergraduate Education". Science & Education 29 no.1 (2019): 123-143. doi:10.1007/s11191-019-00093-7.

Knudsen, Mette Præst, Marianne Harbo Frederiksen, and René Chester Goduscheit. "New Forms Of Engagement In Third Mission Activities: A Multi-Level University-Centric Approach". Innovation 23 no.2 (2019): 209-240. doi:10.1080/14479338.2019.1670666.

Laredo, Philippe. "Revisiting The Third Mission Of Universities: Toward A Renewed Categorization Of University Activities?". Higher Education Policy 20 no.4 (2007): 441-456. doi:10.1057/palgrave.hep.8300169.

Matt, Mireille, Ariane Gaunand, Pierre-Benoit Joly, and Laurence Colinet. "Opening The Black Box Of Impact – Ideal-Type Impact Pathways In A Public Agricultural Research Organization". Research Policy 46 no.1 (2017): 207-218. doi:10.1016/j.respol.2016.09.016.

Mayne, John. "Contribution Analysis: Coming Of Age?". Evaluation 18 no.3 (2012): 270-280. doi:10.1177/1356389012451663.

Meagher, Laura, Catherine Lyall, and Sandra Nutley. "Flows Of Knowledge, Expertise And Influence: A Method For Assessing Policy And Practice Impacts From Social Science Research". Research Evaluation 17 no.3 (2008): 163-173. doi:10.3152/095820208x331720.

Muijen, Heidi S.C.A. "Corporate Social Responsibility Starts At University". Journal Of Business Ethics 53, no. 12 (2004): 235-246. doi:10.1023/b:busi.0000039412.78194.1d.

Raaper, Rille, and Mark Olssen.. "Mark Olssen On Neoliberalisation Of Higher Education And Academic Lives: An Interview". Policy Futures In Education 14 no. 2 (2015): 147-163. doi:10.1177/1478210315610992.

Reed, Mark, Marie Ferré, Julia Martin-Ortega, Rachel Blanche, Ruth Lawford-Rolfe, Martin Dallimer, and Joseph Holden. "Evaluating Impact From Research: A Methodological Framework". Research Policy 50 no.4 (2021): 104147. doi.org/10.1016/j.respol.2020.104147

Reinholz, Daniel L., and Tessa C. Andrews. "Change Theory And Theory Of Change: What'S The Difference Anyway?". International Journal Of STEM Education 7, no. 1 (2020). doi:10.1186/s40594-020-0202-3.

Research Excellence Framework. "Panel Criteria And Working Methods". Reprint, UK, 2012..

Robertson, Jane, and Carol H. Bond.. "Experiences Of The Relation Between Teaching And Research: What Do Academics Value?". Higher Education Research & Development 20 no.1 (2001): 5-19. doi:10.1080/07924360120043612.

Sin, Jung Cheol, Akira Arimoto, William K Cummings, and Ulrich Teichler.. *Teaching And Research In Contemporary Higher Education*. Dordrecht: Springer, 2014 https://link.springer.com/content/pdf/10.1007/978-94-007-6830-7.pdf

Smit, Jorrit P, and Laurens K Hessels. "The Production of Scientific and Societal Value in Research Evaluation: A Review of Societal Impact Assessment Methods." Research Evaluation 30, no. 3 (2021): 323–35. https://doi.org/10.1093/reseval/rvab002.

Shore, Cris, and Susan Wright. "Audit Culture Revisited: Rankings, Ratings, and the Reassembling of Society." Current Anthropology 56, no. 3 (2015): 421–44, https://doi.org/10.1086/681534.

Smith, Katherine, Justyna Bandola-Gill, Nasar Meer, Ellen Stewart, and Richard Watermeyer. *The Impact Agenda: Controversies, Consequences And Challenges*. Croydon: Policy Press, 2020

Spaapen, Jack, and Leonie van Drooge."Introducing 'Productive Interactions' In Social Impact Assessment". *Research Evaluation* 20 no.3 (2011): 211-218. doi:10.3152/095820211x12941371876742.

Spronken-Smith, Rachel, and Rebecca Walker. "Can Inquiry-Based Learning Strengthen The Links Between Teaching And Disciplinary Research?". Studies In Higher Education 35 no.6: (2010) 723-740. doi:10.1080/03075070903315502.

Sufian, Meryl, Jo Anne Grunbaum, Tabia Henri Akintobi, Ann Dozier, Milton. Eder, Shantrice. Jones, Patricia. Mullan, Charlene Raye. Weir and Sharrice White-Cooper, "Program evaluation and evaluating community engagement" in *Principles of Community Engagement* (Washington, DC: US Department of Health and Human Services, 2011).

van Berkel, Henk, Albert Scherpbier, Harry Hillen, and Cees van der Vleuten. *Lessons From Problem-Based Learning*. Reprint, Oxford: Oxford University Press, 2010.

Vaughn, Margaret. "What Is Student Agency And Why Is It Needed Now More Than Ever?". Theory Into Practice 59 no.2 (2020): 109-118. doi:10.1080/00405841.2019.1702393.

VSNU, KNAW, & NWO. *Strategy Evaluation Protocol 2021–2027*. Den Haag: VNSU, KNAW and NWO, 2020.

Watermeyer, Richard, and Jamie Lewis.. "Institutionalizing Public Engagement Through Research In UK Universities: Perceptions, Predictions And Paradoxes Concerning The State Of The Art". Studies In Higher Education 43 no.9 (2018): 1612-1624. doi:10.1080/03075079.2016.1272566.

Welch, Anthony. 2016. "Audit Culture And Academic Production". Higher Education Policy 29 no.4 (2016): 511-538. doi:10.1057/s41307-016-0022-8.

Wilkes, Michael, and John Bligh. "Evaluating Educational Interventions". BMJ 318, no. 7193 (1999): 1269-1272. doi:10.1136/bmj.318.7193.1269.

UNGRADING IN DIALOGUE

Author:
ZACHARY VERNON & RYAN GIBBONEY

Affiliation:
CALIFORNIA STATE UNIVERSITY, LOS ANGELES & JUNIATA COLLEGE, USA

.

INTRODUCTION

The pandemic revealed a lot of harsh truths about the state of our society, but it also underscored major disparities in our students' lived experiences. Though some students responded positively to remote education, many others struggled with issues that had little or nothing to do with learning and much more to do with survival. COVID-19 raised new barriers, especially for students of color, students with disabilities, and students who were caregivers regarding their ability to pursue, continue and complete their education.[1] Considering these struggles, many educators found themselves questioning how to better support students' growth and success. One area that has seen a lot of inquiry and debate is student assessment. In this paper, two design professors teaching in distinct educational settings discuss their experiences with the pedagogical practice of "ungrading" to promote educational equity and refocus education around individual learning and growth over performance and standardization.

CONTEXT

We have seen first-hand the negative impacts of standardization in grading from K–12. Students nowadays are conditioned to seek simple, "right" answers to questions and problems, prioritizing correctness over criticality.[2] Educational scholar Alfie Kohn argues that when students are focused on how well they are doing instead of what they are doing (via extrinsic motivators such as grades), their engagement with the content suffers.[3] According to Davies & Reid, this focus on results over process encourages students to work towards pleasing their faculty instead of solving complex problems individually.[4] Visser et al. argues that "design teachers face a challenge in instilling in students a mindset that embraces experimentation and conditions for 'failure', within an educational context that emphasizes assessment frameworks with prescriptive tasks and criteria."[5] Consequently, they argue, students rely more heavily on formulaic work that draws on past success rather than explorative work that could end in perceived failure—especially when that failure is reflected in grades that could impact their ability and interest in continuing their education.

Beyond the pedagogical issues of traditional grading, standardization through grades fosters inequity through a "one-size-fits-all" understanding of academic advancement and achievement. No two students come into any classroom equally prepared, skilled, or knowledgeable. Thus, creating standards of performance that apply equally to all students in a class dismisses individual learning needs and, in turn, supports systems of oppression that disenfranchise minoritized and under-resourced students. Traditional grading is also inconsistent,[6] and in the case of creative subjects, implicitly biased.[7] While many faculty support and applaud diverse and challenging work in the classroom, there is often a

misalignment between what is taught and the way that performance is assessed,[8] creating anxiety and confusion in students about what they "should" be doing in order to succeed.

In addition to the above issues, setting arbitrary standards of achievement leaves little flexibility for extenuating circumstances that can impact a student's ability to participate or execute in the classroom. Circumstances like: the death of loved ones, being a primary caregiver, challenges with disabilities, experiencing homelessness, and financial issues—all of which we have witnessed even more so during the pandemic. If the purpose of education is to help students learn, grow, and achieve their goals, these punitive grading measures are counter-productive and can make education inaccessible to students without means.

For these reasons and more, many educators and institutions are moving towards gradeless methods of assessment. From proficiency-based grading systems to more anarchistic approaches, there are many ways to "ungrade." In the following section, we will provide two perspectives and applications of ungrading from distinct educational experiences in higher education, followed by a brief summary of the overlaps in pedagogy and practice.

ZACHARY VERNON: CALIFORNIA STATE UNIVERSITY LOS ANGELES, BA ART

While working at a public university in the heart of Los Angeles, I began ungrading my classes in the Spring of 2020 right before the COVID-19 pandemic. I did so in response to my own reaction to and research into grading[9] and to 1) combat what I saw as my own implicit biases; 2) better meet the needs of my students; and 3) better individualize the education I was providing. In the past two years, I have tinkered with the ways in which I incorporate ungrading strategies into the classroom, iterating off what I found was working and what wasn't, informed by student outcomes and formal and informal student feedback.

To begin ungrading, I started by removing all arbitrary grades from my courses that had nothing to do with the learning outcomes: attendance, participation, and even deadlines. In doing so, I risked students not showing up to class, not doing the homework assignments, and falling behind. While some of that did happen, it also allowed for circumstances where students were able to catch-up and succeed even when the realities of life got in the way: students pulling extra shifts to make up for lost income from their parents being laid off, reeling from deaths in the family, or stints of homelessness, to name a few situations that came up. I still maintained a schedule for my classes to provide structure and set goals, but the shift of focus from completion of tasks to growth and development allowed students to continue to learn when survival was their main priority.

As part of a decolonialist and queer pedagogy informed by the work of Susan D. Blum, Jesse Stommel, Alfie Kohn, and others, I have moved away from using rubrics that center my white cisgendered American male perspective on the subjects I teach and instead now pose thoughtful and critical questions about each learning outcome for the students to consider as they participate in the class. These questions are answered in self-assessments the students do at various times throughout the class, which are the main tool that I use to track learning and progress within the course. As an example, in a lower division Concept Development course, one learning outcome is to "analyze a project and initiate investigative research." As part of the self-assessment, the student is prompted to reflect upon how they have learned to approach a project: what questions do they ask, what research methods might they use to answer those questions, what do they struggle with, and in what ways can they continue to improve? In my classes, students prepare presentations at various points in the class that include both written reflections and visual evidence of learning taken from coursework (e.g., assignments, exercises, readings, etc.) as answers to each prompt. These assessments provide an opportunity for the students to practice metacognition, or understanding one's own thought process and learning,[10] and to identify for themselves what they are getting out of the class, where they are struggling, and what they want to

achieve. The assessments also help to personalize the learning, creating individual pathways to success that do not rely on a standardized expectation of what growth looks like. Since students come to my classes with different levels of knowledge and skill, this system creates a more equitable assessment of personal growth and learning by looking at what students have achieved, not what they are lacking.

One of the most important aspects of ungrading strategies is to create a system of written and/or verbal feedback; this is where the true work of ungrading lies. Ruth Butler's research shows that students who receive comments on their work (without grades) consistently outperform students who receive just grades or receive both grades and comments.[11] After each assignment, project, or assessment, written and/or verbal feedback is provided with specific identification of areas of success and opportunities for improvement. With major assessments (typically after projects or at milestones throughout the semester), I provide written feedback as well as an individual conference with each student to go over questions, issues, and to provide resources and references for areas of struggle.

In the final self-assessment of each class, I ask each student to grade themself. Since I am still required by my university to turn in a letter grade, I provide the student an opportunity to have a say in that grade based on what they have achieved in the class, turning their final grade into a conversation between myself and the student. In many cases, the student and I agree. In a few, I must defend why I think their grade should be higher or lower than their own evaluation based on the learning outcomes and observable growth. The result is clear identification and communication of what the student has—or has not—gained in information, knowledge, and skill.

RYAN GIBBONEY: JUNIATA COLLEGE, HUNTINGDON, PA. BA OR BS INTEGRATED MEDIA ARTS (IMA)

My teaching philosophy is based on the belief that design education has the power to make an impact on students and their future as creative citizens. It is my belief that students should be encouraged to think about their role in making visual communication tools that are more legible, transparent, and understandable to all audiences, in an inclusive way. *So why wouldn't our assessment methods also be this flexible, impactful, and transparent?*

I struggled ethically to evaluate my students with one system of rubrics and one set of learning outcomes that were not solely focused on artistic direction and design principles being met. Individual learning is a primary focus in my classroom due to students coming from various backgrounds and skill levels. For this reason, my classroom focus is to set up opportunities for students to learn the expectations of being an interdisciplinary designer and creative in an experiential learning environment. This works by allowing choice of contribution to a client-based team-driven project, opportunity for trying new technologies, and most importantly, time to reflect on any perceived successes or failures. In some academic environments, failure during a client-based project would be considered punishment with a low letter grade. With reflection and revisions in the new ungrading environment, students can learn from their perceived mistakes and find creative ways to approach the problem differently in the future. Course learning outcomes have been adjusted, and less emphasis is placed on the end product. Attendance has transitioned to engagement and participation in discussions, workdays, and client meetings. In my courses, attendance is required as it is the primary way to engage and participate in team and community partner meetings and critiques. Although this is mandatory, it is also flexible, allowing students to join on Zoom if necessary due to health, personal, or work requirements.

Based on my circumstances and the needs of my students, I still felt the need to keep a rubric with some form of hierarchy. Knowing that every interaction with a community partner is different, every student team is different, and every individual student comes in with varying knowledge and skills, it is impossible to have one rubric focused solely on design. I adapted to a three-tiered check system with language to indicate the components of each project and the expectations. Using "excellent,"

"satisfactory," and "unsatisfactory," the check system allows the students to see the expectations for various project contributions and plan accordingly. In his research, Jesse Stommel, a notable ungrading enthusiast and education scholar, found that "much of the language around grading emphasizes efficiency over the needs of individual learners."[12] One of the primary reasons I transitioned my rubrics to highlight individual sections of a project with a three-tiered check system was to allow individual learning to take place. Although I have taken away the pressure of grading, I am still providing clarity of learning outcomes.

Teaching students to document their process and their work was a key element of implementing new assessment methods and their overall success. Once I realized that some of our students don't have prior skill or knowledge in documentation and process, it became a key way to allow for student reflection, time tracking, and professional practices. Through student and faculty conferences in addition to faculty feedback in person and on Slack and Moodle, the students were better able to assess their own work. Creating self-initiated project deadlines that were geared towards final deliverables and end goals was also a great way to allow for individual assessment. Students can now pursue an IMA course and engage in a professional production environment while solving wicked problems in the local community.

Student documentation and final individual assessment can vary based on the student's ability to see their work. Sharing other student reflections in the classroom that are detailed, thorough, and thoughtful helps the next class of students relate their work, self, and personal goals to the class. This creates the expectation to think about how and why they are creating and contributing, allowing them to learn the process of design and collaboration in a more thorough way.

One final primary component of my design classroom is flexible deadlines. This has been one of the biggest learning opportunities as a faculty member transitioning from rigid assessment and grades. I implement this by having students deliver materials in a draft critique folder followed by an evaluated submission and final critique folder. Excellent student feedback has come in regarding the ability to allow work and change their work to make it the best, which has also translated well into the ungrading system.

OVERLAPS

Several themes can be found within our two approaches, with the biggest differences being more in the minutiae of application rather than core strategies.

A key strategy of both approaches to ungrading is centering the student's perspective on their growth through reflective activities and process documentation. By removing ourselves as the sole assessors of growth, the students take more ownership of their education and provide a more in-depth analysis of their learning. In both of our experiences, these reflections lead to deeper engagement with the course content as well as revealed depths of understanding (or lack thereof) that are harder to evaluate simply through examining the results of their work.

Another core strategy or theme is student accountability and autonomy. By removing the punishment of lowering a grade for a missed deadline, the student must find intrinsic motivation to complete work in a timely fashion, while at the same offering grace to them when they struggle to do so. We both attempt to instill that intrinsic motivation in our students by providing them with opportunities to make the class meaningful and worthwhile to them. Moving away from standardization also allows students to achieve different levels of growth that are personal and individualized to their needs and interests. This is incredibly useful in classes where projects, student backgrounds, and potential outcomes vary.

Ryan's rubrics and Zachary's self-assessment prompts both also serve a singular purpose: to provide clarity of content regarding learning outcomes. Students often enter classes with little understanding of what achieving the learning outcomes of the course means in application. In Ryan's case, the rubric provides a roadmap to success, breaking down the content into scaffolded measures of growth.

Zachary's self-assessment prompts provide context for the learning outcomes and give the students specific frameworks for how to think and talk about their achievements and growth.

Below is a quick reference chart for some of the differences and similarities between the two teaching styles.

Assessment Strategies	Vernon	Gibboney
Deadlines	Suggested, with final deadline for semester as only "true" deadline.	Suggested, with final deadline for semester as only "true" deadline.
Attendance	Required, not enforced through grading.	Required, not enforced through grading.
Rubrics	No	Yes
Documentation	Process is documented and presented through self-assessments.	Project proposal with initial pitch that becomes a project report including time tracking, design portfolio, and contribution to a team project.
Self-Assessment	Presentation with both written reflection and visual evidence of learning/growth. Additional follow-up conversation with professor.	Written individual reflection and visual evidence of learning through documentation in project report.
Final Grade	Conversation between student and professor based on self-assessment.	Project proposal evaluated.

Table 1. Assessment Strategy Comparison.

CONCLUSION

As we reconsider and reestablish the purpose and application of higher education within contemporary contexts, we must also consider what we are willing to change and what consequences will come from those changes. Ungrading, in its many forms, allows for greater flexibility in assessment, more personalized growth plans for students, and, importantly, room for the risk-taking, mistake-making, and refinement necessary for true learning.

Through this paper, we encourage reflection not only in the way we promote learning in this new age, but how we evaluate the effects of our teaching. The efficacy and equity of grading policies must adapt to meet the needs of students, and not be beholden to inadequate tradition. As the challenges our students face grow more complex due to a lack of social safety nets and support, we must do what we can to provide avenues of success that do not conform to some mythical norm or ideal trajectory. We must confront our biases, examine our practices, and collaborate with our students to create a learning environment that truly advocates for student success. Much like our students, we can—and should—continue to learn and grow in our practice.

NOTES

[1] "Education in a Pandemic: The Disparate Impacts of COVID-19 on America's Students," U.S. Department of Education, Office for Civil Rights, 2021, https://www2.ed.gov/about/offices/list/ocr/docs/20210608-impacts-of-covid19.pdf.

[2] Randal Peters et al., "It's just not fair!" Making sense of secondary students' resistance to standardized grading," *American Secondary Education* 45(3) (2017): 21–22.

[3] Alfie Kohn, *Ungrading: Why Rating Students Undermines Learning (and What to Do Instead),* ed. Susan D. Blum (Morgantown: West Virginia University Press, 2020), xiii–xx.

[4] Allan Davies and Anna Reid, "Uncovering problematics in design education: Learning and the design entity" (Paper presented at Reinventing Design Education conference, Curtin University, Perth, Australia, December 2000).

[5] Irene Visser, Lisa Chandler, and Peter Grainger, "Engaging Creativity: Employing Assessment Feedback Strategies to Support Confidence and Creativity in Graphic Design Practice," *Art, Design & Communication in Higher Education* 16 (1) (2017): 53–67.

[6] Daniel Starch and Edward C. Elliott, "Reliability of the Grading of High School Work in English," *School Review* 20 (1912): 442–57.

[7] Peter Elbow, "Ranking, Evaluating, Liking: Sorting Out Three Forms of Judgment," *College English* 12 (1994): 188–189.

[8] Staci Rohrbach, "Analyzing the Appearance and Wording of Assessments: Understanding their Impact on Students' Perception and Understanding, and Instructors' Processes," Design and Complexity - DRS International Conference (2010).

[9] Zachary Vernon, "Stop Grading Your Students," *AMPS Extended Proceedings: Online Education: Teaching in a Time of Change* (2021): 37–46.

[10] Dan Rothstein and Luz Santana, *Make Just One Change: Teach Students to Ask Their Own Questions* (Cambridge, Massachusetts: Harvard Education Press, 2011), 120.

[11] Ruth Butler, "Enhancing and Undermining Intrinsic Motivation: The Effects of Task-Involving and Ego-Involving Evaluation on Interest and Performance," *British Journal of Educational Psychology* 58(1) (1988), https://doi.org/10.1111/j.2044-8279.1988.tb00874.x.

[12] Jesse Stommel, "How to Ungrade," in *Ungrading: Why Rating Students Undermines Learning (and What to Do Instead),* ed. Susan D. Blum (Morgantown: West Virginia University Press, 2020), 28.

BIBLIOGRAPHY

Butler, Ruth. "Enhancing and Undermining Intrinsic Motivation: The Effects of Task-Involving and Ego-Involving Evaluation on Interest and Performance." *British Journal of Educational Psychology* 58(1), (1988): 1–14. https://doi.org/10.1111/j.2044-8279.1988.tb00874.x.

Davies, Allan and Anna Reid. "Uncovering problematics in design education: Learning and the design entity." Paper presented at Reinventing Design Education conference, Curtin University, Perth, Australia, December 2000.

Elbow, Peter. "Ranking, Evaluating, Liking: Sorting Out Three Forms of Judgment." *College English* 12, (1994): 187–206. https://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1011&context=eng_faculty_pubs.

Kohn, Alfie. *Ungrading: Why Rating Students Undermines Learning (and What to Do Instead).* Edited by Susan D. Blum. Morgantown: West Virginia University Press, 2020.

Peters, Randal, Jerrid Kruse, Tom Buckmiller, and Matt Townsley, "It's just not fair!" Making sense of secondary students' resistance to standardized grading." *American Secondary Education* 45(3) (2017): 9–28. https://mimas.calstatela.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=125089081&site=ehost-live&scope=site.

Rohrbach, Stacie. Analyzing the Appearance and Wording of Assessments: Understanding their Impact on Students' Perception and Understanding, and Instructors' Processes, in Durling, D., Bousbaci, R., Chen, L, Gauthier, P., Poldma, T., Roworth-Stokes, S. and Stolterman, E (eds.), Design and Complexity - DRS International Conference 2010, 7-9 July, Montreal, Canada, 2020. https://dl.designresearchsociety.org/drs-conference-papers/drs2010/researchpapers/102.

Rothstein, Dan and Luz Santana. *Make Just One Change: Teach Students to Ask Their Own Questions.* Cambridge, Massachusetts: Harvard Education Press, 2011.

Starch, Daniel and Edward C. Elliott. "Reliability of the Grading of High School Work in English," *School Review* 20 (1912): 442–457. https://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1287&context=pare.

Stommel, Jesse. "How to Ungrade." In *Ungrading: Why Rating Students Undermines Learning (and What to Do Instead),* edited by Susan D. Blum, 25–41. Morgantown: West Virginia University Press, 2020.

U.S. Department of Education, Office for Civil Rights, "Education in a Pandemic: The Disparate Impacts of COVID-19 on America's Students." 2021. https://www2.ed.gov/about/offices/list/ocr/docs/20210608-impacts-of-covid19.pdf, iv.

Vernon, Zachary. "Stop Grading Your Students." *AMPS Extended Proceedings: Online Education: Teaching in a Time of Change* (2021): 37-46. http://architecturemps.com/wp-content/uploads/2021/11/Amps-Proceedings-Series-23.1.pdf.

Visser, Irene, Lisa Chandler, and Peter Grainger. "Engaging Creativity: Employing Assessment Feedback Strategies to Support Confidence and Creativity in Graphic Design Practice." *Art, Design & Communication in Higher Education* 16 (1), (2017): 53–67. doi:10.1386/adch.16.1.53_1.

PROCESSING COMPLEX INTERIOR CONSTRUCTION PROBLEMS: A CRITICAL REFLECTION ON PAST, PRESENT AND FUTURE LEARNING

Author:
SADIYAH GEYER, ILSE PRINSLOO

Affiliation:
UNIVERSITY OF JOHANNESBURG, SOUTH AFRICA

INTRODUCTION

Educators are under increasing pressure from the industry to provide students with qualifications to prepare them for rapid social, environmental, and economic changes. Moreover, advances in artificial intelligence and machine learning, robotics, biotechnology, and genetics have accompanied significant changes worldwide. Tertiary institutions aim to effectively produce graduates who have the skills needed to participate meaningfully in the workplace. Doing so necessitates a strategic approach to prepare graduates who can think creatively and critically and have broad perspectives and cross-cultural knowledge.

Interior design education is no different. The combined impact of globalisation, information communication technology (ICT), and the knowledge explosion has led to drastic changes in the built environment and the existing issues that face interior design instructors.[1] Students anticipate obtaining qualifications that will prepare them for future professions that will require them to use technologies that have not been produced yet, to solve challenges that have not been identified yet. Therefore, it has become necessary to adopt new teaching design strategies to accommodate these changes and meet the demands of the future interior designer.

The traditional interior design studio offered students a constructive learning environment that facilitated creative problem-solving. Interior Design students processed problems in an interactive studio by engaging in peer-to-peer and instructor-to-student brainstorming and critiques. However, with recent changes brought about by the Covid-19 pandemic, the learning environment changed, highlighting the differences in problem-solving from various perspectives over generations, involving different technologies and environments.

This study focuses on how interior design students approach problem-solving in interior design. This study aims to understand how solving complex interior construction problems have changed over two student generations to understand the possible effect on future learning. We explore graduates' responses to their approaches to problem-solving through semi-structured interviews with qualified interior designers that have insight into how interior designers of different generations approach problem-solving in the studio.

INTERIOR DESIGN CONSTRUCTION AND DETAILING

Interior design education strives to develop high levels of creativity and expertise in designing increasingly complicated environments for our technologically savvy society. To achieve this, educators equip future interior designers with skills to practice with the depth of knowledge required to handle complex challenges in interior design.[2] Interior design construction focuses on problem-solving processes and skills and, together with design, is the decision-making or trial-and-error processes of creativity.[3]

The fundamental value of the "Interior Design Construction and Detailing 3" module in the interior design curriculum of the University of Johannesburg (UJ) is to stimulate the mind to create drawings as part of the detailed work of the design process. Former interior design graduates and current students at UJ begin their interior construction and detailing learning journey at a drawing desk but quickly progress to computer-aided drawings using software used in the industry. However, students have become more apprehensive of hand-drawing and model-making and are eager to jump to computer software and digital imagery. Computer software impacts knowledge production, structure, and storage as two-dimensional and three-dimensional detail drawings of objects can be saved as templates for future application to different design contexts and problems.[4]

A THEORETICAL BACKGROUND TO TRANSFER OF LEARNING

The effect of particular types of instruction on the type of learning is referred to as "transfer of learning" or "transfer of training", where "transfer" describes the type of instruction designed to teach students how to apply learned knowledge and skills to different contexts.[5] The transfer of learning describes the core of problem-solving, creative thinking, and other high-level mental processes, such as invention and creative output. Furthermore, transfer of learning refers to the "economic source of learning" as it could effectively reduce or significantly increase the time and energy spent learning new knowledge and skills.[6] The industry describes the transfer of learning as a graduate's ability to effectively apply the knowledge or skills acquired from their tertiary education to the tasks presented in the workplace.[7] The degree of transfer of learning can be classified as either "near transfer" or "far transfer."[8] "Near transfer" refers to solving problems with similar properties or executing learned skills in authentic contexts similar to the learning environment. More relevant to this study is "far transfer", which indicates the ability to solve different types of problems under conditions different from the past learning environment. Ideally, an interior design student should have the ability to decontextualise learning and apply the extracted general principles and rules to new contexts. This type of learning transfer requires that a student exceeds the superficial characteristics of a problem and uncover the shared principles between different situations and phenomena.[9]

Problem-solving is a cognitive process aimed at achieving a goal and requires an intellectual process of the brain that explores the explanation of a particular problem, or discovery of a technique, to understand the given goal.[10] The brain uses maximal cognitive functions such as analytical thinking, generalisation, and synthesis in problem-solving, which also entail scientific form, critical thinking, decision-making, and reflective thinking.[11] Problem-solving is a research topic that is understood as finding solutions to problems through an iterative process of choosing a goal, choosing a method, evaluating results, choosing another goal, etc.

Interior construction problems in a studio are not routine and often ambiguous. Therefore, the search for solutions should be creative and varied individually, bringing an overlap between the definitions of creativity and problem-solving in this context. Creativity and problem solving are perfectly interwoven concepts for design problems. Knowledge alone is not enough to solve a problem, and students require problem-solving, creativity, innovation, metacognition, and communication to survive as future interior designers.

Contrary to rational problem-solving, which focuses on critical thinking, design thinking emphasises problem-solving creativity and critical thinking. The design thinking process uses discovering, explaining and creating ideas to explore or expand the problem and then uses the prototyping, experimentation and feedback cycle to refine and develop ideas and reduce the problem.[12] The theoretical basis of design thinking comes from disciplines such as engineering, social science, and design, that try to develop better or alternative solutions to problems, especially difficult or poorly shaped problems.[13] The theorists believe that rational problem-solving methods alone cannot solve all problems. Design thinking or human-centred design is a more feasible way to solve complex problems, especially when the problem or solution is unclear.[14] It further demonstrates that using design thinking to solve problems can identify opportunities well, seize them, and implement change and innovation.[15]

TWENTY-FIRST-CENTURY INTERIOR DESIGN GRADUATES

To be competitive and assume leadership roles today and in the future, interior design graduates must have a world-class design education that equips them with the latest technical knowledge and tools and an adequate understanding of social, economic, and political issues. These graduates should equip themselves with the necessary capabilities of information mining, knowledge integration, idea generation, and, most importantly, problem-solving and design thinking skills to keep up with the rapid changes of the twenty-first century. They are also expected to operate in international and multidisciplinary teams, have a global perspective, and be culturally and linguistically fluent in an increasingly global workplace.[16]

Moreover, the industry demand graduates with a thorough understanding of technical proficiency based on the discipline's principles. As young interior designers enter the industry, they must demonstrate critical, analytical, and creative thinking skills, the ability to apply knowledge in real-life situations and professional skills that enable them to perform effectively at work. The ability to apply design knowledge to real-world challenges involves complex and ambiguous systems holistically and the use of creative problem-solving skills.[17]

Interior design qualification requirements are regularly examined and changed by relevant authoritative bodies through a practice and education relationship. However, with each modification of these standards, the breadth and depth of necessary content grow significantly without a corresponding reduction in existing content.[18] For example, in the mid-nineteenth-century, computer-aided design (CAD) became a required skill, although there was no commensurate drop in manual drafting proficiency. Accordingly, educators employ various techniques to address the growing demand for content in the three to four years available to reach all competencies for an interior design qualification. The application of projects that address numerous problems is a standard method for introducing additional content into studio courses. For example, requiring both hand-drawn and CAD designs for various construction projects or designing a construction project for a building in a different country. However, this approach can minimise the importance of problem-solving, critical thinking, and design communication. These are vital components of a bachelor's degree program and are the qualities practitioners look for in entry-level designers.[19]

Other challenges of the twenty-first century are the effects of technology and its impact on the interior design industry. This has influenced the educational model and how current students and recent graduates are received in the industry. In particular, the introduction of computer software to process complex interior construction problems has significantly affected industry members, compelling graduates from ten and twenty years ago to adapt to new technologies quickly. With the introduction of the ease of access to information and the developments in the technology interior designers use, in the curricula in tertiary institutions, it can be reasoned that the process used by the older graduates to

solve complex interior construction problems would be different from the process that students in tertiary institutions use today.

METHODOLOGY

This paper aims to reflect on past, present and future learning of processing complex interior construction problems. Interviews were conducted with a sample group using semi-structured questions to achieve an in-depth understanding of the topic. The sample group comprise sixteen interior design professionals from different eras of interior design education from twenty-eight years ago until as recently as ten years ago, to reflect on past learning to process complex interior construction problems. All interviewees studied in Johannesburg, South Africa, and are considered competent in interior construction, as an outcome of their education. Based on the literature analysis, we identified three themes as important factors in the transfer of learning. These are the personal capacity to transfer knowledge, the opportunity to use the learning, and the support or opposition from stakeholders.

FINDINGS

The interviewees, who completed their studies more than ten years ago, brought to light that at that point, the interior design industry was still relatively unknown. These interviewees considered their choice to study interior design to be accidental or an alternative to another related industry, such as professions in engineering or architecture. The data analysis shows that the interviewees were learners who had particular abilities that encouraged them to choose interior design as a field of study. They describe themselves and their peer learners as possessing strong technical abilities and a passion for creative thinking. Most interviewees considered technological ability the main difference between them and learners today.

We explored what personality traits the interviewees felt made them ideal candidates to study interior design. Descriptions ranged from being analytical, logical, dedicated and curious to possessing a love for art and design. Considering both their abilities and personality traits, several interviewees believed that curiosity and exploration benefitted them in how they learnt interior construction.

The interviewees were asked to describe the content and sequence of the module(s) that they completed, which assisted them in learning about interior design construction. All interviewees referenced a good understanding of material properties and associated fixing methods. More recently qualified interior designers noted that the process of "making" assisted them in understanding interior construction solutions. None of the interviewees considered Computer Aided Drafting (CAD) to be the focus of interior design construction teaching. More recently qualified interior designers studied when CAD was a new addition to the industry. In contrast, the more senior interior designers felt that they explored CAD mostly on their own, to complete construction drawings.

Interviewees reflected on how the social context influenced their studies at the time. Some interviewees from both groups described a time when security and safety were not as much of a concern as today, allowing them to explore their surroundings for inspiration and examples of construction standards. These interviewees indicated that the content and the sequence of the interior design construction teaching benefitted them in becoming the type of interior designers they are today. All interviewees acknowledged that they use their knowledge of interior design construction daily, with one interviewee stating, "sometimes unconsciously".

We interrogated whether access to technology created opportunities for the interviewees to process complex interior design construction problems. Interviewees identified technologies such as Google Maps, computer numerical control (CNC) machine processes, laser cutting and 3D printing, and CAD software, as technologies that assist interior designers in solving or communicating the solution to complex interior design construction problems. All interviewees felt that access to technology is a

useful tool in solving complex interior design construction problems. Some indicated that technology makes it 'quicker' to identify construction problems and faster to move forward. However, one interviewee considered it a dichotomy in that although it could assist in resolving complex interior design problems, it made interior designers lazy to explore more creative solutions. He explained that we were "caught in the constraints of technology" rather than purposing technology to enrich our creative thought. Other interviewees reiterated the limits of technology to be the existing specifications and standards that leave little room for creativity. Some interviewees explained that the ability to solve complex interior design construction problems was not determined by technology but rather by the tacit and tangible knowledge and skills learned during their studies. The use of technology is useful in that the solution can be documented and communicated faster to the relevant parties, unlike in the past when everything was hand-drawn and access to information was limited.

DISCUSSION

Considering the current and future challenges in interior design practice and the demands placed on interior design graduates, it is apparent that interior design education must evolve and adapt. While technology and design practice have advanced rapidly, the way interior design students are taught has remained relatively unchanged. In design education, lectures and conventional studio sessions are the most common delivery methods. Industry complaints about the lack of critical skills among graduates are well known to educators. While it is simple to criticise the unsatisfactory quality of graduates, industries also have a significant role in the education process.[20]

To remain competitive, change is obligatory. There is a need to uncover new knowledge and technologies through comprehensive research and innovation in interior design education. We need to be able to produce graduates who can make discoveries, solve complex problems, design, and deliver, to serve communities and assist industry. As a result, students' analytical abilities should be developed through various active learning ways and the utilisation of modern tools and technologies. Furthermore, graduates must have the ability to be innovative, explorative, and open-minded. More than just establishing curricular details, educators must make interior design education engaging, inventive, entrepreneurial, creative, challenging, and stimulating in a real-world context to satisfy the requirements of the twenty-first century.[21]

Rapid developments and unique problems have emerged from the increase in technological growth that began in the second part of the twentieth century. To be relevant in the twenty-first century, interior design education has had to rise to the occasion and adapt curricula and how students are taught. Design education must employ considered strategies to create the intended quality of graduates, to meet the requirements and attributes of interior designers in the twenty-first century. While several innovations are being used to improve interior design education, it is critical to guarantee that they have a significant impact. This necessitates a thorough investigation into the relevance of the innovations, from which others can learn and emulate.[22]

CONCLUSION

The findings indicate that interior design graduates possess similar abilities, skills and personality traits which influence their decision to study interior design. Graduates have a curiosity about how things work, an ability to identify problems, a desire to solve them, and a creative and technical cognitive aptitude to approach these problems. The transfer of learning that takes place in the design studio, where students learn knowledge and skills to solve problems, is critical to the success of interior designers in the industry. The mode of the programme delivery has changed over time, due to external influences and demands. However, the findings indicate that the skills and learned knowledge received in the interior design construction module equip interior designers with the necessary tacit and tangible

outcomes to solve complex interior design construction problems daily. Although access to technology and the ability to use the necessary software are advantageous to this process, these are tools to communicate the solutions faster and more effectively, and not necessarily the application of learned knowledge and skills used in processing complex interior construction problems. The transfer of learning, described as the application of learned knowledge or skills to solving problems, is a crucial indicator of the success of any education or training program. It can therefore be reasoned that despite the changes to the modes of programme and content delivery, the purpose and outcomes of the module are met successfully.

NOTES

[1] Ranbir S. Malik, "Educational challenges in 21st century and sustainable development," Journal of Sustainable Development Education and Research 2 (2018): 11.

[2] Denise A. Guerin and Jo Ann A. Thompson, "Interior design education in the 21st century: An educational transformation," Journal of Interior Design 30 (2004): 4.

[3] Özge S. Islamoglu and Kubra O. Deger, "The location of computer-aided drawing and hand drawing on design and presentation in the interior design education," Procedia-Social and Behavioral Sciences 182 (2015): 608.

[4] Islamoglu, The Location of computer-aided, 609.

[5] Anna Fletcher and Gregory Shaw, "How does student-directed assessment affect learning? Using an assessment as a learning process," International Journal of Multiple Research Approaches 6 (2012): 252.

[6] Desi D. Sumadio and Dayang R.A. Rambli, "Preliminary evaluation on user acceptance of the augmented reality use for education," 2010 Second International Conference on Computer Engineering and Applications, no. 2 (2010): 461-465, doi: 10.1109/ICCEA.2010.239.

[7] Erik D. Van der Spek and Pieter Wouters and Herre Van Oostendorp, "Code Red: Triage or Cognition based Design Rules Enhancing Decision making Raining in a Game Environment," British Journal of Educational Technology 42 (2011): 449.

[8] Eveline Chan and Len Unsworth, "Image-language interaction in online reading environments: Challenges for students' reading comprehension," The Australian Educational Researcher 38 (2011): 195.

[9] Chan, Image-language, 196.

[10] Yingxu Wang and Vincent Chiew, "On the cognitive process of human problem-solving," Cognitive systems research 11 (2010): 87.

[11] Alptekin Gursoy, *Education programs and teaching*. (Ankara: University Bookstore Publications, 2006), 232.

[12] Rim Razzouk and Valerie Shute, "What is design thinking and why is it important?" Review of educational research 82 (2012): 337; Ester Van Laar and Alexander J.A.M. Van Deursen and Jan A.G.M. Van Dijk and Jos De Haan, "The relation between 21st-century skills and digital skills: A systematic literature review," Computers in human behavior 72 (2017): 579.

[13] Razzouk, What is design thinking, 339; Julia P.A. Von Thienen and William J. Clancey and Giovanni E. Corazza and Christoph Meinel, "Theoretical foundations of design thinking," in Design Thinking Research, (Cham: Springer, 2018), 13-40.

[14] Razzouk, What is design thinking, 342; Von Thienen, Theoretical Foundations, 27.

[15] Razzouk, What is design thinking, 344; Von Thienen, Theoretical Foundations, 32.

[16] James J. Duderstadt, *Engineering for a Changing World: A Roadmap to the Future of Engineering Practice, Research and Education, The Millennium Project* (Michigan: The University of Michigan, 2008), 43-57.

[17] Linda Katehi, "The global engineer," Educating the engineer of 2020: Adapting engineering education to the new century (2005): 153.

[18] Guerin, Interior design education, 7.

[19] Guerin, Interior design education, 8.

[20] Abdul S. Alkhalidi, "Future directions in interior design education," Journal of leadership and international development (2014): 1.

[21] Alkhalidi, Future directions, 3.

[22] Alkhalidi, Future directions, 6.

BIBLIOGRAPHY

Alkhalidi, Abdul S. "Future directions in interior design education." Journal of leadership and international development (2014): 1-11.

Chan, Eveline and Len Unsworth. "Image-language interaction in online reading environments: Challenges for students' reading comprehension." The Australian Educational Researcher 38 (2011): 181-202.

Duderstadt, James J. *Engineering for a Changing World: A Roadmap to the Future of Engineering Practice, Research and Education, The Millennium Project.* Michigan: The University of Michigan, 2008.

Fletcher, Anna, and Gregory Shaw. "How does student-directed assessment affect learning? Using an assessment as a learning process." International Journal of Multiple Research Approaches 6 (2012): 245- 263.

Guerin, Denise A., and Jo Ann A. Thompson. "Interior design education in the 21st century: An educational transformation." Journal of Interior Design 30 (2004):1- 12.

Gursoy, Alptekin. *Education programs and teaching*. Ankara: University Bookstore Publications, 2006.

Islamoglu, Özge S., and Kubra O. Deger. "The location of computer-aided drawing and hand drawing on design and presentation in the interior design education" Procedia-Social and Behavioral Sciences 182 (2015): 607-612.

Katehi, Linda. "The global engineer." Educating the engineer of 2020: Adapting engineering education to the new century (2005): 151-155.

Malik, Ranbir S. "Educational challenges in 21st century and sustainable development." Journal of Sustainable Development Education and Research 2 (2018): 9- 20.

Razzouk, Rim and Valerie Shute. "What is design thinking and why is it important?." Review of educational research 82 (2012): 330-348.

Sumadio, Desi D., and Dayang R.A. Rambli. "Preliminary evaluation on user acceptance of the augmented reality use for education." 2010 Second International Conference on Computer Engineering and Applications, no. 2 (2010): 461-465. doi: 10.1109/ICCEA.2010.239.

Van der Spek, Erik D., and Pieter Wouters and Herre Van Oostendorp. "Code Red: Triage or Cognition based Design Rules Enhancing Decision making Raining in a Game Environment." British Journal of Educational Technology 42 (2011): 441-455.

Van Laar, Ester, and Alexander J.A.M. Van Deursen, and Jan A.G.M. Van Dijk, and Jos De Haan. "The relation between 21st-century skills and digital skills: A systematic literature review." Computers in human behaviour 72 (2017): 577-588.

Von Thienen, Julia P.A. and William J. Clancey and Giovanni E. Corazza and Christoph Meinel. "Theoretical foundations of design thinking." in *Design Thinking Research*. Cham: Springer, 2018.

Wang, Yingxu and Vincent Chiew. "On the cognitive process of human problem-solving." Cognitive systems research 11 (2010): 81-92.

DECADES OF NARRATIVE: BALANCING CONSISTENCY AND CHANGE IN INTERIOR DESIGN PROGRAMME DELIVERY

Author:
ANDREW GILL, SADIYAH GEYER

Affiliation:
UNIVERSITY OF JOHANNESBURG, SOUTH AFRICA

INTRODUCTION

This paper presents an opportunity to reflect on the many changes that have occurred and the impact on the pedagogy used for an interior design degree programme situated within the faculty of art design and architecture at the University of Johannesburg in South Africa. Despite an abundance of literature motivating the need for change and how to manage change, there is less written from the lecturer's (or facilitator's) point of view regarding how change impacts teaching and learning, to which we would like to contribute. This opportunity arose from a recent systemic review of students' dissertations completed over the last ten years, in the fourth-year programme.[1]

Firstly, we provide a background to the evolution of the programme, which transformed from a Higher Diploma to a BA Honours degree over a period of thirty years, and elaborate on the current programme offering, purpose and learning outcomes. We then discuss some of the significant changes that impacted the programme delivery, both internal and external, enforced and voluntary. Next, our methodological approach is described, and the findings presented. We conclude with a discussion on pedagogical approaches used to maintain consistency in the learning process, enabling students to regularly meet the programme outcomes.

THE EVOLUTION OF THE BA HONOURS DEGREE IN INTERIOR DESIGN

The origins of the current interior programme can be traced to the late 1960s when first offered at the College of Art, Johannesburg (CAJ), at the Witwatersrand Technical College (WTC).[2] To date, the interior programme has always been positioned within an art or art and design faculty. Many of the courses offered in the emerging commercial arts fields took their pedagogical cues from fine art programmes due to the emphasis on practical art-making and visualisation skills. The commercial arts programmes, however, became more vocationally orientated, requiring pedagogical approaches that made qualifying students "work-ready" for employment in industry.

Higher education (HE) in South Africa is highly regulated, meaning that most far-reaching changes to qualification offerings are implemented top-down. Most changes are initiated by the Department of Higher Education & Training (DHET) in response to changes in National Government policies. The implementation of change is governed by the Council on Higher Education (CHE), which has the dual mandate of advising the Ministry on all matters related to HE and establishing and managing external quality assurance systems.[3] These changes are imposed on all institutions of higher learning and

disseminated down through the faculties, to departments and finally into individual programmes. Within this hierarchy, changes made at the lecturer's level are usually to comply with policy and are limited to changes in curriculum content and/or pedagogical approaches.

Although our focus is on the fourth-year stand-alone degree in its various iterations, it is necessary to consider the structure and pedagogies used in the preceding qualification, required for entry into this programme. We therefore briefly discuss some of the significant changes made to the programmes at the three-year diploma and the fourth-year in its various forms of: National Higher Diploma (HDip), Bachelor of Technology degree (BTech) and the Bachelor of Arts Honours degree (BA Hons), as outlined in Table 1. Although an interior design course existed before the formation of the technikons,[4,][5] detailed information is difficult to retrieve.

The three-year National Diploma in interior design was offered at various technikons throughout SA since 1979. All programmes were identical and developed by the Convener of Technikons. This structured coursework programme consisted of specialised practical skills development modules, both artistic and technical, supported by theory modules covering the history of art and architecture and professional practice. Each module was scaffolded vertically throughout the three years and assessed individually.

Initially, the fourth-year National Higher Diploma mimicked the fine art approach of a supervised, self-initiated project with a final output of an "exhibition and dissertation", with one year-end assessment and no structured modules. Although the exact correlation between the written dissertation and the practical work produced was never made explicit, it initiated the "practice informed by theory" pedagogy still evident in higher qualifications in art and design.

The introduction of the fourth-year BTech degree coincided with radical political change at the time, and a paradigm shift to a highly bureaucratised outcomes-based education (OBE) system. This OBE approach manifested in a highly detailed description of the new BTech degree required for accreditation and future evaluation by the authorities. The programme was prefaced with a purpose statement which read as follows;

The qualifying learner will have the competence to apply creativity, problem-solving, specialised knowledge and management principles to the practical implementation of Interior Design, after appropriate research and analysis on an individual basis.

Supporting the purpose were seven exit level outcomes, nineteen specified outcomes and associated assessment criteria, and twelve critical cross-field outcomes (applicable to all accredited qualifications at this level). This was followed by a description of the five individual modules that make up the programme, each with its own purpose statement, learning outcomes and associated assessment criteria. The new purpose statement resulted in the written component taking on the format of a research report used to justify the practical design "solution". Although the final end-year assessment was integrated, each module was assessed individually. The name of the preceding three-year diploma qualification remained and was restructured to better support the new BTech. The institutional mergers allowed more autonomy, at which time the programme was restructured, for a more equal credit weighting between theory and practical modules. The BTech would eventually phase out, to be replaced by a BA Honours degree.

Faculty management took the strategic decision to apply for accreditation to offer a three-year undergraduate BA degree followed by a one-year post-graduate BA Hons degree, to replace the Diploma and BTech programme. Both programmes would be offered at one higher qualification level[6,][7] than previously. This required the complete restructuring of both programmes, including revised staff qualifications and entrance level requirements. The BA degree was implemented in 2016 with a planned three-year delay for the BA Hons.

The new BA Hons was planned and detailed for accreditation by the Education Quality Committee (HEQC). The purpose of the programme reads as:

The purpose of the Bachelor of Arts Honours in Interior Design is to prepare students for research-based postgraduate study and entry into an advanced interior design career level and associated built environment by enabling students to conduct and report on research under supervision, produce creative solutions to complex design problems and develop and communicate the technical resolution of design problems according to industry requirements.

This was supported by four exit level outcomes defined as:

- Conduct and report research under supervision.
- Produce creative solutions to complex interior design problems.
- Produce a comprehensive set of interior design construction drawings, details and specifications according to sound technological, construction and structural principles.
- Act ethically and professionally.

The programme structure remained like that of the previous BTech degree, comprising two theory and two practical modules each with revised purpose statements, specific learning outcomes and assessment criteria, needed to reflect the competencies required to comply with the new South African Quality Authority (SAQA) "level eight" requirements.

The new programme purpose places greater emphasis on preparing students for further research-based higher degrees, requiring change to the curriculum content related to research methodologies and methods. The written dissertation now takes on a more generic research report format and assessed accordingly. The practical module content and structure remain the same as does the pedagogical approach used.

Qualification type	Circa 1969	Interior design first offered at The College of Art, Johannesburg (CAJ) at the Witwatersrand Technical College (WTC)
	1979	The WTC is formally restructured into the Technikon Witwatersrand (TWR)
	1992	The Interior Design Dept. forms part of the newly renamed Faculty of Art & Design (FA&D) at the TWR.
fourth- year National Higher Diploma	1997	The Departments of Architecture and Jewellery are incorporated and the renamed Faculty of Art, Design and Architecture (FADA) comes into existence.
three-year National Diploma	1993	The passing of the *Technikon act No. 125* makes it possible for the technikons to provide degree studies and confer technikon degrees.
	1995	Technikons introduce degree programmes in certain fields, including Interior Design. Bachelor's degree in technology (B-Tech) Master's degree in technology (M-Tech)
fourth-year Bachelor of Technology Degree	1997	The newly elected democratic government establishes the Council on Higher Education (CHE) to transform the higher education system and has far-reaching implications for all institutions of higher learning in SA.
three-year Diploma	2005	The TWR is merged with Rand Afrikaans University (RAU) and the Soweto and Daveyton Campuses of Vista University, and the new University of Johannesburg (UJ) is established.
	2016	A new three-year degree, the Bachelor of Arts in Interior Design is first offered (BA Int) and leads up to stand-alone honours and masters degrees
three-year Bachelor of Arts Degree	2019	The first intake of students into the BA Honours Interior Programme, and aligned with other fourth-years post-graduate studies at UJ
fourth-year Bachelor of Arts Honours Degree	2020	BTech and MTech degrees in interior design are phased out throughout SA.
	2022	

Table 1. Timeline of the evolution of the BA Hons Interior Design degree programme

CAUSES OF CHANGE TO THE PROGRAMME OFFERINGS

Most changes to the programme resulted from policy change at higher external levels, and consequently institutional levels. The more significant ones are discussed below.

The change to a democratically elected government in 1994 initiated a complete reform of HE policy to ensure equal and fair opportunity for all citizens to engage in tertiary studies. The National Council for Higher Education (NCHE) was established and tasked with advising the government on issues relating to HE restructuring to meet the social, cultural, and economic demands of the time.

To ensure equity and redress, increased participation in HE, and the way institutions and systems are built, managed and regulated; a single coordinated system was established in the form of a National Qualifications Framework (NQF). This framework would direct HE to become more responsive to society's interests and needs in response to the difficulties of the new social context. This would require HE institutions to offer: a broader range of programmes, including those that focus on the development of vocationally relevant abilities and skills; cost-effectiveness, and quality; and to ensure the relevance of education and research activities.

The new policy proposed a unified HE system that included universities, technikons, colleges, and private providers with increased cooperation and partnerships in the governance structures and operations. Academic autonomy and institutional self-reliance would need to be replaced with greater functional interdependence, accountability, and cooperation between all role-players. This would require all higher education and training programmes to be included in the National Qualifications Framework (NQF) and regulated by a new South African Qualifications Authority (SAQA).[8]

The need for a more unified HE system, with a diminishing distinction between graduate and technical occupations, and to align institutional types and qualification names to international norms would eventually result in the abandonment of the technikon model, and eventually all related degrees in technology. By 2005 all technikons had either merged with traditional universities or combined to form universities of technology and were renamed and rebranded.[9]

Furthermore, real-world thrusts influence institutional thrusts, which impact the programme. Three critical thrusts identified in the evolution of the programme are: citizenship, decolonisation of the curriculum and the fourth industrial revolution. Together, these thrusts influence the programme structure and delivery through dynamics such as an increased use of technology, national and global trends in interior design, sustainability and industry requirements, and skills development for graduates. Social influences such as the current Covid-19 pandemic also initiate change. The programme structure and delivery were effectively transformed into an online learning mode for two years and then to a more blended, integrated approach, in line with government Covid-19 restriction policies. Some of these significant changes that have transpired and impacted the evolution of the BA Honours Interior Design degree programme are summarised in Table 2 below.

CHANGES

Socio-political-economic changes (External)	Structural changes (Institutional)	Structure and delivery of the Programme (Departmental/Faculty)	Curriculum content and pedagogy (Approach)
Change of government			
Higher Education reform policy	• Transformation of the technikons into universities • Student demographic	• B. Tech to BA Honors • Programme structure • Module changes	• NQF Level exit outcomes • Curriculum content change- More methodology and research methods and writing skills and academic conventions for writing • Development of research-focus area

Regulation and legislation
Real-world thrusts
	• Lecturer qualifications and requirements
	• Institutional thrusts:
	  o Citizenship
	  o Decolonisation of the curriculum
	  4IR
		• Lecturer turnover
		• Student intake numbers
		• Increase in the use of technology
		• National and global trends in interior design
		• Sustainability
		• Industry requirements
		• Skills development	

Covid-19 pandemic and restrictions		• Increase of blended learning approach and digital interface	

Table 2. Changes that have impacted on the evolution of the BA Hons Interior Design degree programme

METHODOLOGY AND DISCUSSION

This qualitative research design is ontologically interpretive and epistemologically subjective, falling within the constructivist paradigm. The authors present their subjective research bias by being facilitators of the programme over several years. Whilst conducting a meta-analysis of a recent ten years of student projects (to establish trends in their responses to urban spatial challenges), the facilitators were provided with the opportunity to reflect on some of the significant changes that impacted the programme delivery and responding pedagogical approaches that afforded consistency in achieving student learning outcomes.

An outcomes-based, constructive alignment pedagogical approach

OBE entered the discourse on curriculum reform shortly after the Government of National Unity took control. The Department of Education, responsible for all education in the country, introduced *Curriculum 2005* as an envisaged paradigm shift to transform basic education and eradicate inequalities. The new OBE school curriculum, (implemented in 1998) was highly criticised for a multitude of reasons[10] and from many quarters, both prior to implementation and in retrospect, due to a lack of achieving meaningful curriculum transformation.[11] The OBE curriculum would eventually be replaced with the *Curriculum Assessment Policy Statement (CAPS)[12]* in 2012, acknowledging that there needed to be a clearer distinction between what is taught (curriculum content) and how it is to be tested or assessed, and OBE as a method of teaching.[13]

The introduction of OBE had far more impact on schools than on universities; however, much of the language, terminology and principles are still evident in the structuring of programmes and modules and used extensively for writing up qualification descriptors for accreditation in both higher education and training sectors. Despite the negativity surrounding OBE, there are certain aspects that have proved beneficial in developing and maintaining a suitable pedagogical approach within the context of constant change in which we teach, and are listed below:

- For OBE to succeed, learning outcomes must manifest as a "tangible application of what has been learnt."[14]
- Outcomes must be described as "doing" activities (in practice), rather than just knowing or other mental processes, and assessed as "a demonstration of the processes being sought."[15]
- OBE prioritises end-learning accomplishments and practice and therefore is suited to training programmes and professional qualifications.[16]
- Final summative assessments can only be made at end of the learning process and should be supported through regular feedback at appropriate stages of the learning process.[17]
- Attaining outcomes should not be determined by time schedules but rather according to learners' own abilities and development, implying that an OBE approach requires a degree of flexibility in the programme delivery.[18]
- Avoid including mental constructs, such as attitudes or values, in the learning outcome as these outcomes are difficult to assess.[19]
- OBE "offers a dialogue between learner and the curriculum where the learner interacts with sources of knowledge, reconstructs knowledge, and takes responsibility for his or her own learning outcomes." [20]

A related OBE theory that has contributed to the development of a consistent and appropriate pedagogical approach is that of constructive alignment, "This theory connects the abstract idea of a learning outcome to things the lecturer actually does to help students learn and things that the students do to actually learn".[21] The three fundamental principles that inform constructive alignment as a pedagogical approach are;

- The learner constructs their own learning through relevant learning activities.
- The lecturer's task is to create a learning environment that supports the learning activities to achieve the outcome.
- The key is that all components (curriculum, outcomes, teaching methods, resources, assessment) of the teaching system should be aligned.[22]

The findings from this critical reflection from the "lecturer's view" indicate that: most changes to the curriculum are imposed; it is ultimately the lecturer's responsibility to maintain quality in the programme delivery to ensure that students learn. The lecturer's engagement with the curriculum is at the micro-level, and with limited authority restricted to altering curriculum content and pedagogical approach only, and usually in response to external change factors.

Despite the imposed changes that have influenced the evolution of the programme, it is evident that many aspects of the pedagogical approach have remained the same, enabling consistency in the programme delivery and the students' ability to meet learning outcomes. We present these identified pedagogical consistencies in Table 3 below.

CONSISTENCIES

Learning manifests as tacit and tangible outcomes of the studio experience

Learning activities align to the nature of the discipline

Practice is supported by theory

Student-centred learning

Students choose own topic of study

Outcomes-based and constructive alignment

Creative problem solving

Creative and pragmatic skills development

Constructive learning - learn by doing

Table 3. Consistencies in the pedagogical approach identified in the evolution of the BA Hons Interior Design degree Programme

CONCLUSION

There is a need to balance consistency and change in the delivery of vocationally orientated programmes such as the one described above. Most changes to the programme are external and imposed. Developing strategies for consistency in the pedagogical approach can help mitigate the unintended consequences of change. Consistency in the pedagogical approach can make it easier for the lecturer to accommodate change whilst ensuring students meet the required learning outcomes. Some useful strategies that have assisted us in developing an appropriate pedagogical approach that can accommodate change are:

- Conceptualising the curriculum content (what students need to know and exit level outcomes that must be achieved) separately from the teaching method or the programme structure. This has allowed for the revision of learning outcomes to align with higher qualification levels and competencies relatively easily whilst retaining the same pedagogical approach and programme structures.
- Contextualising the design studies in time and place. This has allowed students to: respond to the "changing role of the designer", develop a greater social responsibility, propose local solutions

to local problems, and respond better to end user needs. This supports the current institutional objectives of decolonizing the curriculum and active citizenship without the need for structural change.

- Allowing the curriculum to consistently respond to ever-changing real-world issue with the use of appropriate methodologies. This ensures that students conduct first-hand empirical research so that they learn about the problem and possible solutions by engaging with real sites, potential end-users and professionals, this also presents opportunities for the required community engagement objectives.

- Teaching students to substantiate their design decision based upon research findings, assists in more objective decision making and the development of critical thinking skills. This strategy creates an awareness that a design solution is only valid in a specific time and place, and social context which is in a constant state of flux.

- The inclusion of technology into design education has, and will always be a necessity, as students require these skills to enter the workplace. The use of technology as a tool to collect and analyse data, to help visualize spaces and to document and communicate design solutions is valued, and now also presents greater possibilities for required blended learning approaches. However, the use of technology needs to be considered as a 'means to an end'.

- Allowing students to identify and choose their own projects has proved to be one of the most beneficial strategies, and now even more so, in a time where transformation is a primary political objective. This strategy promotes cultural diversity and encourages the students 'own voice'. It allows students to address spatial and social issues which have meaning for them, and to determine the level of complexity of project with which they feel comfortable.

- Acknowledging that students are constantly learning, but how they learn and the methods they use change. The pedagogical approach provides opportunities for students to cultivate their skillset using diverse learning methods. This approach challenges students to adopt a growth mindset, where they grasp and pursue opportunities to advance their knowledge by being responsive to lecture content and feedback. It empowers them to develop their own strategies and learning methods and take responsibility for their own learning outcomes.

Despite the numerous changes over the years made to the qualification names, exit levels, and structure of these programmes, the emphasis on: practical skills development, an appropriate correlation between theoretical and applied knowledge, and making students employable, has remained sacrosanct, and to which we consistently and constructively align our pedagogical approach.

NOTES

[1] Sadiyah Geyer and Andrew Gill, " 'From Design Studio to Research Laboratory: An Interior Design Contribution to Urban Regeneration Studies" (paper presented at the Teaching-learning-research: Design and environments conference, Manchester, United Kingdom, December 02–04, 2020).

[2] "History and Context of the Department of Visual Art," University of Johannesburg, accessed April 19, 2022, https://www.uj.ac.za/faculties/art-design-and-architecture/departments-2/visual-art/about-us/history-and-context-of-the-department-of-visual-art/

[3] "History of the CHE," Council on Higher Education, accessed May 5, 2022, https://www.che.ac.za/about-us

[4] The *Advanced Technical Education Act* (Act 40 of 1967) created a new type of institution to train skilled and high-level personnel. Original called college for advanced technical education (CATE) and located in the higher education sector. In 1979 the name changed to "technikon". The new name had been derived from the Greek word "technike" which refers to anything related to technique or technology and serves as an important basis for the difference in orientation between universities and Technikons.

[5] Jaya Raju, "The historical evolution of university and technikon education and training in South Africa and its implications for articulation between the two types of higher educational institutions with particular reference to LIS education and training," (2006), accessed May 26, 2022, https://openscholar.dut.ac.za/bitstream/10321/404/1/Raju_ 2006.pdf

[6] National Qualification Framework (NQF). The framework ensures every qualification offered the same standard. The NQF Levels (one to ten) are the standards of learning achievement in South Africa.

[7] The South African Qualifications Authority, Level Descriptors for the South African National Qualifications Framework, November 2012, 5-13, https://www.saqa.org.za/docs/misc/2012/level_descriptors.pdf

[8] Jayaram N. Reddy and National Commission on Higher Education (NCHE), National Commission on Higher Education discussion document: a framework for transformation: higher education: system, governance, funding, 1996a (Pretoria: NCHE, 1996), 76-80.

[9] Jaya Raju, "The historical evolution", 11.

[10] Jonathan D. Jansen, "Curriculum Reform in South Africa: a critical analysis of outcomes-based education," Cambridge Journal of Education, no. 28:3 (1998): 321-331, doi: 10.1080/0305764980280305

[11] Lis Lange, "20 Years of Higher Education curriculum policy in South Africa," Journal of Education, no. 68 (2017): 31-57, accessed June 26, 2022, http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S2520-98682017000100004&lng=en&nrm=iso

[12] A National Curriculum and Assessment Policy Statement (CAPS) is a single, comprehensive, and concise policy document introduced by the Department of Basic Education for all the subjects listed in the National Curriculum Statement for Grades R - 12.

[13] "Curriculum Assessment Policy Statements (CAPS)," Department of Basic Education RSA, accessed 12 May, https://www.education.gov.za/Curriculum/CurriculumAssessmentPolicyStatements(CAPS).aspx

[14] William G. Spady, Outcomes-Based Education: Critical Issues and Answers (Arlington: American Association of School Administrators, 1994) 2.

[15] Spady, Outcomes-Based Education, 2.

[16] Spady, 4.

[17] Spady, 38.

[18] Spady, 167.

[19] Jansen, "Curriculum Reform," 7.

[20] Stephanus P.T. Malan, "The 'new paradigm' of outcomes-based education," Tydskrif vir Gesinsekologie en Verbruikerswetenskappe 28 (2000): 26.

[21] John Biggs, "What the student does: Teaching for enhanced learning," Higher Education Research & Development 18 (1999): 57-75

[22] Nic Aucamp, "Guidelines for Writing Learning outcomes and Assessment criteria," (Johannesburg: University of Johannesburg 2006)

BIBLIOGRAPHY

Aucamp, Nic. "Guidelines for writing Learning outcomes and Assessment criteria." (Johannesburg: University of Johannesburg 2006)

Biggs, John. "What the student does: Teaching for enhanced learning." Higher Education Research & Development 18 (1999): 57-75

Council on Higher Education. "History of the CHE." Accessed May 5, 2022.
https://www.che.ac.za/about-us

Geyer, Sadiyah and Gill Andrew. " 'From Design Studio to Research Laboratory: An Interior Design Contribution to Urban Regeneration Studies." Paper presented at the Teaching-learning-research: Design and environments conference, Manchester, United Kingdom, December 02–04, 2020.

Jansen, Jonathan D. "Curriculum Reform in South Africa: a critical analysis of outcomes-based education." Cambridge Journal of Education, no. 28:3 (1998): 321-331, doi: 10.1080/0305764980280305

Lange, Lis. "20 Years of higher education curriculum policy in South Africa." Journal of Education, n. 68 (2017): 31-57. Accessed June 26, 2022. http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S2520-98682017000100004&lng=en&nrm=iso

Malan, Stephanus P.T. "The new paradigm of outcomes-based education," Tydskrif vir Gesinsekologie en Verbruikerswetenskappe 28 (2000): 22-28.

Raju, Jaya. "The historical evolution of university and technikon education and training in South Africa and its implications for articulation between the two types of higher educational institutions with particular reference to LIS education and training." (2006). Accessed May 26, 2022. https://openscholar.dut.ac.za/bitstream/10321/404/1/Raju_ 2006.pdf

Reddy, Jayaram N., and Ken Burns. National Commission on Higher Education (NCHE), 1996a. Pretoria: NCHE, 1996.

Republic of South Africa: Department of Basic Education. "Curriculum Assessment Policy Statements (CAPS)." Accessed 12 May. https://www.education.gov.za/Curriculum/CurriculumAssessmentPolicyStatements(CAPS).aspx

Spady, William G. Outcomes-Based Education: Critical issues and Answers. Arlington: American Association of School Administrators, 1994.

The South African Qualifications Authority. Level Descriptors for the South African National Qualifications Framework. November 2012. 5-13. https://www.saqa.org.za/docs/misc/2012/level_descriptors.pdf

University of Johannesburg. "History and Context of the Department of Visual Art." Accessed April 19, 2022. https://www.uj.ac.za/faculties/art-design-and-architecture/departments-2/visual-art/about-us/history-and-context-of-the-department-of-visual-art/

ESTABLISHING EQUILIBRIUM: NOT A NOVELTY JUST NOVEL

Author:
SUMEI KAREN TAN, PETER MAX BRUGGER

Affiliation:
WINCHESTER SCHOOL OF ART, UNIVERSITY OF SOUTHAMPTON, UK

INTRODUCTION

There have been a lot of changes in education over the past three years since the start of the global pandemic.[1] Unsurprisingly, these changes have come with a variety of challenges. Switching to online modalities have sent educators around the world scrambling to adjust and to adapt as various institutions in higher education have tried to transition and continue their programmes online as smoothly as possible.[2] Having experienced different levels of success and learnt from mistakes during this period, this change has offered useful if not invaluable information for teaching.[3] Simply put, what has been learnt in this period and the next step, how can educators improve and better facilitate their teaching?

A broad question that can be further divided into an overlapping three parts: the first, deals with student engagement and involvement; the second looks at the teaching focus; and finally, content, which is mediated, and in this case, influenced by the means of lesson delivery. Although not new, these three components are similar to the three main factors proposed by Lear et al. which look at general factors on students, types of course and instructors in an online educational environment that is an ongoing interactive process.[4] However, models such as these need to be re-evaluated given the many changes in context, and circumstance; similarly, certain assumptions on these areas such as student engagement and involvement, teaching context and delivery need to be reassessed, particularly because of new imperatives within institutions, and prevalence of online teaching in programmes within traditional higher educational institutions.

Learner Motivation and Engagement

The underlying premise for many educators switching to online teaching is that after allaying student worries and concerns, students will and can adjust by making use of university resources online and therefore, carry on as per normal. This premise - to a certain extent - was valid. However, very rapidly, the enforced isolation and lack of real-life interaction soon emphasised differences in student behaviour or magnified types of learner response and motivation, as indicated in a slew of reports and news which unfortunately emphasised the negative aspects of online student learning within the new context.[5]

From anecdotal evidence, there appeared to be broadly three groups of students forming a pattern of interaction and behaviour: those who kept a very low profile while attending online sessions; another group who would send frequent emails to query and ask for clarification; and finally, the group of students who would occasionally make an appearance to log in their attendance and then disappear but would get into contact when assignment deadlines loom near or have requests for deadline extensions.

Previously, in any large cohort these types of learner behaviour were deemed typical where attendance has been observed to be linked to types of penalties around absences. This is concerning particularly when opportunities for learner-to-instructor engagement remain the same or get reduced given their importance as indicated in different studies particularly in the last five years.[6]

New Context

One issue which has emerged is that student attendance has been sporadic, if not dismal. This can be seen in attendance records and reported student absences. Anecdotes from lecturers follow several themes on this issue. For example, tutors who actively encouraged interaction by posing questions, and calling out a few students to answer were losing their online audience. The attendance also varied according to student perceptions of content relevance and importance where higher attendance was noticed with real-time presence of students appearing online one after another, suggesting that they were connected to one another in online chats and were informing and thus encouraging and motivating their classmates to attend. This seems to confirm the findings in Martin and Bollinger's 2018 study in which students were reported to find little value in synchronous sessions, preferring to take their time to respond to questions posted online.[7]

Another behaviour or action which has been observed is that students were tailoring their use of recordings or recorded lectures and seminars to their own purpose, at their own time, pace and convenience. This type of response towards digital material is not new and has been studied at length in film and media studies when audiences skipped or repeated viewings on recordings.[8] Similarly, it would not be too far-fetched to find students replicating such viewing behaviour on online materials by fast-forwarding the recording, skipping what presumably is perceived as 'irrelevant bits', and/or moving straight to the core content, or what is perceived as crucial.

New Learning Behaviours

This new context where online materials are the predominant source of content for students suggest that old assumptions held by educators need to take into account the different behaviours adopted by students. This change in learning in which students ignore synchronous online teaching in order to view recorded lectures in their own time and at their own pace can thus be labelled as 'delayed-deferred student engagement'.

The value in this learning behaviour lies in the comfort and convenience afforded by these recorded lectures and because students can have repeat viewings of key parts of the recording. The latter behaviour can be seen as students taking ownership when they choose to repeat sections of the recording in order to comprehend what is being said or has been recorded and also taking their own time to digest and mull over new information for better understanding and mastery of new concepts. This form of engagement is a positive development as students are headed in the right direction, and if they continue on this path, the possibility increases of them mastering key ideas or crossing the threshold to acquiring new knowledge in the near future.[9]

This delayed-deferred behaviour certainly offers the time and space for more diligent students to learn at a pace suited to them while juggling part-time jobs amidst other social or academic activities common to students in higher education. In fact, materials within this delayed-deferred engagement can lend themselves to further exploration or discovery for students if they are designed to trigger curiosity or elicit responses.[10]

However, this type of behaviour presupposes that the majority of students would be motivated to cross the threshold to mastery with this form of engagement. As is the case, not every student will have such a positive response towards learning; and so, such convenience in recorded materials for these students might be negated by the perceived extra effort involved for follow-up questions or clarification via

emails to lecturers that typically follows from synchronous settings. Also, when recordings are skipped and jumped when viewing them, this might limit what students can gain from watching the entire lecture as key parts could be missed. This is best illustrated in Figure 1 on the delayed-deferred student engagement model.
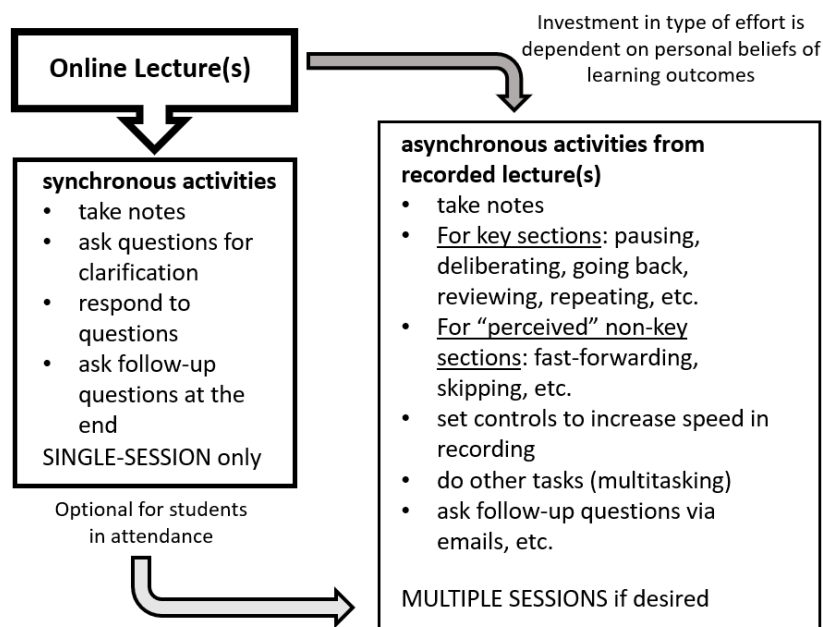
Figure 1. Delayed-deferred Student Engagement Framework

Certainly, no lecturer can assume that students will view the recording 'attentively' in its entirety nor can they assume that students will not be 'multitasking' while listening to the recorded lecture. Studies in fact have shown that there are certain student behaviours which are not conducive to learning; and that such behaviours are due to fixed or ingrained beliefs held among which is that additional effort towards learning may not offer improvement in educational achievements.[11] Such behaviour suggests a less-than-desirable outcome in learning. However further studies in this area of education on implicit theories of intelligence have also indicated that student behaviour can be modified with positive results when accompanied by changes in teaching style and instructions.[12]

There is one important point to note: for a practitioner more used to seeing direct student engagement in lecture halls, this change may be perceived as a negative outcome of online learning in comparison to in-person teaching. As such, online teaching has sometimes been regarded as a poor cousin to in-person teaching, particularly when resources and teaching are not geared to be carried out as predominantly online and when lecturers are unable to gauge from audiences their reactions and response to what is being taught. Many studies have also looked at the high attrition rate of attendance on online courses such as MOOCS which were attributed to decreases in motivation.[13] Therefore, there is a need to take into consideration this new type of engagement, and to a certain extent encourage student motivation be it through this form of delayed-deferred student engagement. There are three proposed strategies shown in Table 1 which takes into consideration the delayed-deferred student engagement. These are types of signposts, "narrative" which follows a logical sequence, and brief but comprehensive review of key points at the end of any lesson or lecture.

Clear Signposting

- To encourage active listening via signposts for non-linear viewing habits
- To have repetition of key terms within the recording to ensure that core points have been conveyed

Clear chronological 'narrative'

- To help listeners identify key information for review by having clearly demarcated sections
- To have a clear introduction and list of objectives (e.g. goal-orientated) in order to steer or cue students to important sections in the recording
- This can also offer useful priming to students on what was learnt previously and what will come next in the content

Brief but comprehensive review of key points at the end

- To have a review of key points as this will be crucial reminders to students of what has been covered or what is important in that particular lecture
- This can also serve to guide students to future research particularly if questions are posed at the end to trigger new ideas or activate prior knowledge from previous lectures

Table 1. Strategies for Delayed-Deferred Student Engagement

This raises another useful point: at which stage is it spoon-feeding students and diminishing student opportunities to discover information for themselves; or would that be giving students the information and allowing time for them to digest the information within the online session? There are different implications for these. For the first, in which information is presented, students will come to expect them and might lead to dependence (something not encouraged) where students might not choose to explore and discover on their own.[14]

CHALLENGES TO TEACHING

There are challenges with regards to this type of student engagement mentioned earlier which might be delayed and/or deferred as it does not take place within the online lesson itself. This delayed-deferred behaviour or action is actually not new and as mentioned is how audiences view online films or recordings in which streaming can be consumed non-chronologically, with some segments being repeated. If we accept this as a likely possibility that this happens – particularly as the current cohort of students are generally considered digital natives and are comfortable with technology and its multiplicity of features[15] - how do lecturers manage this without abjuring or negating their responsibility as educators to involve and engage students in their learning process?

Three Manageable Assumptions

Before offering measures that tutors can take, there are three assumptions which must be addressed. First is the fact that the educator is relatively comfortable with technology and can navigate or incorporate different online teaching software and applications within their teaching. For example, within the use of Microsoft TEAMs, they are comfortable using the related applications such as Forms, etc. Second, educators are able and willing to make adjustments in order to utilise a variety of methods that can encourage higher student engagement such as interest and attention. Finally, such adjustments, if they take a certain amount of time and effort, can be replicated or that skills learnt can be used repeatedly or frequently in future materials.

The next step is the fact that teaching needs to be stripped down to meet this new model of delayed-deferred student engagement in order to sustain interest and attention. With online teaching it is harder to monitor student engagement and interest and therefore, materials should exemplify simplicity and clarity as default principles of best practice in material development. Thus any assumption that teaching can be replicated or duplicated from previous in-person lectures ought to be re-evaluated in order to take into account this new context as shown previously in Figure 1.

Within the context of simplicity and clarity, this does not, however, mean the total absence of interaction; in fact, a 'light touch' is encouraged for smaller classes such as mentioning student names (not as interrogative questions but to affirm or praise). In bigger groups, this can be through rhetorical questions designed to provoke thinking but remaining general to the class as this does not put any one student in the spotlight.

In terms of material and focus, this suggests a re-ordering and a step back in order to reflect upon the class objective i.e. what is fundamental to helping students gain that knowledge. In other words, looking at what is considered essential and what is good to know for students. In short, there is no more room for tangents, extraneous material and longer discussions within the recorded lecture.

However tempting it is to add details which are not directly pertinent, this will only negatively impact the initial reception of students and in their later review, in their delayed-deferred engagement. Content in the lecture in turn has to be pared down, punchy if possible, and with clear signposting, which can cater to non-chronological consumption of the recording while maintaining student attention and keeping attendance high and stable. This suggests careful selection and balance on the part of educators to decide how much and to what extent content and technological applications are included in any online teaching or materials. For example, too much content can be overwhelming, which means that key or core information will be ignored or will be lost in the deluge of information. Similarly, too little content without much background will only reduce the import of any lesson and what students can 'take-away' and thus encourage students to ignore future materials as not being pertinent to their learning.

CONCLUSION

As discussed, this change in how online lectures are consumed has important implications for educators in terms of material preparation and content delivery. The issues to consider within the delayed-deferred student engagement framework are the following:

- student engagement is dependent on many factors such as motivation, and willingness to expand effort or to review materials
- content that seems crucial (and obvious) to lecturers might not appear so to students
- there is urgency for educator adaptability and flexibility in order to encourage learner acquisition of knowledge

If the above issues have indeed been taken into account and carefully addressed, there can be many positive signs. It must be noted that online teaching will change incrementally due to constant updates by external providers and thus this skill for teacher-adaptability and exploitation of crucial content both suggest a balancing act between adherence to one's plan and flexibility to abandon such plans if functionality is compromised. Similarly, unless caution and balance are observed, the reaction from positive acceptance of online learning and teaching can become avoidance for both learners and educators, respectively. Such strategic implementation by the tutor who also shows restraint in delivery in their pedagogies can rightfully be said to serve and increase the depth and breadth of knowledge for their students. Therefore, for many lecturers who have constantly been improving their pedagogy, it can be said that they have indeed found a new form of equilibrium within current understanding of the new normal.

NOTES

[1] Ofqual's Strategy, Risk, and Research Directorate. 2021. *Learning during the pandemic: review of research from England*. Great Britain.

[2] Sumitra Pokhrel, and Roshan Chhetri. "A literature review on impact of COVID-19 pandemic on teaching and learning." *Higher Education for the Future* 8, no. 1 (2021): 133-141.

[3] Andreas Schleicher. *The impact of COVID-19 on education: Insights from education at a glance 2020*. OECD (2020) accessed May 13, 2022. https://www.oecd.org/education/the-impact-of-covid-19-on-education-insights-education-at-a-glance-2020.pdf

[4] Janet L. Lear et al. "Interactivity/community process model for the online education environment." *Journal of online learning and teaching* 6, no. 1 (2010): 74.

[5] Branwen Jeffreys, 2022. "Covid Pandemic Fuels Deepening Education Inequalities In England, Say Mps". *BBC News*, accessed May 13, 2022, https://www.bbc.co.uk/news/education-60683839.

[6] Cynthia Janet Tanis. "The seven principles of online learning: Feedback from faculty and alumni on its importance for teaching and learning." *Research in Learning Technology* 28 (2020). https://doi.org/10.25304/rlt.v28.2319; and Patrick Lowenthal et al., "Thinking beyond Zoom: Using asynchronous video to maintain connection and engagement during the COVID-19 pandemic*." Journal of Technology and Teacher Education* 28, no. 2 (2020): 383-391.

[7] Florence Martin, and Doris U. Bolliger. "Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment." *Online Learning* 22, no. 1 (2018): 205-222. https://doi:10.24059/olj.v22i1.1092

[8] Daniel Hassoun. "Logics of Attention: Watching and Not-Watching Film and Television in Everyday Life." (PhD diss., Indiana University, 2019). 47-50.

[9] Jan HF Meyer, and Ray Land. "Threshold concepts and troublesome knowledge (2): Epistemological considerations and a conceptual framework for teaching and learning." *Higher education* 49, no. 3 (2005): 373-388, https://doi.org/10.1007/s10734-004-6779-5; and Meyer, Jan HF, Ray Land, and Caroline Baillie. *Threshold concepts and transformational learning*. BRILL, 2010.

[10] Joyce Yukawa. "Preparing for complexity and wicked problems through transformational learning approaches." *Journal of Education for Library and Information Science* 56, no. 2 (2015): 158-168. https://doi.org/10.3138/jelis.56.2.158

[11] Jennifer A. Mangels et al. "Why do beliefs about intelligence influence learning success? A social cognitive neuroscience model." *Social cognitive and affective neuroscience* 1, no. 2 (2006): 75-86, https://doi.org/10.1093/scan/nsl013

[12] Aneeta Rattan et al. ""It's ok—Not everyone can be good at math": Instructors with an entity theory comfort (and demotivate) students." *Journal of experimental social psychology* 48, no. 3 (2012): 731-737, https://doi.org/10.1016/j.jesp.2011.12.012

[13] Sherif Halawa, Daniel Greene, and John Mitchell. "Dropout prediction in MOOCs using learner activity features." *Proceedings of the second European MOOC stakeholder summit* 37, no. 1 (2014): 58-65.

[14] Donna Smith, and Katy Smith. "The Case for 'Passive' Learning –The 'Silent' Community of Online Learners." *European Journal of Open, Distance and e-learning* 17, no. 2 (2014), https://doi.org/10.2478%2Feurodl-2014-0021

[15] Chris Jones et al. "Net generation or Digital Natives: Is there a distinct new generation entering university?" *Computers & education* 54, no. 3 (2010): 722-732, https://doi.org/10.1016/j.compedu.2009.09.022

BIBLIOGRAPHY

Halawa, Sherif, Daniel Greene, and John Mitchell. "Dropout prediction in MOOCs using learner activity features." *Proceedings of the second European MOOC stakeholder summit* 37, no. 1 (2014): 58-65.

Hassoun, Daniel. "Logics of Attention: Watching and Not-Watching Film and Television in Everyday Life." PhD diss., Indiana University, 2019.

Jeffreys, Branwen. 2022. "Covid Pandemic Fuels Deepening Education Inequalities In England, Say Mps". *BBC News*, accessed May 13, 2022, https://www.bbc.co.uk/news/education-60683839.

Jones, Chris, Ruslan Ramanau, Simon Cross, and Graham Healing. "Net generation or Digital Natives: Is there a distinct new generation entering university?." *Computers & education* 54, no. 3 (2010): 722-732. https://doi.org/10.1016/j.compedu.2009.09.022

Kamins, Melissa L., and Carol S. Dweck. "Person versus process praise and criticism: implications for contingent self-worth and coping." *Developmental psychology* 35, no. 3 (1999): 835. https://doi.org/10.1037/0012-1649.35.3.835

Lear, Janet L., Charles Ansorge, and Allan Steckelberg. "Interactivity/community process model for the online education environment." *Journal of online learning and teaching* 6, no. 1 (2010): 71-77.

Lowenthal, Patrick, Jered Borup, Richard West, and Leanna Archambault. "Thinking beyond Zoom: Using asynchronous video to maintain connection and engagement during the COVID-19 pandemic." *Journal of Technology and Teacher Education* 28, no. 2 (2020): 383-391.

Mangels, Jennifer A., Brady Butterfield, Justin Lamb, Catherine Good, and Carol S. Dweck. "Why do beliefs about intelligence influence learning success? A social cognitive neuroscience model." *Social cognitive and affective neuroscience* 1, no. 2 (2006): 75-86. https://doi.org/10.1093/scan/nsl013

Martin, Florence, and Doris U. Bolliger. "Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment." *Online Learning* 22, no. 1 (2018): 205-222. doi:10.24059/olj.v22i1.1092

Meyer, Jan HF, and Ray Land. "Threshold concepts and troublesome knowledge (2): Epistemological considerations and a conceptual framework for teaching and learning." *Higher education* 49, no. 3 (2005): 373-388. https://doi.org/10.1007/s10734-004-6779-5

Meyer, Jan HF, Ray Land, and Caroline Baillie. *Threshold concepts and transformational learning*. BRILL, 2010.

Ofqual's Strategy, Risk, and Research Directorate, 2021. *Learning during the pandemic: review of research from England*. Great Britain.

Pokhrel, Sumitra, and Roshan Chhetri. "A literature review on impact of COVID-19 pandemic on teaching and learning." *Higher Education for the Future* 8, no. 1 (2021): 133-141.

Rattan, Aneeta, Catherine Good, and Carol S. Dweck. ""It's ok—Not everyone can be good at math": Instructors with an entity theory comfort (and demotivate) students." *Journal of experimental social psychology* 48, no. 3 (2012): 731-737. https://doi.org/10.1016/j.jesp.2011.12.012

Schleicher, Andreas. "The impact of COVID-19 on education: Insights from education at a glance 2020." *OECD* (2020) accessed May 13, 2022. https://www. oecd. org/education/the-impact-of-covid-19-on-education-insights-education-at-a-glance-2020. pdf.

Smith, Donna, and Katy Smith. "The Case for 'Passive' Learning –The 'Silent' Community of Online Learners." *European Journal of Open, Distance and e-learning* 17, no. 2 (2014). http://dx.doi.org/10.2478%2Feurodl-2014-0021

Tanis, Cynthia Janet. "The seven principles of online learning: Feedback from faculty and alumni on its importance for teaching and learning." *Research in Learning Technology* 28 (2020). https://doi.org/10.25304/rlt.v28.2319.

Yukawa, Joyce. "Preparing for complexity and wicked problems through transformational learning approaches." *Journal of Education for Library and Information Science* 56, no. 2 (2015): 158-168. https://doi.org/10.3138/jelis.56.2.158

DECOLONIZING ART & DESIGN EDUCATION IN PAKISTAN: LINKING RESEARCH, PRACTICE & POLICY

Author:
SADIA PASHA KAMRAN

Affiliation:
COLLEGE OF ART & DESIGN, UNIVERSITY OF THE PUNJAB, PAKISTAN

INTRODUCTION

At the dawn of the 21st century, in the Global South, decolonization as a subject of inquiry was getting a stronghold in every field of life. The concept was considered to be an essential integer for a harmonious world. In Pakistan, it took around two more decades to create awareness and popularize the notion in a way that engaged the thinkers, academics, policymakers and other stakeholders in making conscious efforts to decolonize art and design education. The need to reevaluate the strategies for a more comprehensive and result-oriented approach in art and design education is realized today. This study examines the art and design education in Pakistan in its historical, political and cultural context. It identifies the need to look at the conceptual aesthetic encounters between colonized and the colonizers. It asks for rethinking the terms and relocating the compass on imminent challenges than merely reiterating the cause and effect of being a former colony. It proposes contextually-engaged learning and systems of knowledge production as a promising approach towards a more stabilized society that is eager to create an impact on the global horizon.

HISTORY AND POLITICS OF EDUCATION SYSTEM IN COLONIAL INDIA

The British claim to bring 'development' and 'modernity' to India.[1] The magnitude of the effect of this imposed development and mechanism of the increased market integration and raised incomes are still in doubt. The reality is that the colonizers ripped the land off its resources, inflicted famines and laid the foundations for everlasting political anarchy.[2] Britain's rise for two hundred years was financed by its depredations in India.[3] There was "a parasitical symbiosis between an advanced trading nation and a vast agrarian state".[4] In this course of action, the local intellect and the age-old legacies of education and knowledge production were condemned to establish an air of supremacy for the foreign rule.

Educational Legacy of Ancient India

India had been the seat of higher learning and knowledge since the axial age. The contribution of Indian metaphysicians and logicians who articulated the great traditions of Hinduism, Buddhism and Jainism is duly acknowledged.[5] Taxila and Nalanda University establish this legacy. Taxila "was a seat not of elementary, but higher education, of colleges or a university as distinguished from schools…which exercised a kind of intellectual suzerainty over the wide world of letters in India".[6] Nalanda University followed the modern residential model in ancient times.[7] These universities taught different theoretical disciplines such as linguistics, law, astronomy, mathematics, medicine, arts and reasoning along with the Vedic and Buddhist religious texts.[8]

Educational Trends in Medieval and Pre-Modern India

During the Medieval era, India got introduced to the Islamic conventions of learning. Islam puts an extra emphasis on seeking knowledge and truth as part of a religious duty to each Muslim.[9] Arabs and Turks who brought Islam to the subcontinent were also acquainted with the Persian achievements in educational leadership of the Medieval world.[10] Translation of Greek knowledge into Arabic by Muslim scholars is acknowledged as an extensive feat that enabled the European Renaissance.[11] Islamic education focused on the spiritual elevation and intellectual heritage, in accordance with which the *Madrassahs* and *khanqahs* in the Islamic lands provided ethical and practical manifestation of a just and useful life as the main aim of all the learning pursuits. Accessibility of these institutional units to commoners who seek to learn the traits of life as prescribed by Quran and *Sunnah* interrupted the previously prevalent caste hegemony in the ancient Indian education system. Islamic education thrived during the Sultanate period and many learned scholars took refuge in India during the Mongol invasion of Persia. Later, under the Mughals these *madrassahs* remained functional. The arrival of the British found these institutions under the spell of self-serving *maulvis* playing a proactive role in combatting the changing socio-political scenario of the time hence, limiting the scope of education to preach and serve the politico-religious agendas.[12]

British Understanding of Indian Education

Education was not a priority in colonial India. On the orders of the Governor-General's (1844) preference was to be given to 'Western-educated' for government jobs. This drew attention towards educating the Indians. It was realized that without Western education "India will never be able to develop the power necessary for the attainment of social, economic, political and religious well-being and her masses must continue poverty-stricken and superstitious, the women remain non-producers, economically and intellectually, and the progress of sanitation and the eradication of disease must be indefinitely postponed".[13] Extreme poverty of the masses, inadequate means of communication, caste, the *purdah*, child marriage, child widowhood, the conflict of communal interests, ambitions and seemingly unbridgeable chasm between urban and rural life were considered a hindrance to a result-oriented educational system in British India. Lack of public investment, religious stratification and reliance on Muslim religious *madrassahs* further deteriorated the situation. Around 1920, educational control was transferred to ministers and constituted representatives. However, education accounted for a small share of the total budget averaging 3.5 percent between 1881 and 1941.[14]

Similar negligence is found in the case of art education in India when the British officials deputed to gauge the condition and working of education systems declined the existence of any local tradition of art in the area that needed to be preserved or promoted. "No art in Hindustan is carried to the same degree of perfection as in Europe, except some articles in which the cheapness of labor gives them an advantage" they believed.[15] Thus negated the artistic traditions and aesthetic trends fostered for thousands of years in the region.[16] This obliviousness towards Indian art is one reason for the lack of Britain's distinct education policy for India. The other reason was that nineteenth-century Britain itself was experiencing shifts in processes and mechanisms in all institutions of society.[17]

COLONIZATION OF ART AND ART EDUCATION

Indian art was misapprehended and the established Indian traditions of knowledge production and distribution were confused with fables and myths. India had a legacy of oral transmission of knowledge. The Vedas were orally passed on to posterity.[18] This preferred method of oral transmission from teacher to student in a colloquial setting was underestimated when T.B. Macaulay, Governor General's Council for India declared that "India had nothing to teach its own subjects". He boasted that "a single shelf of a good European library was worth the whole native literature of India and Arabia…the [Indian] dialects

contain neither literary nor scientific information" and condemned Indians as "the champions of errors" who must be taught only English.[19] Elimination of mother tongues slowed down the intellectual development of the community and inflicted the locals with an inferiority complex while silencing them in the longer run. All this targeted at systematic wiping out of traditional Indian education and vocational systems.[20] The aim was "to subdue, overwhelm and enslave the Indian mind".[21]

The Great Exhibition (1851), invited the colonials' attention towards art education in India. George Birdwood, an Anglo-Indian official while chairing the annual meeting of The Royal College of Arts in 1910, declared that painting and sculpture as 'fine arts' did not exist in India.[22] With this mindset art and design education was introduced "…to meet rapidly expanding industrial ambitions" of the colonials.[23] Between 1839-1875 several art institutions were set up.[24] However, education at these institutions lacked critical thinking, concept development, philosophy or history and students were taught imitation techniques in art and design.[25] An art administrator and historian E.B. Havel had an eye for Indian aesthetics. He claimed that "…art still survives in the length and breadth of India as part of a great traditional culture, intimately bound up with the religion and daily life of the great mass of the Indian people. In this traditional culture art still is as much a part of national life and education as it was in Europe from the dawn of civilization down to the eighteenth century".[26] Such thoughts rescued the indigenous art education by recognizing the ideas of individuality in traditional art that was also the ultimate scope of all art in the nineteenth-century Western world.

POST-COLONIAL PAKISTAN & RECOLONIZATION OF ART EDUCATION

In post-colonial Pakistan, Mayo School of Arts, Lahore carried forward the colonial legacy in true spirit, redeeming the Indian art as craft-oriented. No wonder, the school was under the Ministry of Industry up till 1963 and not of education. This arrangement infused a similar inferiority complex about the indigenous practices as previously incurred by the colonizers resulting in breeding a generation of artists who proudly focused on European naturalism in landscape and portrait painting or deconstruction of form with ideas of abstraction and expressionism as favored by early twentieth-century Parisian art circles. Most artists conformed with the Western aesthetics as introduced by the British and propagated it as the single available option for a 'modern' Pakistan.[27] This hegemony of European Academy Art propagated an environment that demeaned the indigenous traditional aesthetic legacies consequently tainting the modern art as controversial, borrowed or simply irrelevant to the masses.

The official medium of instruction in art schools remained English depriving a large number of the students out of the classroom discourse. The art history prescribed surveys, like the aesthetic trends were imported which have notoriously been biased towards non-Western art as it is categorized under the section of decorative arts if included in the first place. The creative sensibilities were passed onto the students through practice and counseling. Even today, students and artists remain vacuous about their practice and depend upon a few who are well-versed in English and theoretic expression.

PAKISTAN TOWARDS DECOLONIZATION

Unlike other parts of the colonized India, e.g. Bengal the absence of any Nationalist movement in twentieth-century Northwestern part of India that came to be Pakistan in 1947, no organized efforts of decolonization were made until at least the tragic incident of 9/11.[28] It will be appropriate to say that the dawn of the 21st century pushed Pakistani intelligentsia towards realizing the need to probe inwards and shape up an identity to look after what Pakistan meant in the changing geo-political scenario. It took another decade or so to popularize the concept worthy of debate.

Initiatives in Arts and Creative Industries

Decolonization as a formal scope of study in art and design education in Pakistan is still a novel idea. It mostly remains a concern of few who have exposure to the global academic circles. However, certain steps on an individual level can be considered as important milestones towards the process of decolonization. This includes the efforts to re-assure the importance of mother languages, collection of regional and folklore, setting up of citizen's archives, restoration of heritage sites and the need for research and writing our history. Art institutions, directly or indirectly, have played role in taking and supporting such initiatives. The art and cultural industry that lost its importance and relevance to societal well-being and advancement due to the colonial mismanagement and its aftermath was not only resilient to survive but has proven strong enough to lead from upfront. Indian legacy of visual and material culture was hard to manipulate.

A careful analysis of Pakistani art establishes that art had broken its ties with the colonial legacy around 1990's when its didactic, ethical, educational and political tendencies were acknowledged and were put into action. The newly invested power in form of the neo-miniature movement "steeped in the past and yet modernist in its application", [29] gave voice to diminishing local traditions earning a big name and place for indigenous artforms in the international art markets. Neo-miniature movement "shackles the conventions" from within[30]. It was not imposed or borrowed and was not merely to forge an identity in response to the Western quest of the East.[31]

Rethinking Art, Design and Decolonization

Though the process of owning the tradition in art and developing it into modern, relevant and useful for Pakistani society was initiated, the methods and ways of administering art and design education are still not theorized in a way that it can be adopted as a policy and be employed to rejuvenate the artistic mind. Art education like the overall system of education in Pakistan has been under the tyranny since independence.[32] To give a background it is sufficient to say that policy makers have been either under the influence of various political agendas or have been mostly from the field of science and technology who were not been able to set the direction of art education in a way that would augment art in the Pakistani scenario. Similarly, educationists who have been celebrated practitioners of art have not paid attention to developing pedagogies to best suit the needs of indigenous students. Developing curriculum, defining syllabus and setting up the degree requirements require conscious linking of past, present and future. Blindly following or shifting from European or American systems of education on personal or political whims cannot resolve the issues.

It is important to link up the efforts to understand the potential of art education and formalize a path. One widespread channel is decolonization. Decolonization like other concepts has developed from what it stood for as the aftermath of WWII. From "casting off alien rule and putting people as the ultimate authority within the state"[33] or to "realization of internal self-determination to consciously address relevant issues of cultural, religious and political nature"[34] on the state level it has gone to the common public with an idea of social-engagement and adopting the concept as a way of life. It is to be realized that 'decolonizing' is not a 'one window operation'. The adjustments have to be made at several levels. Decolonzing is an attitude that demands dismissal of hierarchies, decentring of knowledge and its systems of production. It aims to diminish the barriers between 'us' and 'them'. It disparages any ideology that promotes prejudice and devalues any tradition or culture may it was of colonizers or colonized. It discourages unnecessary digression from the natural flow of wisdom and learning i.e. time and technology had to blur the boundaries between indigenous and foreign. It demands diversity and requires diligent disposition of the very thought of debasing what is 'past' now and in doing so it allows us to dream about a 'better' future. All this is possible only if communities are taken on board and are made conscious of the prevailing situation.

While fixing what was lost during the colonization of mind and practices, the current flow of affairs is to be watched out too. Simply going back to the point of initiation cannot resolve the issue of art being considered irrelevant or extraneous. Thus, a more rational approach will require to look at the past, live in the present and point towards the future at the same time. Art like other social activities is an ever-changing pursuit. It changes its meaning and significance along with time and place. What was relevant in eighteenth-century India cannot cater to twenty-first century Pakistan. So going back is not the answer.

Contextualizing Art and Design Pedagogies and Practices

The need of the time is to adopt scientific research methodologies to look for the lost connections that kept the creative spirits alive for centuries in South Asia. A holistic approach is an answer to the gaps. Art education in Pakistan cannot be spelled out without contextualizing it in the larger scenario or without taking into consideration the global trends, the geo-politics, environmental crisis or trade policies. Globalization automatically encompasses the value of localization. Indigeneity is the key feature in devising any art and design policy or pedagogy. To activate and galvanize the ideals of originating, living, experiencing, adopting and adapting is what decolonization means in contemporary Pakistan. Decolonization is a two-way process that must engage the colonized as well as the colonizer. To practice, the 'act' of decolonization one must learn to engage contextually. It involves historical fact-finding, the ability to embrace the differences and address the complexes, an unbiased mind and a strong will to move forward.

As discussed, Western bias toward Indian art was due to the lack of understanding of Indian aesthetics. In the seventeenth century the history of aesthetics was being compiled in the West. At this point, not much written material was available on the subject of aesthetic theories in South Asia. However, laws and principles of art-making can be located in the historic and religious treatises since Vedic times. The metaphysical approach towards art in Islamic culture instituted aesthetics as a quest for Ultimate Reality and got associated with spiritual learning. Such consideration that art history and aesthetic theories in non-Western cultures were not separate fields of knowledge but were rather learnt and recorded under the larger umbrella of religion, ethics, morals or even court proceedings will ultimately decolonize the canon.[35]

Regarding the practice of rote learning, the physiology and the psychology of the indigenous must be given consideration. Be it the case of Vedas or Quran, both are learnt by heart, memorized and recited without having a deep understanding of Sanskrit or Arabic languages. So, it cannot be dismissed as a 'sinful' way of learning. Last but not the least is the idea of interdisciplinarity in education which is not novel to this part of the world.[36]

CONCLUSION

The fast-changing times alter the scope of art and design which require modification in the education system. The deviating democracies, delipidated economies, technological advancements, human conditions and ecologies intensify the need to integrate teaching, learning, research, scholarship and communal development as a connected activity. This implies complex interactions between various streams of knowledge – physical, metaphysical, spiritual, philosophical and applied. One system, one strategy and one approach is no longer a solution. There can be as many appropriate answers to a given question of decolonization of art and design education. If history, politics, religion and economy had been the important integers previously, understanding the creative practices of the past, memory, archives and connectivity is the present while diversity, equity, empathy, sustainability and collaboration would be the future of art and design in Pakistan. In practice, such a mindset will diminish the hierarchy of Fine arts over crafts or the rift between representational and conceptual art. It will also

break the hegemony of Western art over Eastern. Eastern aesthetic theories will become authentic even if their reference is provided through history, religion or sociology and not only from philosophy. Cross-cultural influences are a reality. These influences have been traced in historic objects and must be considered valid in the age of globalization. Colonization of India is a reality. It cannot be reversed but the after-effects when realized can be addressed and reprimanded. Religion, politics, economy and the natural world have always been the main features that affect the production of art and cultural industries. So does the lived experience and the forthcoming challenges and prospects. All these factors must be weaved together for an affective art and design education.

NOTES

[1]British built hospitals, prisons, police stations and schools, constructed roads, laid railway tracks and combat diseases and superstitions. All of this was to gain economic interests. See Dan Bogart and Latika Chaudhary, "Regulation, Ownership, and Costs: A Historical Perspective from Indian Railways," *American Economic Journal: Economic Policy* 4, no. 1 (2012): 28. DOI: 10.1257/pol.4.1.28

[2] William Harrison Woodword*, A Short History of the Expansion of the British Empire, 1500-1902.* (England: Cambridge University Press,1902), 229-248.

[3] "Viewpoint: Britain Must Pay Reparations to India," British Broadcasting Corporation News, 22 July, 2015. https://www.bbc.com/news/world-asia-india-33618621.

[4] Thakur Kundan Kumar, "British Colonial Exploitation of India and Globalization," *Proceedings of the Indian History Congress* 74 (2013): 405–15. http://www.jstor.org/stable/44158840.

[5] Antony Back, "The "Axial Period": What Was It and What Does It Signify?" *The Review of Politics 70*, no.1 (2008): 23–39. http://www.jstor.org/stable/20452955.

[6] Radha Kumud Mookerji, *Chandragupta Maurya and his times* 4th ed. (India: Motilal Banarsidass, 1988), 478-9. *ISBN 81-208-0433-3*

[7] Lowe Roy Yashuara, *The Origins of Higher Learning: Knowledge Networks and the Early Development of Universities* (UK: Taylor & Francis, 2016),62. ISBN 9781317543268.

[8] Jessica Frazier and Flood Gavin, *The Continuum Companion to Hindu Studies.* (US: Bloomsbury Publishing, 2011), 34. ISBN 978-0-8264-9966-0.

[9] The importance of learning in Islam can be seen from the prayer given in the following verse of the Quran: "My Lord! Increase me in Knowledge" (20:114).

[10] It is believed that for several centuries a series of brilliant philosophers and scientists made Baghdad the intellectual center of the medieval world. For details Robert Pasnau, "The Islamic Scholar Who Gave Us Modern Philosophy Averroës' Writings on Aristotle shaped Western philosophy as we know it". Humanities 32, no.6 (2011) https://www.neh.gov/humanities/2011/novemberdecember/feature/the-islamic-scholar-who-gave-us-modern-philosophy.

[11] Dimitri Gutas, *Greek Thought, Arabic Culture: The Greaco- Arabic Translation Movement in Baghdad and Early Abbasid Society 2nd-4th/8th-10th Centuries.* (Delhi: Routledge, 1998), 1-26.

[12] Arjumand Ara, "Madrasas and Making of Muslim Identity in India," *Economic and Political Weekly* 39, no. 1 (2004): 34-38.

[13]George Allen Odgers, "Education in British India," The Phi Delta Kappan 8, no. 2 (Oct., 1925): 1-6.

[14]Latika Chaudhry, "*Caste, Religion and Fragmented Societies: Education in British India," 2012 (working paper London School of Economics* available at SSRN: https://ssrn.com/abstract=2087140 or http://dx.doi.org/10.2139/ssrn.2087140.

[15] James Mill, *The History of British India* (US: Chelsea House, 1968),11 quotes William Tennant, *Indian Recreations* (India, 1817), 341.

[16] As a result of this mindset, the town planning of the Indus Valley civilization (5000-2500 BC) could not convince the colonizers of an urban setting with water storage and an underground sanitation system. They overlooked the extensive experimentation behind the refined Buddhist iconography (1st Century AD) which was supported through the religious inquiries. Illustrated Jain manuscripts (11th Century Pala painting) and stone carvings in Hindu temples appeared grotesque to them[16] and failed to qualify as Fine Arts. Mughal art which is considered to be an epitome of aesthetic beauty today was ridiculed based on refuting mathematical precision and was categorized as a mere craft so did the jewelry, metal arts or embroidery that are the essence of Muslim material culture of Medieval India.

[17] Following these trends, art education policies, particularly in Britain and unexceptionally in its colonies, were based on the ideas like 'Diffusion of useful knowledge' or 'Science as the foundation of high art' as propagated by Lord Brougham (1826) and Herbert Spencer (1861) respectively. M. C. Grobel, 'The Society for the Diffusion of Useful Knowledge, 1826–1846', MA diss., (London University, 1933). For detail also see Edwin George West, "Educational slowdown and public intervention in 19th-century England: A study in the economics of bureaucracy". *Explorations in Economic History* 12, no. 1 (1975): 61-87. Also see Christopher Harvie and Colin Matthew, *Nineteenth-Century Britain: A Very Short Introduction* (UK: Oxford University Press, 2000), 22-49. ISBN-13:9780192853981.

[18] Penned down only in 1500 BC for over three and a half millennia they were orally transmitted. See Joshua Mark, *The Vedas.* World History Encyclopedia. https://www.worldhistory.org/The_Vedas/.

[19] Stephen Evans, "Macaulay's minute revisited: Colonial language policy in nineteenth-century India". *Journal of Multilingual and Multicultural Development* 23, no.4 (2002): 260–81.

[20] John Kampfner, "Macaulay by Zareer Masani – review". *The Guardian.* 22 July 2013. Accessed 10 April, 2021.

[21] Roderick W. Home, "The Royal Society and the Empire: The Colonial and Commonwealth Fellowship. Part 1. 1731-1847." *Notes and Records of the Royal Society of London* 56, no. 3 (2002): 307–32. http://www.jstor.org/stable/3557735.

[22] Mark Sedgwick, *Against the Modern World: Traditionalism and the Secret Intellectual History of the Twentieth Century.* (London: Oxford University Press, 2004*), 52.* ISBN 978-0-19-515297-5.

[23] Ami Kantawala, "Art Education in Colonial India Implementation and Imposition," *Studies in Art Education: A Journal of Issues and Research in Art Education* 53, no.3 (2012): 208-222.

[24] The British set art institutions included; Calcutta Mechanics' Institution and School of Art, Government School of Industrial Arts Madras, J.J. School of Art, Bombay and Mayo School of Art, Lahore.

[25] Renate Dohmen, Art, industry and the laws of nature: the South Kensington method revisited. *Open Arts Journal.* (2020): 23. DOI:10.5456/issn.2050-3679/2020w03.

[26] Ernest Binfield Havell, "Art Administration In India". *Journal of the Royal Society of Arts 58, no.* 2985 (1910): 274–298. http://www.jstor.org/stable/41339009

[27] Allah Bux (1895-1978) had a Western style which he never left. A.R. Chughtai (1897-1975), an established artist since the pre-partition of India, "consciously acknowledged the Mughal, Persian and …Muslim tradition of painting" as the most appropriate style of art in new Pakistan. Zubeida Agha (1922-1997), Anna Molka (1917-1994) Shakir Ali (1916-1975), Khalid Iqbal (1929-2014) and many more with formal training in the European art system are considered to be the pioneers of the modern art and art education in Pakistan. While Zubeida Agha never did a formal teaching job but rather created an impact on Pakistani art through her exhibitions and gallery that she owned, the other three set the direction of art as they held important academic positions at the Punjab University and National College of Arts.

[28] Refers to terrorist attacks in US on September 11th, 2001.

[29] Raza Rumi and Salwat Ali, "The Miniature goes global," The Dawn, January 10, 2016.

[30] Virginia Whiles, *Art & Polemic in Pakistan*: *Cultural Politics and Tradition in Contemporary Miniature Painting.* (US: I.B.Taurus, 2010), 2.

[31] This is with reference to Shakir Ali or Sadqain painted in the so-called cubist style. In the 1980's Zahoor-ul Akhlaq 'employed stylistic features' of traditional miniature painting to develop a more 'modern sensibility' that could represent Pakistani art. It took another decade when in 90's Shahzia Sikandar, Imran Qureshi, Rashid Rana to name a few, took it to next level – experimenting not only with form and space but medium, scale, subject matter and technology. Also see Akbar Naqvi, *Image and Identity Fifty Years of Painting and Sculpture in Pakistan.* (Pakistan: Oxford University Press, 1997), 204 & 259.

[32] Discussing education policies, projections and procedures under the changing political regimes are relevant here but way out of the scope of this study. See discussion in Abdul Hameed Nayyer and Ahmed Salim. "The Subtle Subversion: The State of Curricula and Textbooks in Pakistan," Social Development Policy Institute, Islamabad, 2003**.** unesco.org.pk/education/teachereducation/reports/rp22.pdf

[33] Patrick Thornbery, "Self-determination, Minorities, Human rights: A Review of International Instruments," *International & Contemporary Law* Quaterly 38, no. 4 (1989): 867-89.

[34] Anthony Whelan. "Self-Determination and Decolonisation: Foundations for the Future." *Irish Studies in International Affairs* 3, no. 4 (1992): 25–51. http://www.jstor.org/stable/30001796. Accessed 8 Apr. 2022.

[35] An example at hand is the *Ain-e Akbari* – Laws of Mughal emperor Akbar's court, commonly considered a court chronicle. A keen eye would acknowledge among the details of routine court proceedings an intense debate and the theoretical underpinnings behind the art and culture of the era. As in the chapter where Abul-Fadl, the court historian, lists down the names, religion and cast of around one hundred artists working in the royal atelier (Vol. 2,17) he also records detailed instructions about the form and style of painting as dictated by the emperor himself explaining and advising the artists to pursue the metaphysical approach and seek for the ideals of transcendental reality.

[36] One can refer to Taxila or Nalanda Universities which are recorded to provide expertise in at least two hundred faculties. Similarly, the Medieval Persian trends give us the *ulama and mashaikh* – scholars who were poets, religious guides, scientists, physicists, surgeons and medical practitioners at the same time.

BIBLIOGRAPHY

Ara, Arjumand. "Madrasas and Making of Muslim Identity in India." *Economic and Political Weekly* 39, no. 1 (2004): 34-38.

Black, Antony. "The "Axial Period": What Was It and What Does It Signify?" *The Review of Politics 70, no.*1 (2008): 23–39. http://www.jstor.org/stable/20452955.

Coomaraswamy, Ananda. "The Significance of Oriental Art." *The Art Bulletin* 2, no.1 (1919): 17-22.

Crowe, Joseph Archer. *Reminiscences of Thirty Years of My Life.* London: J. Murray, 1859.

Bogart, Dan and Latika Chaudhary. "Regulation, Ownership, and Costs: A Historical Perspective from Indian Railways." *American Economic Journal: Economic Policy* 4, no. 1 (2012): 28-57. DOI: 10.1257/pol.4.1.28.

Dohmen, Renate. "Art, Industry and the Law of Nature> South Kengiston Methods." *Open Arts Journal* 9, no.1 (2020): 23-42. DOI:10.5456/issn.2050-3679/2020w03

Evans, Stephen. "Macaulay's minute revisited: Colonial language policy in nineteenth-century India". *Journal of Multilingual and Multicultural Development* 23, no. 4 (2002). doi:10.1080/01434630208666469. S2CID 144856725.

Frazier, Jessica and Flood Gavin. *The Continuum Companion to Hindu Studies.* US: Bloomsbury Publishing, 2011. ISBN 978-0-8264-9966-0.

Grobel, Monica Christina. "The Society for the Diffusion of Useful Knowledge, 1826–1846," MA diss., London University, 1933.

Ghoshal, Upendra Nath. *History of Political Ideas of India. The Ancient Period and the Period of Transition.* London: Oxford University Press, 1959.

Gutas, Dimitri. *Greek Thought, Arabic Culture: The Greaco- Arabic Translation Movement in Baghdad and Early Abbasid Society 2nd-4th/8th-10th Centuries.* Delhi: Routledge, 1998.

Harvie, Christopher and Colin Matthew. *Nineteenth-Century Britain: A Very Short Introduction.* UK: Oxford University Press, 2000.

Hashmi, Salima. *50 Years of Art in Pakistan.* Lahore: Sang-e-Meel, 1997.

---. *Unveileing the Visible: The Lives and Works of Women Artists of Pakistan.* Lahore: Sang-e-Meel, 2001.

Havell, Ernest Binfield. "Art Administration In India." *Journal of the Royal Society of Arts* 58, no. 2985 (1910): 274–98. http://www.jstor.org/stable/41339009.

Kantawala, Ami. "Art Education in Colonial India: Implementation and Imposition." *Studies in Art Education: A Journal of Issues and Research in Art Education* 53, no.3 (2012):208-22.

Kulke, Hermann and Rothermund Dietmar. *A History of India* 6th Edition. UK: Taylor & Francis, 2016.

Kundan Kumar, Thakur. "British Colonial Exploitation of India and Globalization." *Proceedings of the Indian History Congress* 74 (2013): 405–15. http://www.jstor.org/stable/44158840.

Le, Huu Phuoc. *Buddhist Architecture.* India: Grafikol, 2010. ISBN 9780984404308.

Mill, James. *The History of British India.* US: Chelsea House, 1968.

Mitter, Partha. *Art and Nationalism in Colonia India, 1850-1922: Occidental Orientations.* USA: University of Cambridge Press, 1994.

Mookerji, Radha Kumud. *Chandragupta Maurya and his times* 4th ed. India: Motilal Banarsidass, 1988.

Naqvi, Akbar. *Image and Identity Fifty Years of Painting and Sculpture in Pakistan.* Pakistan: Oxford University Press, 1997.

Odgers, George Allen. "Education in British India." The Phi Delta Kappan 8, no. 2 (Oct., 1925): 1-6.

Riaz, Sana. *New Islamic Schools: Tradition, Modernity, and Class in Urban Pakistan.* UK: Pargrave Macmillan, 2015.

Sabra, Abdelhamid Ibrahim. "The Appropriation and Subsequent Naturalization of Greek Science in Medieval Islam: A Preliminary Statement." *History of Science* 25, no. 3 (1987): 223- 243.

Sedgwick, Mark. *Against the Modern World: Traditionalism and the Secret Intellectual History of the Twentieth Century.* London: Oxford University Press, 2004. ISBN 978-0-19-515297-5.

Thornbery, Patrick. "Self-determination, minorities, human rights: a review of international instruments". International & Contemporary Law Quarterly 38, no. 4 (1989): 867-89.

Walzer, Richard Rudolf. *Greek into Arabic. Essays on Islamic Philosophy.* Cambridge: Harvard University Press,1962.

West, Edwin George. "Educational slowdown and public intervention in 19th-century England: A study in the economics of bureaucracy". *Explorations in Economic History* 12, no.1 (1975): 61-87.

Whelan, Anthony ."Self-Determination and Decolonisation: Foundations for the Future." *Irish Studies in International Affairs* 3, no.4 (1992): 25-51.

Whiles, Virginia. *Art & Polemic in Pakistan*: *Cultural Politics and Tradition in Contemporary Miniature Painting.* US: I.B.Taurus, 2010.

Woodword, William Harrison. *A short history of the expansion of the British Empire, 1500-1902*. England: Cambridge University Press, 1902.

Yashuara, Roy Lowe. *The Origins of Higher Learning: Knowledge Networks and the Early Development of Universities.* UK: Taylor & Francis, 2016.

THE TALKING PROJECTION: TEACHING THAT IS NOT FLAT

Author:
PETER MAX BRUGGER

Affiliation:
WINCHESTER SCHOOL OF ART COLLABORATION WITH DALIAN POLYTECHNIC UNIVERSITY, UNIVERSITY OF SOUTHAMPTON, UK

INTRODUCTION

Nearly two years ago online teaching became a necessity, the only point of student-teacher synchronous engagement. Teaching through Microsoft TEAMS, Zoom, Slack, or any other platform for the teacher meant appealing to student learners, though their own computer. Online teaching for the educator necessitated the hasty adaption of personal computing equipment to the formalised surroundings of a conferencing platform that initially was itself a hasty adaption to run a flipped synchronous class. To varying degrees this hasty adaption meant that the teacher and the class would all interact on a shared platform led and observed on multiple screens in a variety of uncontrolled and unmonitored locations. Online learning on personal computing equipment in a variety of locations may have been the case for the majority, but not all educational establishments and not all individuals were either lucky enough or indeed institutionally organised in such a way. With remote teaching a necessity, but in-class learning still expected, any synchronous class delivery necessitated further adaption. Thus, this paper will explore such an adaption, this will be divided into theoretical and practical and will aim to conclude on a practical outcome. First, we will draw upon current pedagogies, such as the Zone of Proximal Development (ZPD), Universal Design for Learning (UDL) and Substitution, Augmentation, Modification, Redefinition (SAMR). Second, we will consider how the blending of current pedagogies will result in the application of the novel Single Screen Framework (SSF).

The problems with online synchronous teaching and the need for SSF

Teaching online on any platform runs the risk that the educator prioritises reading as an instructional from a pre-prepared script over learner engagement and unintentionally discourages motivation. Indeed, a combination of text/note based reading by the educator with the purpose of instruction runs a risk, exacerbated on computer, of confusing and disincentivising students.[1] For the learner, teaching that appears didactic or prescriptive may originate from a well-meaning educator, but a certain ignorance concerning the altered interpretive dynamic produced over an online learning environment (OLE) increases the chance of negative unexpected outcomes.[2] In fact, because of such an altered interpretive dynamic, a novel framework directing a methodological approach stands to impact and possibly produce positive pedagogical prospects.

Limitations of technology and the reactions placed upon the individual by external factors, such as the pandemic and international travel restrictions are a combination that, for me, resulted in teaching

University students who were in a classroom but as the international teacher I was to appear as a projection on a projector screen (see fig.1). Lecturing on the University of Southampton Winchester School of Art collaboration with Dalian Polytechnic University (DPU) it would have been easy to read off pre-prepared power point slides and conduct lectures/lessons in a prescriptive way. It would have been easy to continue with the three key assumptions which have since been challenged: that the learners will be motivated; the class will be attended using a stable platform; and that there will be no interruption to the internet through a bad connection. However, to keep with these assumptions and to teach in such a prescriptive way, would likely not allow learners to meet the goals of their University course.

Ultimately, due to circumstances, such as the aforementioned limitation of technology, prompting the reliance on three assumed matters as well as matters surrounding the reliance on software. An issue was created by the available hardware: a projector and projector screen, hardware that could not be changed but had to be used. Use of the hardware and software frequently resulted in classes that had limited engagement in which the projection of a power point slide (see. fig 1) could not be seen with any great clarity. Indeed, it was this limitation of hardware, that could not be circumvented, and the reliance on software, effecting the distanced/class-based style delivery that the issue of 'flatness' the literal as well as figurative 'flat' lesson delivery was to demand augmentation of pedagogy. Thus, in order to motivate and encourage active learning this situation necessitated the development and application of a novel Single Screen Framework (SSF).

Figure 1. Projected to the class at DPU. Taken with kind permission in 2021

Theories behind SSF

In the development of Single Screen Framework (SSF) as a guide of functional principles designed to meet the needs of class-based learners and a remote educator, we would first have to consider the aspects of class practicality and long-term individual motivation. With class practicality and long-term motivation to be considered, we can divide this into three resourceful and practical criteria: Function of technology, Utility of design and Narrative of time spent in the class.

A question that, as an educator I never thought that I would ask was: Can the students see me or any materials on the projector screen? Between two to three feet is the natural sitting position of the learner who attends a class on a personal device, such as a laptop, however as we can see in figures 1 & 2 was not the case and in fact the students sat at over 2 meters from the projector screen. Thus, in order to minimize assumptions on student/learner accessibility a framework would be needed that considered function, utility and narrative in order to circumvent any potential limiting factor to accessibility and engagement.

On interrogating the need for student/learner engagement through accessible materials, research was undertaken in order to find a grounded framework from current pedagogy that would provide a source of motivation. Indeed, a desire behind SSF would be to encourage individuals, who are not used to undertaking self-directed research, being recent college graduates, to conduct research in their own time and to actually offer materials/information as shared in-class engagement.
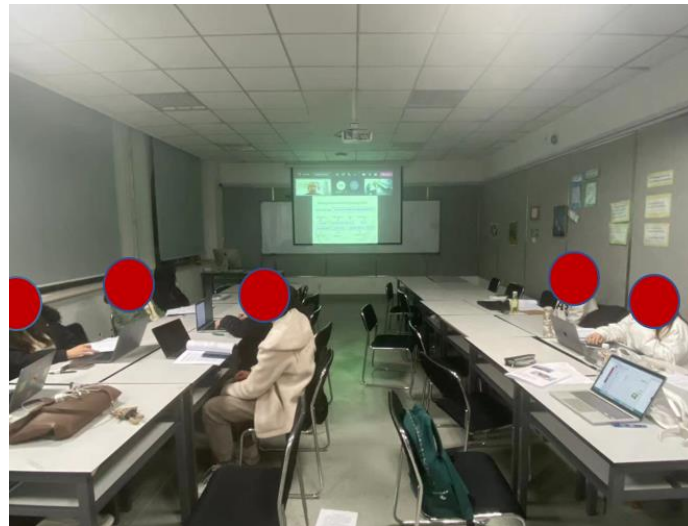
Figure 2. Taken from the back of the classroom. The University arrangement of the desks mean that the students are at a minimum of 2 meters from the projection

Figure 3. The set-up. It is important to remember that the students may not be able to see the projector screen

Aiming to encourage in-class engagement and independent learner motivation, but aware of technical limitations as well as current social practices, it was decided that any theory or framework adopted should aid and promote social cohesion but also reduce the reliance on a power point presentation in order to increase student engagement through activities that may on first glance be seen as non-didactic. Given the needs of the distanced and somewhat novel circumstances of the in-class set-up three theories were decided upon. The three theories chosen were to be adapted to into the Single Screen Framework (SSF), these were: the Zone of Proximal Development, Universal Design for Learning, and Substitution,

Augmentation, Modification, Redefinition. Each theory presented directly applicable pedagogies with which to approach the class, from the social, taking from sociology, to the technological and that based on the superficial motivating student engagement with prepared class materials such as power point slides and handouts.

The Zone of Proximal Development (ZPD) is a social cultural theory developed by Lev Vvgotsky in 1978.[3] As a socio/cultural theory, this suggests that learners learn based on interaction with the educator but importantly that they learn and are motivated by other students. This goes on to suggests that stronger learners, perhaps those more comfortable with the material learned, will assist the unsure.[4] Thus, through the scaffolding of materials within the class a dialogue focused on problem-solving and mutual assistance could be fostered. In practice ZPD was encouraged in every lesson, however to individuals who were not used to discussion or collaboration with others in offering or asking for assistance, this proved to be something that was only to be successful over the long-term.

Universal Design for Learning (UDL) is a framework developed in 2005 by the Centre for Applied Special Technology, in which it offers concrete guidelines in the production of materials designed to elicit interest.[5] The UDL guidelines are divided into 3 sections: engagement, representation, and action & expression, this framework is partly focused on the presentation and the relationship of design to increasing sustained learning and motivation.[6] Indeed, in practicality such an alteration of the presentational style of the superficial in the use of power point slides and in the design of handouts did almost immediately increase learner uptake of materials. Whereas handout retention and note-taking had previously been minimal, a slight superficial alteration which did result in a change in learner behavior between classes.

The model Substitution, Augmentation, Modification, Redefinition (SMAR) was proposed and developed by Puentedura in 2006.[7] This model focuses on the understanding and use of digital and other technologies to interpret and thereby reframe certain class-based tasks.[8] With the use of this model the learner receives via the use of technology a certain recontextualization and functional improvement that acts to scaffold a task or set of tasks.[9] Indeed, given the adoption of information communication technologies (ICT) that allowed for teacher-learner augmentation, even as a synchronous in-class activity, this had the ability to appeal to learners on an individual and more personal basis.

An adaption and synthesis of ZPD, UDL and SAMR, into the Single Screen Framework resulted in a pedagogical framework designed to ensure the teaching to groups of students who have limited access to ICT but where ICT was necessary for the effective running of the class.

Single Screen Framework

To return to function, utility and narrative we may think of the three guiding theories, whereby the function will be the focused use of technology to complement the utility of class design and the narrative flow of the class session. However, given the imbedded focus of SSF on limited ICT capabilities we must therefore think of selection and interoperability of class materials and ICT networks. Indeed, a mock-up of SSF may be seen as in the figure below (see fig. 4) in which no single networked system is depended solely upon and in-built backchannels allow for the potential of scaffolded learning of groups or targeted students. What is indeed necessary here is selection of various attractive communication technologies that exploit the networks and motivate individual learners to ignore the deficiencies presented by the teacher/educator being remote.
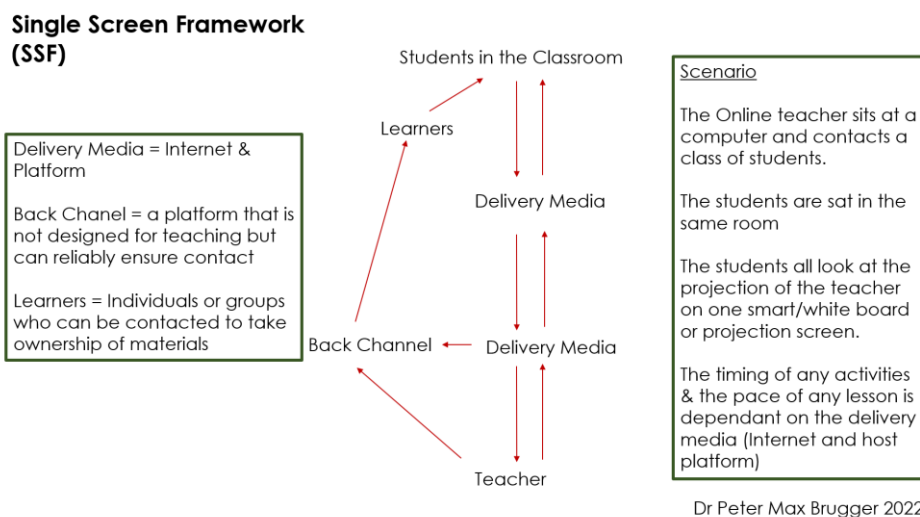
Single Screen Framework (SSF)

Students in the Classroom

Learners

Delivery Media

Delivery Media = Internet & Platform

Back Chanel = a platform that is not designed for teaching but can reliably ensure contact

Learners = Individuals or groups who can be contacted to take ownership of materials

Back Channel ← Delivery Media

Teacher

Scenario

The Online teacher sits at a computer and contacts a class of students.

The students are sat in the same room

The students all look at the projection of the teacher on one smart/white board or projection screen.

The timing of any activities & the pace of any lesson is dependant on the delivery media (Internet and host platform)

Dr Peter Max Brugger 2022

Figure 4. Single Screen Framework. The presentation of a scenario and a diagram indicating the relationship of communication networks

In improvement of communication with the individual learner and in the maintenance of their concentration it was imperative that accessibility and interactivity be ensured in order to increase receptivity. Indeed, for accessibility, with reference to UDL, three items of software were augmented to suit class requirements: A mouse highlighter resulting in a coloured halo around the mouse pointer, the near exclusive use of Century Gothic Text, and moving animations. For interactivity in-line with ZPD the social media platform 'WeChat' was adopted; and concerning SAMR the highly flexible teacher materials and activities website called 'Word Wall' was used. Selection therefore of targeted digital tools has an importance in bringing together separate technologies that were adopted for learner utility.

Accessibility in SSF

Accessibility in SSF focused on whether the learner could see and indeed read from the projector screen. To meet SSF three augmented practices were used:

A mouse highlighter granted a coloured translucent halo around the pointer and served to focus the occasionally wandering attention of certain students. The mouse highlighter was found and later installed via a tutorial on YouTube.[10] The effect on in-lesson interactivity was to indicate to the individual what was to be achieved but also by functioning as to highlight items this allowed the student, who may need to read the material again with an anchor to ground and reassure themselves.

The Century Gothic font type, whilst a personal favorite, happens also to be one of the most readable typefaces. Studies on readability such as research conducted in 2013[11] & 2017[12] both researched and compared the ease and speed of readability looking at typeface recognition, accuracy, font size and colour combinations: all of which highly relevant given the distanced and sometimes imperceptible nature of the final distanced projection (see fig 2). Research conducted in 2013[13] compared the word recognition rate of 10 typefaces including 'Times new Roman', 'Arial', 'Century Gothic', ultimately suggesting greater ease of readability of 'Arial' and 'Century Gothic' typefaces. This same research later went on to deliver a caveat, that irrespective of typeface chosen word recognition and text readability for all participants whether they were dyslexic or not was negatively impacted when it was italicized,[14] and thus all italicised materials were altered to be underlined or made bold. Ultimately, it was in using the 'Century Gothic' typeface that seemed to increase learner access and utilization of

materials provided, and after a changeover to use 'Century Gothic' rather than 'Calibri' there was noticeable retention of handouts.

Moving Animations, whilst used sparingly but with a targeted use on a power point slides served a purpose to the mouse highlighter in which they could and often did draw focus. The effect was not simply to draw focus however, but to show importance and prompt student in problem-solving. Thus, the strategic use of animations to would/may draw student attention to a probable answer and reinforce their own autonomy and potential for attainment. The use of animations in a power point for this purpose were not to be used all the time but were strategically used to prompt and by degrees encourage individual students in order to show them that they can find/research the answer.

Student/Learner accessibility was increased by the adoption of three augmented practices. The changes that these practices represented were not major alterations to previous lesson delivery, but as part of SSF did prompt accessibility encouraging engagement.

Interactivity in SSF

Interactivity in SSF was used to motivate and create a dialogue between the educator and learner. To meet SSF two external software applications were customised and used:

The social media platform of 'WeChat' was an invaluable backchannel in contacting individual learners during synchronous sessions.[15] In a variety of scenarios, such as when groupwork was set or individuals were called upon to present preprepared work, a network of collaboration through scaffolding was encouraged by direct contact with students who were known to be able to assist others in achieving class work. Contact with individual students in such a way as to prompt a mutually collaborative atmosphere was time-dependent, and indeed individuals became used to this targeted contact over time and towards the end of my time with them this assistive behavior had become automatic.

The teaching materials website 'Word Wall' is a free website that provides customisable templates that can easily be adapted for any class.[16] Indeed, sharing the class screen I was able to invite a student to come up to the class computer (see fig. 1) and to take control of the session on Microsoft Teams and to spin a wheel (see fig. 5). The majority of students, who had not experienced this before were rather reticent at first to come up to the classroom computer and to take control of the class session in order to spin the wheel. Taking-Control of the sessions, in 'Word Wall' resulted in two mouse pointers in which the student could interact but I as the educator would retain overall control and could override or interact if the individual was struggling. However, after the initial spin of the wheel (see fig. 5) students were very keen to do this and would often, as I found, be much more likely to put in the effort to answer the question. A progression of this was witnessed on certain occasions as the individual would go so far as to ask other members in the class. In increasing interactivity activities/games such as this were invaluable, and in a way similar to a 2020 study on the effects of Kahoot on teacher training and computer engineering students[17] introducing a certain degree of gamification for a class-based activity that had a clear aim focused the individual. However, the effect was not solely on the individual but and on other students in the classroom, as this was seen to focus them as on a few occasions other classmates would offer unprompted answers.

The adoption of 'WeChat' and 'WordWall' proved invaluable in encouraging students to interact and become active participants in class as well as in activities. Both software applications did create very quick and easy rooms for dialogue between the educator and the learner.
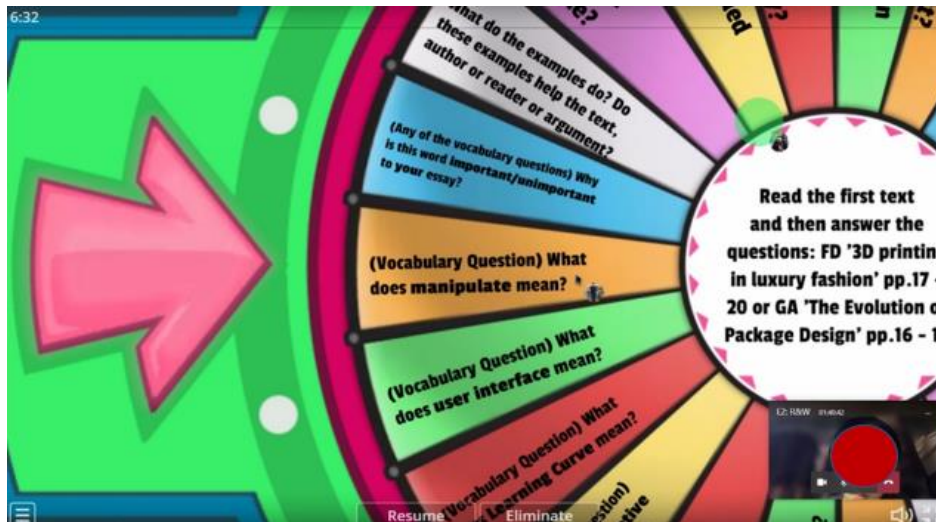
Figure 5. A student takes control of the class computer to spin the wheel and answer a vocabulary question with template provided by Word Wall

CONCLUSION

As discussed, the Single Screen Framework is an adaption of three pedagogical theories, the Zone of Proximal Development, Universal Design for Learning, and Substitution, Augmentation, Modification, Redefinition. With an eye on limiting the potential of prescriptive remote teaching, focus is placed upon a student-centred approach that in the consideration of function, utility and narrative aims to include the student in scaffolded learning. Motivation can be encouraged in the long-term by the addition of a backchannel in which scaffolding can take place and indeed actions, such as those outlined by ZPD reinforced, encouraged and expanded. The current framework is tailored to meet the needs of the learners studying on the University of Southampton Winchester School of Art collaboration with Dalian Polytechnic University (DPU). However, SSF is a flexible framework that aims to guide the approach to distanced lessons that when presented with students who have different requirements for accessibility and interactivity this has the potential to meet their needs.

NOTES

[1] Florence Martin and Doris Bollinger. "*Engagement Matters: Student Perceptions on the Importance of Engagement Strategies in the Online Learning Environment,*" *Online Learning Journal* 22, no. 1 (2018): 205-222

[2] Florence Martin and Doris Bollinger. "*Engagement Matters: Student Perceptions on the Importance of Engagement Strategies in the Online Learning Environment,*" *Online Learning Journal* 22, no. 1 (2018): 205-222

[3] Lev Semenovich Vygotsky and Cole Michael. *"Mind in society: Development of higher psychological processes."* (Harvard: Harvard University Press, 1978)

[4] Lev Semenovich Vygotsky and Cole Michael. *"Mind in society: Development of higher psychological processes."* (Harvard: Harvard University Press, 1978)

[5] "The UDL guidelines," CAST, accessed 13th April 2022,
https://udlguidelines.cast.org/?utm_source=castsite&lutm_medium=web&utm_campaign=none&utm_content=aboutudl

[6] "The UDL guidelines," CAST, accessed 13th April 2022,
 http://www.hippasus.com/rrpweblog/archives/2012/08/14/SAMR_SixExemplars.pdf

[7] Ruben R. Puentedura. "The SAMR model: Six exemplars." (2012): 1-52.

[8] Ruben R. Puentedura. "The SAMR model: Six exemplars." (2012): 1-52.

[9] Erica R. Hamilton and Joshua M. Rosenberg and Mete Akcaoglu. *"The substitution augmentation modification redefinition (SAMR) model: A critical review and suggestions for its use." TechTrends* 60, no. 5 (2016): 433-441.

[10] Kevin Stratvert. *"How to Highlight Mouse Pointer Windows 10 YouTube."* 6th August 2020. Tutorial, 18.03.
https://www.youtube.com/watch?v=kwSqtNvT7to&t=1s

[11] Luz Rello and Ricardo Baeza-Yates. *"Good fonts for dyslexia." Proceedings of the 15th international ACM SIGACCESS conference on computers and accessibility*, pp. 1-8. 2013.

[12] Luz Rello and Ricardo Baeza-Yates. *"How to present more readable text for people with dyslexia." Universal Access in the Information Society* 16, no. 1 (2017): 29-49.

[13] Luz Rello and Ricardo Baeza-Yates. *"Good fonts for dyslexia." Proceedings of the 15th international ACM SIGACCESS conference on computers and accessibility*, pp. 1-8. 2013.

[14] Luz Rello and Ricardo Baeza-Yates. *"How to present more readable text for people with dyslexia." Universal Access in the Information Society* 16, no. 1 (2017): 29-49.

[15] Joseph Arthur Davies et al. "Responding to COVID-19 in EAP contexts: A comparison of courses at four Sino-foreign universities." *International Journal of TESOL Studies* 2, no. 2 (2020): 32-51.

[16] "Word Wall: Create better lessons quicker." Word Wall

[17] María Luisa Pertegal-Felices and Antonio Jimeno-Morenilla and José Luis Sánchez-Romero and Higinio Mora-Mora. *"Comparison of the effects of the Kahoot tool on teacher training and computer engineering students for sustainable education." Sustainability* 12, no. 11 (2020): 4778.

BIBLIOGRAPHY

Bajracharya, Jiwak Raj. "Technology Integration Models and Frameworks in Teaching and Training." *Journal of Training and Development* 6, no. 01 (2021): 3-11.

Cast. "The UDL Guidelines." Accessed 13th April 2022
https://udlguidelines.cast.org/?utm_source=castsite&lutm_medium=web&utm_campaign=none&utm_content=aboutudl

Davies, Joseph Arthur, Laura Jane Davies, Brandon Conlon, Jamie Emerson, Hannah Hainsworth, and Hugh Gregory McDonough. "Responding to COVID-19 in EAP contexts: A comparison of courses at four Sino-foreign universities." *International Journal of TESOL Studies* 2, no. 2 (2020): 32-51.

Hamilton, Erica R., Joshua M. Rosenberg, and Mete Akcaoglu. "The substitution augmentation modification redefinition (SAMR) model: A critical review and suggestions for its use." *TechTrends* 60, no. 5 (2016): 433-441.

Longobardi, Claudio, Michele Settanni, Shanyan Lin, and Matteo Angelo Fabris. "Student–teacher relationship quality and prosocial behaviour: The mediating role of academic achievement and a positive attitude towards school." *British Journal of Educational Psychology* 91, no. 2 (2021): 547-562.

Lubega, J. T., and Muyinda Paul. "Adoption of the SAMR model to asses ICT pedagogical adoption: A case of Makerere University." (2014).

Martin, Florence, and Doris U. Bolliger. "Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment." *Online Learning* 22, no. 1 (2018): 205-222.

Onyango, George, and Rhoda Gitonga. "Exploring how technology complements constructivism using a lesson plan." In *2017 IST-Africa Week Conference (IST-Africa)*, pp. 1-11. IEEE, 2017.

Pertegal-Felices, María Luisa, Antonio Jimeno-Morenilla, José Luis Sánchez-Romero, and Higinio Mora-Mora. "Comparison of the effects of the Kahoot tool on teacher training and computer engineering students for sustainable education." *Sustainability* 12, no. 11 (2020): 4778.

Puentedura, Rueben R. "The SAMR model: Six exemplars." *Retrieved August* 14 (2012): 2012. http://www.hippasus.com/rrpweblog/archives/2012/08/14/SAMR_SixExemplars.pdf.

Rello, Luz, and Ricardo Baeza-Yates. "Good fonts for dyslexia." In *Proceedings of the 15th international ACM SIGACCESS conference on computers and accessibility*, pp. 1-8. 2013.

Rello, Luz, Martin Pielot, and Mari-Carmen Marcos. "Make it big! The effect of font size and line spacing on online readability." In *Proceedings of the 2016 CHI conference on Human Factors in Computing Systems*, pp. 3637-3648. 2016.

Rello, Luz, and Ricardo Baeza-Yates. "How to present more readable text for people with dyslexia." *Universal Access in the Information Society* 16, no. 1 (2017): 29-49.

Stratvert, Kevin. "How to Highlight Mouse Pointer Windows 10." YouTube. 6th August 2020. Tutorial, 18.03. https://www.youtube.com/watch?v=kwSqtNvT7to&t=1s

Vygotsky, Lev Semenovich, and Michael Cole. *Mind in society: Development of higher psychological processes.* Harvard university press, 1978.
   https://www.google.co.uk/books/edition/Mind_in_Society/RxjjUefze_oC?hl=en&gbpv=1

Walker, R. A. "Sociocultural issues in motivation." *Social and emotional aspects of learning* (2010): 712-717.

Word Wall. "Word Wall: Create better lessons quicker." Accessed 13th April 2022. https://wordwall.net/

CULTIVATING CRITICAL THINKERS: AN INQUIRY INTO CRITICAL AND CONTEXTUAL DISCUSSION IN DESIGN EDUCATION

Author:
ELEANOR HERRING

Affiliation:
THE GLASGOW SCHOOL OF ART, UK

INTRODUCTION

This paper focuses on a challenge within the School of Design at The Glasgow School of Art, namely how to support critical and contextual discussion in a workshop setting. It is my experience that some students do not feel able or want to contribute to the critical dimension of these sessions; others object to the tone or contribution from other students; and there is a difficulty for everyone in knowing how to address sensitive or challenging subjects. Within design education, it is accepted that while the acquisition of procedural knowledge is important, more important still is that students become active critical thinkers and communicators. But what makes a critical space in an art school and how is it cultivated? What is my role as the educator leading critical and contextual discussions, and how can I work with and support students to develop their critical skills? Furthermore, what pedagogical strategies are useful to support critical engagement?

This paper draws on pedagogical research conducted for the PG Cert in Higher Education Learning, Teaching in the Creative Disciplines.[1] The project examined how to cultivate critical discussion and the ingredients necessary to support it in the context of my third year undergraduate course The Politics of Space. A subgroup of five student volunteers participated in three discrete sessions via Zoom that addressed the weekly topics of the course.[2] These sessions tested out different models for choreographing a critical discussion about public space that allowed for honesty and nuance, while maintaining a safe, respectful environment for all participants. This paper will discuss whether collaborative learning and scaffolding of critical thinking skills is helpful when crafting teaching sessions, and the dynamics within a critical discussion.

Literature Review and Methodology

Before embarking on this project, it was first necessary to situate critical thinking in a pedagogical context. Literature on the concept of 'scaffolding' and social constructivism was key to its realisation, particularly in terms of how students understand what is meant by critical engagement. The metaphor of scaffolding was popularised as a way of explaining Soviet psychologist and social constructivist Lev Vygotsky's perspective on development, learning, and education. Keith S. Taber argued that the idea that teachers should "scaffold" student learning is extremely widespread. In practice, scaffolding is understood as structuring learning or supporting learners and removing the scaffold as the learner develops, much as a scaffold is removed from a building during construction.[3] According to Radhika

Kapur social constructivism is a concept that borrows from Vygtosky, and which centre around the co-construction of knowledge. For Kapur, teachers understand that students are not "unfilled vessels waiting to be loaded with knowledge".[4] Instead, there is an interdependency between learners and educators.

The literature on collaborative learning was useful in thinking about strategies to encourage deeper engagement with and between my students and myself. For Marjan Laal and Seyed Mohammad Ghodsi the "underlying premise of collaborative learning is based upon consensus building through cooperation by group members".[5] Laal and Ghodsi emphasise the importance of the social support system needed to work cooperatively, and the need to be taught how to "challenge ideas and advocate for their positions without personalizing their statements".[6] In such a context, students are encouraged to become more responsible for their learning. According to Igor Pyrko, Viktor Dörfler and Colin Eden, communities of practice conceptualises collaborative learning as a process of "thinking together". However, for Etienne and Beverly Wenger-Trayner, communities of practice aren't necessarily harmonious places: "if they are totally conflict free, you should be concerned that groupthink may be settling in or voices being silenced".[7]

Literature on critical thinking in an art school was also invaluable in terms of situating the project in a wider context. In their book *Art and Design Pedagogy* Susan Orr and Alison Shreeve coined the term "sticky" as a means of conveying 'the challenges, conflicts, dilemmas, ambiguity in the creative curriculum'.[8] This understanding points to the tensions and conflicts (and potential) embodied within critical thinking. For educators bell hooks and Stella Cottrell "critical thinking is an interactive process, one that demands participation on the part of the teacher and students alike".[9] And in different ways, both hooks and Cottrell acknowledge that "becoming more self-aware takes courage … [it is] challenging to question our beliefs".[10]

This idea of courage became increasingly important after reading Paulo Friere's work on critical pedagogy. In a conversation between Antonio Faundez and Paulo Freire, they emphasise the importance of asking questions, and reflecting on what it means to ask questions.[11] Asking questions should not be an intellectual game - at the level of asking questions for their own sake, according to Freire. Henry Giroux's analysis of Friere's work is useful, because it links critical pedagogy (and asking questions) to action and possible change, thus giving education a fundamental purpose. Giroux laments the absence of critical thinking in education and claims that "one of the fundamental tasks of educators is to make sure that the future points the way to a more socially just world".[12] With the field of design history, it is increasingly accepted that design education is part of a broader democratic project. In a pedagogical special issue of the *Journal of Design History*, Massimo Vignelli claimed that education must develop critical decision-making skills that improve rather than reiterate practice.[13] Maya Oppenheimer also positions design education as preparing students to "become contributors to society, to become active communicative citizens".[14]

Finally, a vital theoretical perspective was provided by David Swartz, whose work reflects on the role of an educator in leading a discussion and the power that merely asking a question represents.[15] Swartz goes to the heart of the critical discussion and the role of the educator in asking questions, probing further, sitting on the fence, changing sides, floating ideas and introducing doubt. Swartz addresses (and exposes) some of the tensions within Friere's approach, such as how to frame open-ended questions to students without leading them to the answer? What are the presumptions that underpin the questions educators ask? How to monitor a discussion without censorship? And what is the power dynamic in such a context? In this respect, Swartz's work presents a critical framework for the project.

Research Approach

This was an Action Research project, which began with a question familiar to action researchers: how do I improve what I'm doing?[16] As noted by John Elliott, action research is a form of teacher development, which is linked to the "teacher as researcher" movement.[17] A necessary precondition of action research, is "a felt need on the part of the practitioner to initiate change, to innovate".[18] According to Linda Dickens and Karen Watkins, action research remains an umbrella term for activities which are intended to foster change, and can conceived as a "cycling back and forth" between research, planning, theorising, learning and development.[19] Importantly, action research is not just about the creation of knowledge, rather it is about guiding new behaviour and solving a problem.[20] According to Clem Adelman, Lewin declared "no action without research; no research without action".[21] Using the writings and models by the authors already cited, I approached this research project by following the action research cycle.

Critical thinking and a code of conduct

The first scheduled session functioned as an introduction to the project, with all five students in attendance. I wanted to be as transparent as I could to echo Biggs and Tang's point that good teachers are "upfront" about their objectives.[22] I structured the session around a series of discussion points, i.e. what does criticality mean to each person in the group; what is our prior knowledge/experience of critical thinking; what are our motivation and objectives in initiating/participating in the project; and finally what could constitute the rules of our critical discussions? I shared my findings about critical pedagogy and Freire's view that "none of us possesses the truth. It is to be found in the 'becoming' of dialogue" to emphasise that there was no right or wrong answer.[23] As well as listening to the participants opinions on these points, I also contributed my own opinions, with a view to being as honest as possible – much as bel hooks describes: "I do not expect students to take any risks I would not share".[24] At the end of the session, everyone contributed to a Code of Conduct, as illustrated in Figure 1.

'Code of Conduct' for sub-group within Politics of Space (a Practitioner Enquiry Research Project).
Co-written by Eleanor Herring and Participants A, B, C, D, E.
21st October 2021.

The following rules have been developed by the participants of the sub-group as a way of setting broad parameters for any subsequent critical discussion:

- *Honesty*: we should aim to be honest.
- *Curiosity:* we should aim to be curious and ask questions.
- *Awareness of difference:* there is no right or wrong answer; we each have our own area of expertise.
- *Validity:* everyone's opinions are valid.
- *Respect:* everyone's opinions should be respected.
- *Patience:* we should aim to be patient with one another, particularly for those whose first language isn't English.
- *Safeguarding:* this should be a safe space, free from intimidation. Where a discussion becomes triggering, we are free to exit at any point, without repercussion.
- *Judgment:* we should try not to judge one another.
- *Monopolising the discussion*: we should be wary of unintentionally monopolising the discussion, and moderate ourselves and each other accordingly.
- *Listening*: we should practice good listening skills, and equally we should feel heard.

Figure 1. Code of Conduct.

The student's perspectives about critical discussion in an art school were fascinating.[25] Participant C noted that they often found themselves conversing in a bubble, and that peer discussion could sometimes be too comforting. Participant E agreed and said they had difficulty building a critical circle without "a feedback loop". The studio for this student was so "cushioned that criticism would feel entirely out of place". One said that their studio offers an environment of "like-minded people" and a judgment-free zone, which was positive, while another claimed that in their studio, "there is a little bit of lack of critical conversation…it's polite and nice… [which perhaps is] a cultural thing". Participant A also added that to be critical and engage with others requires energy, which is sometimes lacking in both staff and students – a point which links to Taber's argument that genuine dialogue in which we "make real efforts to understand and consider the positions of others is of course possible but it can be difficult intellectual work".[26]

A structured approach to critical thinking

In the second session, I tested out a structured approach to critical thinking, followed by a debrief. I prepared a series of questions for the sub-group related to the topic of the Politics of Space course that week, titled "Contesting Space, planning and participation". In this session, the class discussed examples where the design of a space has been contested, and where debates have led to action and change. At this session, unfortunately only three students could attend.[27] I began the session by leading the discussion, asking questions to the group present, and inviting each participant to contribute. Besides asking critical questions, interpreting the answers and mediating between students, I also added in some thoughts and experiences of my own. Elliot claims that pedagogy is a reflective process, and certainly while I was holding these workshops, I was also reflecting on the process of teaching and adapting my methods and comments accordingly. In this respect I tried to remain in my pedagogic role while also reflecting. The structured element of this workshop was expressed through my questions, in which I adopted a "drip feed" approach to critical thinking.[28] I hoped that my questions would act as a form of scaffold, and that by modelling critical thinking to the students they would be able to succeed in the task unaided during the unstructured workshop.

Some participants contributed a lot, while others waited to be invited. Mostly the participants' microphones were off unless they were speaking. I felt some pressure from students to constantly talk and ask questions. Due to having to conduct the workshop via Zoom, the conversation felt somewhat stilted. Watching the recording afterwards, I became conscious that my reaction was always affirmative. I asked critical questions but they were couched in a friendly way. I mirrored their viewpoint and relayed it back to them to ensure I understood correctly.

The student's account of the session in the debrief afterwards were revealing.[29] As Bridget Somekh reveals about action research, the truth is "that students are experts on pedagogy".[30] Participant E said the session was "very, very nice. Almost too nice. I don't feel like any of us here are very confrontational, maybe by nature. And that has to do also with the structure because, you know [when you] introduce a new question, we all express our opinion and just bounce off each other. You know, it's reflective, but it didn't feel critical". Participant C said "we're kind of like, bringing up our personal examples", and suggested "if we were maybe set an example of a space where there are definitely pros and cons" [that would be preferable]. Participant D agreed and suggested that next time I might "pick something a bit more neutral". The participants observations were helpful and exposing, and when planning the final session I tried to accommodate their feedback, particularly around the sharing of personal experience. Borrowing from Jack Whitehead's action–reflection cycle, I modified my problems, ideas and actions in the light of my evaluations.

An unstructured approach to critical thinking

The objective of the final session was to test out an unstructured approach to critical thinking relevant to that week's class, which had been delivered by a colleague and addressed the politics of digital space.[31] Unfortunately, only three students attended.[32] I began the session by presenting a 'neutral' visual example as a springboard for discussion – see Figure 2. The image is a representation of the Internet which featured in the lecturer's Powerpoint presentation and was therefore familiar to the students. I told the students that they would have thirty minutes to discuss the image and any positives and/or negatives associated with digital space, but that the conversation would be led by them.[33] I felt very privileged to listen to the conversation and watch how they interacted with each other, asked each other questions, volunteered their own opinions, and introduced other perspectives. The critical quality of the conversation was very high.
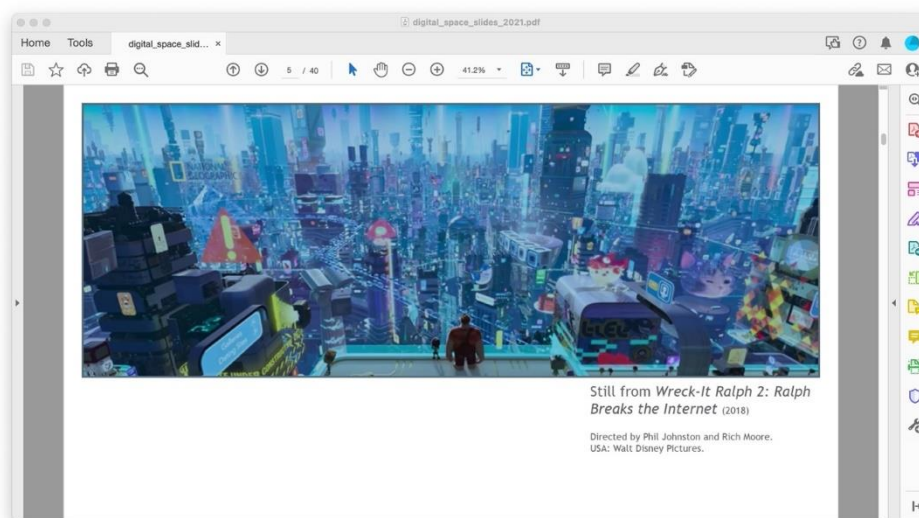

Figure 2. 'Image Still from Wreck-It Ralph 2: Ralph Breaks the Internet (2018). Directed by Phil Johnston and Rich Moore. Copyright Walt Disney Pictures

In the debrief afterwards, Participant D said, "that kind of looser structure is definitely almost more productive than the last one we tried". Participant B said that "hearing other people's opinions …definitely helped me see, like, the topic that we're talking about in a more three-dimensional way" and hearing other people's opinions sparked thoughts and inspiration. Participant E said that "the main thing I gained is thinking about what happens in open discussions, like, there's a critical discussion, is that a natural thing that happens? Or, how much input has to be given first?" The reaction to starting with a neutral image was positive. Participant D said, it was "easy to quickly get an opinion as opposed to a piece of text". Participant E compared it to a stimulus in an exam, and said that in a non-academic context "a conversation rarely loops" back around to the starting point. However, in this session, "you sort of force yourself to go back to the stimulus". All agreed that it was quite easy to quickly ignore me. Participant B said, "once I got into the conversation, there was a lot more natural to just talk and forget about your presence". Participant E acknowledged the advantages the small group had in terms of pre-existing familiarity with each other and the topic, and attributed the success of the discussion to "a relatively big shared knowledge pool". Participant B noted that the size of the group was helpful in that "there are multiple opinions, but not too many and you want to participate rather than step back / listen to the conversation".

CONCLUSION

Like Jack Whitehead, I started this project by asking "how do I improve what I am doing?" And as the project developed, I began to ask further questions such as, what would improvement look like and what is within my power to change? My findings point to the effort involved in being critical; the significance of the dynamic between the students and each other, as well as with the educator; the delicate balance between expressing polite doubt and appearing confrontational; and the risk of creating a feedback loop with like-minded people. The findings also illustrate the inadvertent impact of inviting personal or anecdotal information from students; the benefits of adopting a more neutral approach (such as visual analysis); and the distinction between being reflective instead of critical.

The limitations of this project concern the number of participants. While the student participants represented a mix of genders, nationalities and studio disciplines, there were only five volunteers. Furthermore, only three participated at each of the structured/unstructured workshops. By chance all three participants who attended the unstructured workshop were from Interaction Design, a department with more knowledge than most about digital design, meaning that not only did the students know each other and were comfortable expressing their critical opinions, but they were also familiar with the topic in a way that students from other departments may not have been. This limits the extent to which I can draw wider conclusions from the research. The project was further limited by the medium through which we communicated with each other. Zoom limited the intimacy of the workshops, and the way in which we engaged with each other. Technical problems meant that at least one student could not attend a workshop.

The value of the project is significant for me as an educator. I learned that co-constructing a code of conduct is an excellent safeguarding activity, and one that also encourages collaborative learning, and helps students reflect critically on the rights and responsibilities underpinning participation in a critical discussion. Similarly, I learned a great deal from scheduling a debrief at the close of each session, which in turn helped me craft the next session. The student response to the different ways a workshop can be scaffolded, confirmed the advantages of an unstructured approach to learning, particularly in small intimate groups where the participants know each other and the subject is one they feel comfortable discussing. Engaging in a critical discussion without intimacy, trust and familiarity is more challenging. Out-with the parameters of this research project, teaching large student numbers is increasingly the norm. In an ideal scenario, class numbers would be greatly reduced, however, whether it is possible to overcome the limitations of the sector is doubtful. Nonetheless, this project has been a valuable exercise in deconstructing the building blocks of learning and teaching.

NOTES

[1] Specifically, the research was conducted as part of a Practitioner Enquiry Research Project.

[2] In line with GSA guidance, the 3 sessions were delivered via Zoom, a change in delivery from pre-pandemic face-to-face teaching.

[3] K.S. Taber, 'Scaffolding Learning: Principles for Effective Teaching and the Design of Classroom Resources' in M. Abend (Ed.), *Effective Teaching and Learning: Perspectives, strategies and implementation*. New York: Nova Science Publishers, 2018, 3.

[4] Radhika Kapur. *The Significance of Social Constructivism in Education*, 2019, page 5.

[5] Marjan Laal, Seyed Mohammad Ghodsi. 'Benefits of Collaborative Learning'. *Procedia - Social and Behavioural Sciences* 31 (2012) 486.

[6] Marjan Laal et al., 486.

[7] Wenger-Trayner, Etienne and Beverly. 'Communities of practice a brief introduction'. *Communities of practice*, Version April 15, 2015, page 7.

[8] Susan Orr and Alison Shreeve. *Art and Design Pedagogy in Higher Education: Knowledge, Values and Ambiguity in the Creative Curriculum*. Routledge 2017, 6.

[9] bel hooks. *Teaching Critical Thinking*. London: Routledge, 2010, 8-9.

[10] bel hooks, 6.

[11] Ana Maria Aranjo Freire, Donaldo Macedo (eds). *The Paulo Freire Reader*. NY: Continuum Publishing Company 1994, 221-3.

[12] Henry Giroux. 'Rethinking Education as the Practice of Freedom: Paulo Freire and the promise of critical pedagogy', *Policy Futures in Education*, Volume 8 Number 6 2010, 718.

[13] Vignelli in Maya Oppenheimer

Oppenheimer, Maya. 'Histories of Design Pedagogy Virtual Special Issue'. *Journal of Design History*, 2016 Vol. 33 No. 1, page e-14

[14] Vignelli, e-16.

[15] David Swartz. 'A Critique of Doubt: Questioning the Questioning Method as a Means of Obtaining Knowledge'. *The Journal of Aesthetic Education*, Vol. 51, No. 2 (Summer 2017), 40-52.

[16] Such a question features heavily in the writings of Jack Whitehead, Jean McNiff, Lin Norton and John Elliott.

[17] John Elliott. *Action research for educational change*. Buckinghamshire: Open University Press, 1991, 3.

[18] John Elliott, 53.

[19] Linda Dickens, Karen Watkins. 'Action Research: Rethinking Lewin', *Management Learning*, Vol. 30(2): 127.

[20] Linda Dickens,130.

[21] Lewin in Clem Adelman. 'Kurt Lewin and the Origins of Action Research', *Educational Action Research*, 1:1, 1993, 8.

[22] John Biggs and Catherine Tang. *Teaching for Quality Learning at University*. 4th edition. Berkshire, UK: Society for Research into Higher Education and Open University Press, 2011, 99.

[23] Ana Maria Aranjo Freire, Donaldo Macedo (eds). *The Paulo Freire Reader*. NY: Continuum Publishing Company 1994, 219.

[24] bel hooks.*Teaching to Transgress*. London: Routledge, 1994, 21.

[25] Interview with student participants, October 21, 2021.

[26] Keith S. Taber, 'Scaffolding Learning: Principles for Effective Teaching and the Design of Classroom Resources' in M. Abend (Ed.), *Effective Teaching and Learning: Perspectives, strategies and implementation*. New York: Nova Science Publishers, 2018.

[27] Participant A had to cancel at short notice, and Participant B had technical difficulties and could not join remotely.

[28] Keith S. Taber, 11.

[29] Interview with student participants, October 28, 2021.

[30] Bridget Somekh. 'Theory and Passion in Action Research'. *Educational Action Research*, 11:2, 2003, 250.

[31] Interview with student participants, November 4, 2021.

[32] Participant A had withdrawn from the project shortly before the start of session three due to studio commitments, and Participant C was ill.

[33] I turned my audio off but left my camera on, and made notes while I listened to the discussion.

BIBLIOGRAPHY

Adelman, Clem. "Kurt Lewin and the Origins of Action Research". Educational Action Research, 1:1, (1993), 7-24.

Advance HE, Flipped Learning Starter Tools, accessed May 30, 2022. https://www.advance-he.ac.uk/knowledge-hub/flipped-learning-0

Bassey, Michael. *Case Study Research in Educational Settings*. Milton Keynes: Open University Press, 1999.

Biggs, John, and Catherine Tang. *Teaching for Quality Learning at University*. 4th edition. Berkshire, UK: Society for Research into Higher Education and Open University Press, 2011.

Bovill, C. & CJ Bulley. 'A model of active student participation in curriculum design: exploring desirability and possibility' in Rust, C. (Ed.) Improving student Learning: Global theories and local practices: institutional, disciplinary and cultural variation. Oxford: Oxford Bookes University Press, 2011.

Braun, Virginia and Victoria Clarke. Using thematic analysis in psychology. Qualitative Research in Psychology, 3 (2). 2006, 77-101.

Cottrell, Stella. *Critical Thinking Skills: Palgrave Study Skills*. Hampshire: Palgrave MacMillan 2005.

Davies, Allan. Writing Learning Outcomes and Assessment Criteria in Art and Design, accessed May 30, 2022 http://arts.brighton.ac.uk/__data/assets/pdf_file/0003/67278/Writing-Learning-Outcomes-and-Assessment-Criteria-in-Art-and-Design.pdf

Dove, Martin. 'Don't underrate the value of arts degrees', Letters, *The Guardian*, 8.5.21.

Dickens, Linda and Karen Watkins. 'Action Research: Rethinking Lewin', *Management Learning*, Vol. 30(2): 127–140.

Elliott, John. *Action research for educational change*. Buckinghamshire: Open University Press, 1991.

Elliott, John. 'Educational action research as the quest for virtue in teaching', *Educational Action Research*, 23:1, 2015, 4-21.

Fallan, Kjetil. *Design History: Understanding Theory and Method*. London: Berg 2010.

Freire, Ana Maria Aranjo and Donaldo Macedo (eds). *The Paulo Freire Reader*. NY: Continuum Publishing Company 1994.

Giroux, Henry. 'Rethinking Education as the Practice of Freedom: Paulo Freire and the promise of critical pedagogy', *Policy Futures in Education*, Volume 8 Number 6 2010.

GSA Research Ethics Code of Practice, 2016, accessed May 30, 2022. https://www.gsa.ac.uk/media/1877631/gsaresearchethicscodeofpractice2016.pdf

GSA Undergraduate Ethics Policy, accessed May 30, 2022. https://www.gsa.ac.uk/media/1526424/gsa-ug-ethics-policy-jan-2018.pdf

Harvey, Jen (Ed). Evaluation Cookbook, Learning Technology Dissemination Initiative. Heriot Watt University, accessed May 27, 2022: http://www.icbl.hw.ac.uk/ltdi/cookbook/cookbook.pdf

Hay, Iain. 'The Letter: Advice and reflections for a university teacher beginning an academic career'. *Journal of Geography in Higher Education*, 2013, Vol. 37, No. 4, 578-594.

Harries, Susie. *Nikolaus Pevsner: The Life*. London: Chatto & Windus, 2011.

Hickman, Richard. *Critical studies in art and design*. Bristol: intellect books, 2005.

hooks, bel. *Teaching to Transgress*. Abingdon: Routledge, 1994.

hooks, bel. *Teaching Critical Thinking*. Abingdon: Routledge, 2010.

Huppatz, D J. 'Introduction to Methodology'. *Journal of Design History*, Volume 33, Issue 1, February 2020, e25–e40.

Kapur, Radhika. *The Significance of Social Constructivism in Education* (Abstract) 2019/05/31, accessed October 8, 2021 https://www.researchgate.net/publication/323825342_The_Significance_of_Social_Constructivism_in_Education

Kneale et al (2016) Evaluating teaching development in higher education, accessed May 30, 2022. https://www.advance-he.ac.uk/knowledge-hub/evaluating-teaching-development-higher-education

Marshall, Stephanie, Fry, Heather, Ketteridge, Steve, A Handbook for Teaching and Learning in Higher Education: Enhancing academic practice (Routledge 1999)

Laal, Marjan; Ghodsi, Seyed Mohammad. 'Benefits of Collaborative Learning'. *Procedia - Social and Behavioural Sciences* 31 (2012) 486 – 490

McLoughlin, Marie. 'The textile student needs little Giotto, (or a little will go a long way)' (Pevsner. Nov 1968). The 1970 Coldstream Report in response to the art school unrest of 1968 4 Jan 2019, In: Journal of Design History. 32, 2, p.181.

McNiff, Jean. Action Research, accessed May 30, 2022. https://www.jeanmcniff.com/ar-booklet.asp

Nasser-AbuAlhija, Fadia. 'Contemporary Evaluation of teaching: challenges and promises'. *Studies in Educational Evaluation*, Vol. 54, 2017. pp: 1-3

Norton, Lin. *Action Research in Teaching and Learning, A Practical Guide to Conducting Pedagogical Research in Universities*. Routledge, 2018.

Open University, 'Vygotskian principles on the ZPD and scaffolding', accessed October 8, 2021 https://www.open.edu/openlearncreate/pluginfile.php/5904/mod_resource/content/1/Vygotskian_principles_on _the_ZPD_and_scaffolding.pdf

Oppenheimer, Maya. 'Histories of Design Pedagogy Virtual Special Issue'. *Journal of Design History*, 2016 Vol. 33 No. 1.

Orr, Susan and Alison Shreeve. *Art and Design Pedagogy in Higher Education: Knowledge, Values and Ambiguity in the Creative Curriculum*. Abingdon: Routledge 2017.

Pyrko, Igor; and Viktor Dörfler, and Colin Eden. 'Thinking together: What makes Communities of Practice work?'. *Human Relations*, 2017, Vol. 70(4) 389 –409.

QAA Subject Benchmark Statement 'History of Art, Architecture and Design' (2019), accessed October 8, 2021. https://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/subject-benchmark-statement-history-of-art-architecture-and-design.pdf

Ramsden, Paul. *Learning to Teach in Higher Education*. Abingdon: Routledge, 2003.

Rintoul, Jenny. Integrating critical and contextual studies in art and design (Routledge, Oxon 2017)

Somekh, Bridget. 'Theory and Passion in Action Research'. *Educational Action Research*, 11:2, 2003, 247-264.

Swartz, David. 'A Critique of Doubt: Questioning the Questioning Method as a Means of Obtaining Knowledge'. *The Journal of Aesthetic Education*, Vol. 51, No. 2 (Summer 2017), 40-52.

Taber, Keith S. 'Scaffolding Learning: Principles for Effective Teaching and the Design of Classroom Resources' in M. Abend (Ed.), *Effective Teaching and Learning: Perspectives, strategies and implementation*. New York: Nova Science Publishers, 2018.

Tovey, Mike (Ed) *Design Pedagogy*. Farnham: Gower, 2015.

Waters-Adams, Stephen; Nias, Jennifer. Using action research as a methodological tool: understanding teachers' understanding of science'. *Educational Action Research*, 11:2, 2003, 283-300.

Wenger-Trayner, Etienne and Beverly. 'Communities of practice a brief introduction'. *Communities of practice*, Version April 15, 2015. Available online: https://wenger-trayner.com/wp-content/uploads/2012/01/06-Brief-introduction-to-communities-of-practice.pdf [accessed 8.10.21]

Whitehead, Jack. *Practice and Theory in Action Research: Living-Theories as Frameworks for Action*, Chapter · October, accessed May 30, 2022. https://www.researchgate.net/publication/312002433_Practice_and_Theory_in_Action_Research_Living-Theories_as_Frameworks_for_Action

Whitehead, Jack. 'Accepting Educational Responsibility: Building Living Theory Cultures of Educational Inquiry in a UK/global context [contribution to a symposium presentation on 'Accepting Educational Responsibility: Building Living Theory Cultures of Educational Inquiry in Global Contexts' at the April 2021 Conference of the American Educational Research Association], accessed October 8, 2021.

http://www.actionresearch.net/writings/aera21/jack.pdf

LESSONS LEARNED: REMOVING BARRIERS TO LEARNING AND STUDENT ENGAGEMENT

Author:
HEATHER WORNE

Affiliation:
UNIVERSITY OF KENTUCKY, USA

INTRODUCTION

The COVID-19 pandemic has illuminated how students and communities have experienced (further) marginalization with a pivot to primarily remote or hybrid learning. However, virtual learning platforms and technologies also provide new opportunities for students to engage and contribute within inclusive and equitable spaces. This work has often focused on reviewing course materials and learning outcomes; however, I argue instructors need to move beyond simply decolonizing syllabi primarily in terms of content. Many of our course policies create unnecessary barriers to success, particularly among the most vulnerable students (e.g., 1st generation, BIPOC, LGBTQ+, economically disadvantaged, non-traditional, neurodivergent, and students with visible and invisible disabilities). Many of these barriers became more prominent during the pandemic, but they always existed. In this paper, I will reflect on my own experiences teaching undergraduate courses over the last two years and offer suggestions for how we can improve the learning experience for all of our students.

Spring 2020 and Beyond: The COVID-19 Pivot to Online Learning

When the COVID-19 pandemic began in March 2020, we had one week, our Spring Break, to pivot to online course delivery. I am a biological anthropologist who teaches primarily hands-on experience-based classes, most with a lab component. In my upper-level bioarchaeology course, students are taught how to analyze skeletal elements in a series of hands-on labs. Students enrolled in this course are usually anthropology majors with at least introductory background in the field of biological anthropology. My other course was a large-lecture, introductory course with a laboratory component that fulfills the college requirement: Intellectual Inquiry in the Natural, Physical and Mathematical Sciences. For some, this course is often the only exposure they have to biology or the scientific method. Students have varying backgrounds in science, and include all levels (first years through graduating seniors), most are not anthropology majors. In this introductory course, it is difficult enough to make sure that I am able to engage all students, by making sure that those with very little background are grasping basic concepts without losing the attention of those who enrolled in the class because they were already interested in the subject matter. At my university, a large proportion of our students are first generation and nontraditional scholars. When teaching in-person, we are able to gauge how students were doing, but with the switch to online it became painfully clear that many were already struggling with basic organization and study habits.

In both courses I managed to devise several online labs utilizing online 3-D models of skeletal remains and hominin fossils. I organized weekly discussion boards to approximate course discussions and created online quizzes and exams. It turned out that developing the online assignments were the least of my worries. The bigger issues that I faced involved making sure that students knew what was expected of them in any given week. We had used the learning management system Canvas, but I soon realized that students were not familiar with where things were located, and surprise, several had never consulted the syllabus. They were not aware of the general course structure and had been relying solely on my announcements in class about upcoming assignments. When we moved online, the activities or assignments that were usually introduced in class, now had to be accessed by the students on their own. I had always organized my course materials in Canvas by weekly modules, but students were finding themselves overwhelmed by having to plan their week in my course (as well as all of their other courses). In order to keep students, and myself, on track, I developed weekly guides. The weekly guides provide a list of the learning goals for the week, what they needed to read, what lectures they need to attend via Zoom or watch online, what they needed to do (quizzes or discussions), and a list of all the deadlines for the week. While all of these changes were necessary for online course delivery, when we returned to in-person learning, I realized that many of the modifications I made were helping students who, prior to COVID-19, would have likely fallen behind and either dropped or failed the course.

As we began returning to more hybrid and in-person learning in the semesters since Spring 2020, I have relaxed many of my course policies to accommodate absences. I began recording all of my in-person lectures and providing them online for students to review on their own if they had to miss class. But I realized several students who had attended the lectures were using the videos to review the content while studying. I had assumed in the past that requiring in-person attendance was necessary to keep students on-track, but that was not the case. Even after my courses were completely in-person, I wanted students to feel like they could stay home if necessary due to illness, but there are varying reasons that they have for missing class and requiring documentation for every absence penalizes those who already face so many barriers to learning. Documentation for an illness requires going to a doctor, which costs money and time that many of my students do not have to spare. Those who may had been 'just getting by' prior to COVID were suffering serious mental health emergencies. Even with insurance, accessing mental health care is extremely expensive and cumbersome.

Students with invisible disabilities are often not able to get the required documentation necessary to receive the accommodations they need to succeed. Many of these students may not even be aware of these disabilities or have the resources to get a formal diagnosis. For example, it is estimated that between two and eight percent of college students have symptoms associated with ADHD, but many are undiagnosed and/or untreated, this number is significantly higher among BIPOC students[1] and women.[2] I was one of those students. I wasn't diagnosed with ADHD until graduate school. I managed to get by in undergrad, but I am not so sure I would have made it to graduation if I had been a student during COVID-19. During the height of the pandemic, instructors managed to provide many of these accommodations to everyone. We provided recorded lectures, flexible deadlines, lenient attendance policies, provided more detailed instructions for the novel online assignments, devised alternative assignments when technology failed us, etc.

In the future, I argue that many of these accommodations should not only be developed on a case-by-case basis, but they should be baked into our overall course structure and course policies. We all probably learned how many of our students were one paycheck away from being un-homed or not being able to afford daily food. Numerous students had serious mental health emergencies, that were exacerbated by the pandemic, but likely existed before to some degree, under the radar. Today, more than sixty percent of U.S. students in higher education presented the diagnostic criteria for at least one mental health issue.[3] Since 2013, cases of depression have increased by 135 percent and anxiety has

increased by 110 percent. If providing the ability to miss class without having to provide documentation allows a student to go to a job interview, or take care of a sick child, or give themselves a mental health day, then having overall lower attendance is worth it. Most students who needed help over the past two years did not have documented disabilities. Registering disabilities with a university comes with added barriers that are often greater for 1st generation, BIPOC, LGBTQ+, economically disadvantaged, and nontraditional students.

I do not plan to get rid of deadlines forever or never require attendance again, but if course policies were developed with the assumption that many of our students have an invisible disability or will at some point need these accommodations, everyone will benefit. I wanted to discuss a few of the changes that I have made, or plan to make, as I update old courses and develop new ones. I drew on methods and approaches that are not new, but I share some of my own experiences as I have worked to learn from the last couple of years of undergraduate teaching.

RETHINKING OUR COURSES

Utilizing the central principles in the Universal Design for Learning (UDL) provides a useful roadmap for designing or redesigning courses to accommodate all learners.[4] By anticipating the varied needs and abilities, instructors can provide new opportunities for students to learn and contribute within inclusive and equitable spaces. The guiding principles of UDL are to: 1) make learning relevant and accessible for all students, 2) provide multiple means of presenting course content, and 3) provide options for how students can express themselves and/or demonstrate mastery. The goal is to assume your students will have diverse needs and abilities, and remove any barriers to student success.

Multiple modes of content delivery

When I returned to in-person learning, I set up automatic recording of my lectures in the classrooms using a video capture system provided by my university. I was also able to quickly edit the videos (and the captions when necessary) or insert outside links or annotations in the video prior to posting them to the weekly Canvas modules. This not only helped students with documented disabilities, but also students with invisible disabilities, students for whom English isn't their first language, students who had to miss class, those who wanted to review the material at their own pace at home, etc. I also started providing short video clips, infographics, or diagrams that I found online that explained the content I covered in lecture to accommodate students who may have had trouble grasping the material quickly. When possible, I posted links to short podcast episodes or news stories that discussed real-life examples of the topics covered in class. The extra content was usually optional, but I found that several students had clearly taken advantage of the modes of delivery that spoke to them.

Multiple means of expression

In Fall 2020 I knew many of my students were stressed and scared, and I just wanted to make it easier to get through the semester. So, in one of my upper-level courses, I decided to offer an unessay[5] as an alternative to the final paper. Rather than write a formal research paper, students could choose an alternative product to demonstrate what they had learned from their research. Students who chose the unessay also needed to provide a detailed outline or annotated bibliography to demonstrate how their research informed their final products. I also had them turn in an abstract for my approval and I checked in periodically to make sure they were on track well before the deadline. I was absolutely blown away by the students' creativity and enthusiasm. Some examples include a buzzfeed-style online quiz to determine what kind of hominin you are, a podcast episode, decorated cupcakes illustrating the different stages of decomposition, a children's book about a little Neandertal girl, a comic book about the origin story of a superhero with extreme high elevation adaptations, some sample pages of a graphic novel

about migration and health, etc. They invested considerably more time and effort in researching their topics than I usually see with traditional essay assignments. They really embraced being able to choose how they demonstrated what they had learned. I have assigned the unessay alternative three times now and it continues to be my (and their) favorite assignment. While I was initially uneasy giving students so much flexibility because I didn't want to set them up to fail, I realized that they were more than capable.

While an unessay would not be feasible in a large introductory course, this past semester I introduced an infographic assignment in place of a formal lab report to allow students to be more creative in how they presented their findings. Students were far more engaged in this project than previous lab assignments, and it was clear that they put more effort and thought into their final products.

In every course I have ever taught, I have included a participation grade of some sort. There are always students who struggle with speaking in front of the class, and while they may be very engaged in the course content and understand the concepts introduced in class, their grade may be affected by a lack of perceived participation. A colleague recently shared an idea she found online[6] for expanding how participation can be understood in the classroom that I plan to incorporate into my classes in the future. Rather than participation points, students earn 'colleague' or 'collegiality' points. This provides alternative ways of assessing participation beyond just how often a student speaks out loud in class. Collegiality points may be earned by contributing to the collegial class environment, depending on the student's skills. This could include taking notes for the class one day, helping set-up/breakdown a lab activity, annotating a class reading, proofreading for a classmate, helping a fellow student find library resources, posting to a class forum with thoughts about the day's content, or sharing recent relevant news stories. The point is that there are many roles our students can play in the classroom and, for many students, the skills that are recognized or rewarded are not always reflective of all of the varied contributions that students make in any given course.

Assignment transparency

It is important to make the learning process more transparent using strategies to make explicit what steps are needed to succeed. During the switch to online teaching, it became clear that my assignment instructions were woefully deficient. To more experienced learners my instructions were fine, but for many students they just didn't know where to begin and what exactly I was expecting of them. And since I wasn't there to walk them through it in class, they only had my written instructions to guide them. Utilizing transparent teaching methods, students are provided with: 1) the purpose of the assignment or why it matters, 2) a list of the steps or components of the assignment, and 3) examples of what a successful assignment looks like, as well as providing useful and timely feedback so students can learn and improve between assignments.[7] A 2016 study found that implementing more transparency in courses improved academic success for all students in the course, particularly among 1st generation, lower income, and underrepresented students.[8] Several of these changes are easy to implement, and could make a significant difference for so many of our students.

CONCLUSION

Completely changing my courses in March of 2020 was one of the worst periods of teaching for me, and I have no intention of making such drastic changes again. However, many of the modifications I am suggesting, we have already figured out to varying degrees. Instructors devised new strategies for providing structure during an extremely tumultuous time and found ways to build in flexibility and accommodations that did not seem feasible prior to Spring 2020. Now that it is clear what is possible and are maybe aware of how precarious some of our students are, we can't go back to 'normal.' If anything, for many students, that 'normal' never really existed. I argue that instructors should

incorporate what was learned over that past two years as we develop/redevelop our courses. As the Center for Teaching and Learning at my institution suggests, I can try to make at least one change in each class per semester.

NOTES

[1] Camille Alvarado and Vania Modesto-Lowe, "Improving Treatment in Minority Children with Attention Deficit/Hyperactivity Disorder," *Clinical Pediatrics* 56, no. 2 (2017): 171-176, doi: 10.1177/0009922816645517, and Yu Shi et al. "Racial Disparities in Diagnosis of Attention-Deficit/Hyperactivity Disorder in a US National Birth Cohort," *JAMA Network Open* 4, no. 3 (2021): e210321, doi: 0.1001/jamanetworkopen.2021.0321.

[2] J. Gershon, "A Meta-Analytic Review of Gender Differences in ADHD," *Journal of Attention Disorders* 5, no. 3 (2002): 143-54, doi: 10.1177/108705470200500302.

[3] Sarah Ketchen Lipson et al. "Trends in College Student Mental Health and Help-Seeking by Race/ethnicity: Findings from the National Healthy Minds Study, 2013–2021," *Journal of Affective Disorders* 306 (2022): 138–147.

[4] Anne Meyer et al. *Universal Design for Learning: Theory and Practice* (Massachusetts: CAST Professional Publishing, 2014), and David H. Rose and Anne Meyer, *Teaching Every Student in the Digital Age: Universal Design for Learning* (Virginia: Association for Supervision and Curriculum Development, 2002).

[5] Rhiannon P. Jakopak et al. "Writing Science: Improving Understanding and Communication Skills with the 'Unessay,'" *Bulletin of the Ecological Society of America* 100, no. 4 (2019): e01610, doi: 10.1002/bes2.1610.

[6] Max Liboiron (@MaxLiboiron), "We aren't allowed to grade for 'participation' in class here (which is good IMO), but I do have 'colleague points' that changes the culture of the classroom," Twitter post, December 21, 2021, 10:03 a.m., https://twitter.com/MaxLiboiron/status/1470771504145215499?s=20&t=FFUPL76KRchAZk2I4wjdcQ

[7] Tiffany O. Howard et al. "Transparency Teaching in the Virtual Classroom: Assessing the Opportunities and Challenges of Integrating Transparency Teaching Methods with Online Learning," *Journal of Political Science Education* 16, no. 2 (2020): 198-211, DOI: 10.1080/15512169.2018.1550420, and Mary-Ann Winkelmes et al. "A Teaching Intervention That Increases Underserved College Students' Success," *Peer Review* 18, no. 1 (2016): 31-36.

[8] Mary-Ann Winkelmes et al. "A Teaching Intervention That Increases Underserved College Students' Success," *Peer Review* 18, no. 1 (2016): 31-36.

BIBLIOGRAPHY

Alvarado, Camille, and Vania Modesto-Lowe. "Improving Treatment in Minority Children with Attention Deficit/Hyperactivity Disorder." *Clinical Pediatrics* 56, no. 2 (2017): 171-176. doi: 10.1177/0009922816645517.

Gershon, J. "A Meta-Analytic Review of Gender Differences in ADHD." *Journal of Attention Disorders* 5, no. 3 (2002): 143-54. doi: 10.1177/108705470200500302.

Howard, Tiffany O., Mary-Ann Winkelmes, and Marya Shegog. "Transparency Teaching in the Virtual Classroom: Assessing the Opportunities and Challenges of Integrating Transparency Teaching Methods with Online Learning." *Journal of Political Science Education* 16, no. 2 (2020): 198-211. DOI: 10.1080/15512169.2018.1550420

Jakopak, Rhiannon P., Kevin L. Monteith, and Bethann Garramon Merkle. "Writing Science: Improving Understanding and Communication Skills with the 'Unessay'". *Bulletin of the Ecological Society of America* 100, no. 4 (2019): e01610. doi: 10.1002/bes2.1610

Liboiron, Max (@MaxLiboiron). "We aren't allowed to grade for 'participation' in class here (which is good IMO), but I do have 'colleague points' that changes the culture of the classroom," Twitter, December 21, 2021, 10:03 a.m. https://twitter.com/MaxLiboiron/status/1470771504145215499?s=20&t=FFUPL76KRchAZk2I4wjdcQ

Lipson, Sarah Ketchen, Sasha Zhou, Sara Abelson, Justin Heinze, Matthew Jirsa, Jasmine Morigney, Akilah Patterson, Meghna Singh, and Daniel Eisenberg. "Trends in College Student Mental Health and Help-Seeking by Race/ethnicity: Findings from the National Healthy Minds Study, 2013–2021." *Journal of Affective Disorders* 306 (2022): 138–147.

Meyer, Anne, David H. Rose, and David Gordon. *Universal Design for Learning: Theory and Practice*. Wakefield, MA: CAST Professional Publishing, 2014.

Rose, David H., and Anne Meyer. *Teaching Every Student in the Digital Age: Universal Design for Learning.* Alexandria, VA: Association for Supervision and Curriculum Development, 2002.

Shi, Yu, Lindsay R. Hunter Guevara, Hayley J. Dykhoff, Lindsey R. Sangaralingham, Sean Phelan,

Michael J. Zaccariello, and David O.Warner. "Racial Disparities in Diagnosis of Attention-Deficit/Hyperactivity Disorder in a US National Birth Cohort." *JAMA Network Open* 4, no. 3 (2021): e210321. doi: 0.1001/jamanetworkopen.2021.0321.

Winkelmes, Mary-Ann, Matthew Bernacki, Jeffrey Butler, Michelle Zochowski, Jennifer Golanics, and Kathryn Harriss Weavil. "A Teaching Intervention That Increases Underserved College Students' Success." *Peer Review* 18, no. 1 (2016): 31-36.

PROVIDING AUTHENTIC WORKPLACE TEAM LEARNING IN ARCHITECTURE DESIGN STUDIOS

Author:
LINUS TAN

Affiliation:
DESIGN FACTORY MELBOURNE, SWINBURNE UNIVERSITY OF TECHNOLOGY, AUSTRALIA

INTRODUCTION

Many design studios globally teach architectural design using the master-apprentice model. A studio leader assigns an open-ended project brief to students and guides them through a design process to resolve the brief and propose a design outcome. Unsurprisingly, many studio leaders implement groupwork to prepare students for the current collaborative nature of architectural projects found in professional practice. However, putting students in groups only offers them an opportunity to work together; it does not teach them how to collaborate as a team of designers. So how can student teams in architecture design studios facilitate positive teamwork while stimulating a professional environment that provides authentic workplace team learning processes?

This paper first reports briefly on team learning concepts found in architecture pedagogy, team learning concepts found in workplace learning, and critical tenets of student-centered learning. The purpose is not to provide a thorough review of team learning concepts, for researchers have already done so, but to synthesize team learning constructs from the two disciplines into an executable teamwork framework for students.[1] I then propose a student-centered learning framework for students to understand, apply, and evaluate their team learning processes in design pedagogy. The paper concludes with recommendations for students and design studio leaders on facilitating effective team processes in the design studio environment.

TEAM LEARNING CONSTRUCTS

This section reviews briefly team learning literature in architecture pedagogy and workplace team learning literature in organizational learning.

Team learning in architecture pedagogy literature

In 2012, Tucker and his colleagues conducted two-year-long research on team learning in architecture and related design learning contexts.[2] Through an extensive review of educational and design literature, they identified "what constitutes effective teamwork, what contributes to effectiveness in teams, what leads to positive design outcomes for teams, and what leads to effective learning in teams."[3] From the review, they developed an Input-Process-Output (IPO) framework to measure team effectiveness in student design teams (refer to Figure 1).
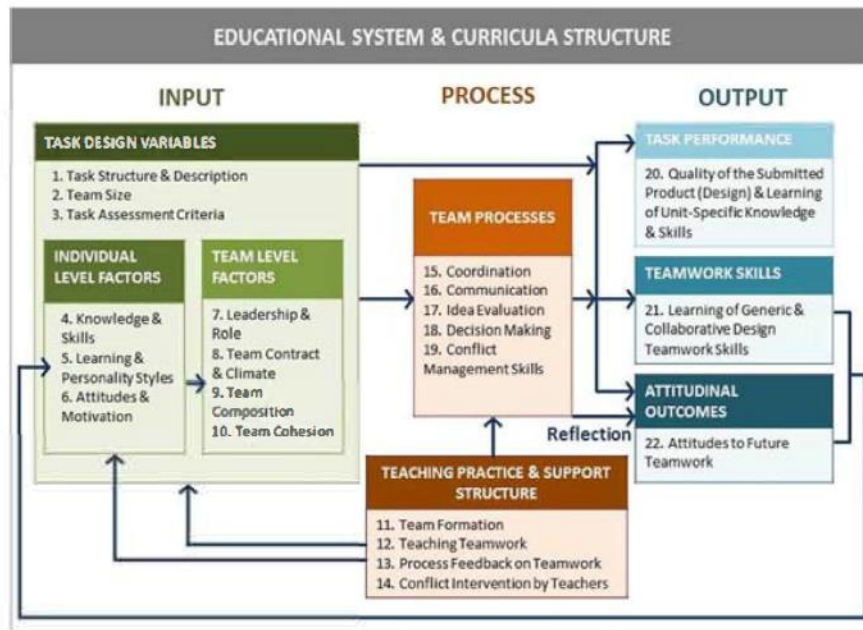
Figure 1. IPO framework of effectiveness in student design teams

Since this paper aims to develop a student-centered learning model for team learning in architecture pedagogy, constructs that impact the effectiveness of student teamwork but lie outside the students' control, such as *Task Structure & Description* and *Team formation* (as shown in Figure 1), are omitted from discussion. These omissions do not imply that those constructs are of lesser value but simply that the constructs are beyond the boundaries of where students perform teamwork. Outputs such as *Attitudes to Future Teamwork* were also omitted from discussions because they were used to assess teamwork effectiveness whereas this paper focuses on revealing the conditions and processes that students must address before and during design studios to enhance team learning. The remaining constructs that impact how the students learn from their team members are described below.

There are three individual-level constructs:

1. knowledge and skills,
2. learning and personality styles,[4] and
3. attitudes and motivation.[5]

A student's *knowledge and skills* may differ from their teammates, which impacts the level of team learning that can occur between students. A student's *learning style* influences their level of engagement with the rest of the team, whereas their *personality style* influences how they choose to communicate with their team. A student's *attitude and motivation*, commonly informed by previous teamwork experience, impacts their amount of drive to work in a group. Four team-level constructs implicate how students collaborate:

1. leadership and role,[6]
2. team climate,[7]
3. team composition,[8] and
4. team cohesion.[9]

Leadership and roles enable teams to set more explicit individual task goals, which may help students to collaborate more efficiently. A *team climate* that provides a psychologically safe environment for team members to share their opinions safely fosters greater team learning. A *team composition* of diverse individuals gives students more opportunities to learn from one another's differences. *Team*

cohesion, which is the bond that 'glues' team members together throughout their project, increases the number of encounters team members can learn from each other.

Aside from the seven constructs, there are an additional five constructs at the process level that influence student teamwork:

1. coordination,[10]
2. communication,[11]
3. idea evaluation,[12]
4. decision making,[13] and
5. conflict management.[14]

When team members *coordinate* their effort, they continuously learn from each other's progress to ensure the project is developing on time. When they *communicate* verbally and visually, students learn from one another's project progress and how communication can be carried out in different ways. When team members *evaluate their ideas* together, they learn different ways of generating and evaluating design ideas from one another. Similarly, when team members *make decisions* together, they know each other's perspectives and different ways to assess their design project. Finally, *managing conflict* enables teams to maintain team cohesion and team climate, which ultimately increases opportunities to continue learning from one another.

Team learning in workplace learning literature

Generally, team learning is the effort each member makes to create a team mental model and eventually build their team knowledge. Unlike the current research focus on design collaboration, which looks broadly at how designers transmit information, team learning examines how team members transmit, understand, refine, and retransmit information between one another.[15] There are three ways to comprehend team learning: [16]

1. A process about how team members learn from, evaluate, and change according to the feedback given by other team members,[17]
2. An outcome, which is the team's knowledge produced when team members share their knowledge and experience,[18] and
3. The relationship between the process and outcome.

In this paper, I use Edmondson's perspective to examine team learning as a process to compare with the processes identified in teamwork in architecture pedagogy. Team learning processes, also recognized as team learning behaviours (TLBs) in the organizational learning literature, consist predominantly of the following three behaviours: [19]

1. sharing,
2. co-construction, and
3. constructive conflict.

Sharing is when team members communicate their ideas to one another. *Co-construction* is when team members contribute their thoughts to supplement each other's ideas. *Constructive conflict* is when team members with different opinions use their differences to find a common vision. Aside from these three primary TLBs, there are also auxiliary behaviours that have been shown to facilitate TLBs:

1. task and process reflexivity,[20]
2. error communication,[21]
3. task learning,[22]
4. boundary-crossing,[23] and
5. team experimenting.[24]

Task and process reflexivity is when team members reflect together on past processes specifically to improve their future processes. *Error communication* is when team members share their mistakes so

that other team members can learn and avoid the error. *Task learning* is when team members share tips to help other members complete their tasks more efficiently. *Boundary crossing* is when team members enquire from individuals outside the team to gain new knowledge and disseminate it to the rest of the group (i.e. sharing). *Team experimenting* is when team members trial new team processes to improve how they work together.

While organizational learning researchers have examined and reported these TLBs in many disciplines,[25] these behaviours have only been recently reviewed and measured in the architecture discipline.[26]

Student-centered learning framework

Today there is an increasingly diverse and heterogeneous student body. This change in demographics is challenging the traditional ways students are taught. To address this diversification, the nuances of student needs can be acknowledged and handled by moving the attention from the teacher to the student.[27] While evolving a traditional teaching approach to a student-centered learning (SCL) model needs significant effort,[28] evidence shows that SCL models reap greater learning rewards.[29] Research also shows that SCL models are already used in architecture and design pedagogy, though they are more commonly reported as technology-based learning pedagogy.[30] To create a student-centered team learning framework, I referenced Lea et al. seven tenets of SCL (see Table 1).[31]

#	SCL Tenet	Description
1	Active learning	Activities that involve learners to engage and interact with the learning materials beyond cognitive understanding.
2	Deep learning and understanding	Activities that enable students to internalize and connect learning concepts with their learning experience
3	Increased responsibility and accountability	Providing students with greater ownership of their learning experience, where they determine and pursue their own learning goals.
4	Sense of autonomy	Providing students with the skills to find information and build knowledge, as opposed to giving them the expected knowledge.
5	Teacher and learner interdependence	Teachers become learning guides where students can seek assistance when required and develop ideas together.
6	Mutual respect	Students respect both teachers and peers, which enables students to see their peers as individuals to learn from and enables teachers to observe more accurately students' responsibility and autonomy.
7	Reflexive approach to teaching and learning	Teachers and students reflect on past learning experiences to iteratively improve ways of learning.

Table 1 Lea et al.'s seven tenets of student-centred learning

TEAM LEARNING CONCEPTS WITHIN THE SCL FRAMEWORK

The SCL aspects described above provide a suitable and uniform structure to conceptually connect team learning constructs (as researched by Tucker et al. and Tan) in architectural pedagogy and practice. Table 2 and 3 show these connections and their rationale.

Constructs	SCL tenets	Rationale for linkage
Knowledge and skills	Active learning	As students bring different knowledge and skills to the team, each student actively engages and learn from one another to leverage one another's expertise and skills.
	Mutual respect	Students need to respect and accept each other's differences before they can learn from each other's knowledge and skills.
Learning and personality styles	Deep learning and understanding	Students internalize that there are many learning and personality styles to learn how to work with different types of people in future collaborations.
	Mutual respect	Students need to respect that everyone has different learning and personality styles to effectively work with and learn from one another's differences.
Attitudes and Motivation	Mutual respect	Students need to accept that everyone has different attitudes and motivation towards teamwork before they can work learn positive attitudes and motivations from one another.
	Reflexive approach	Students reflect as a team and learn from their past teamwork experiences to establish positive team processes.
Leadership and role	Increased responsibility and accountability	Students negotiate amongst themselves different roles and responsibilities to maximize their own learning goals.
Team climate	Increased responsibility and accountability	Students are responsible for maintaining a supportive team environment and are held accountable for their actions when they negatively upset the 'psychological safety' of the environment.
	Mutual respect	Students need to respect one another's opinions to maintain a psychologically safe environment that continues to encourage each other to share their ideas.
Team composition	Deep learning and understanding	Students internalize that there are people are different and have different experiences to learn how to work with a range of people in future collaborations.
	Mutual respect	Students need to respect one another's differences to learn from different perspectives.
Team cohesion	Increased responsibility and accountability	Students are responsible for maintaining a cohesive team throughout the project and are held accountable of their own engagement with the rest of the team.
	Teacher/learner interdependence	Students become responsible for creating team cohesion as opposed to relying on teachers to resolve the lack of cohesion.
Coordination	Active learning	Students report back to the team and engage with one another's individual progress to ensure the design project develops on time.
Communication	Active learning	Students may communicate differently, which require team members to also learn of how one another prefers to communicate and adjust accordingly to accommodate one another's communication preference.

Constructs	SCL tenets	Rationale for linkage
Idea evaluation	Deep learning and understanding	Students learn and internalize how one another develops and evaluate ideas, so that the team can develop a team-based idea evaluation process.
Decision making	Deep learning and understanding	Students learn and internalize one another's perspective and decision-making approach, so that the team can develop a team-based decision-making process.
Conflict management	Active learning	Students learn how to differentiate between a constructive and destructive conflict.
	Deep learning and understanding	Students learn through observation and experience of their team processes how constructive and destructive conflicts can occur, to facilitate the former while avoiding the latter.
	Teacher/learner interdependence	Students become responsible for avoiding and de-escalating destructive conflicts, as opposed to relying on teachers to resolve negative conflicts between members.
	Mutual respect	Students need to respect one another's differences in opinions before they can develop a constructive conflict of ideas.

Table 2. Linking team learning in architectural pedagogy to SCL tenets

Constructs	SCL tenets	Rationale for linkage
Sharing	Active learning	Students learn of each other's perspectives and ideas.
	Mutual respect	Students need to respect one another to enable each other to share their ideas openly.
Co-construction	Active learning	Students engage with one another's ideas to develop each other's ideas.
	Deep learning and understanding	Students learn and internalize one another's perspectives, so that the team can develop a team-based idea.
Constructive conflict	Active learning	Students learn how to differentiate between a constructive and destructive conflict.
	Deep learning and understanding	Students learn through observation and experience of their team processes how constructive and destructive conflicts can occur, to facilitate the former while avoiding the latter.
	Teacher/learner interdependence	Students become responsible for avoiding and de-escalating destructive conflicts, as opposed to relying on teachers to resolve negative conflicts between members.
	Mutual respect	Students need to respect one another's differences in opinions before they can develop a constructive conflict of ideas.
Error communication	Deep learning and understanding	Students learn from one another the root causes of errors and internalize the knowledge shared to avoid repeating the mistake.
	Teacher/learner interdependence	Students learn from one another their own mistakes, as opposed to relying on teachers to identify team errors.
Task and Process reflexivity	Reflexive approach	Students reflect on their completed tasks and team processes to learn how to improve their team processes.
Task learning	Sense of autonomy	Students gain confidence to share their skills in complete tasks effectively with one another.
Boundary crossing	Sense of autonomy	Students gain confidence and skills to seek out solutions from outside their team.
	Teacher/learner interdependence	Students find knowledge on their own, as opposed to relying on teachers to provide them with the solutions.
Team experimenting	Active learning	Students learn how to trial, test, and apply new ways for effective team processes.
	Sense of autonomy	Students rely on themselves to gain experience and new knowledge on effective team processes.

Table 3. Linking team learning in architectural practice to SCL tenets

STUDENT-CENTERED TEAM LEARNING FRAMEWORK

Based on the analysis, I propose a student-centered team learning framework for students to understand, apply, and evaluate their team learning processes (see Table 4).

Understanding teamwork	Applying team learning process	Evaluating team processes
Knowledge and skills	Sharing	Error communication
Learning and personality styles	Co-constructing	Task and process reflexivity
Attitudes and motivation	Constructive conflict	Idea evaluation
Leadership and role	Task learning	Decision-making
Team climate	Boundary crossing	Conflict management
Team composition	Team experimenting	
Team cohesion	Coordination	
	Communication	

Table 4. SCL framework for architecture students on team learning process

Recommendation for students

Before starting teamwork, students should seek to understand team members' 1) knowledge and skills, 2) learning and personality styles, and 3) attitudes and motivation. They will also need to understand how to 1) maintain a psychologically safe team climate, 4) leverage the opportunities presented by their team composition, and 5) how to maintain team cohesion.

During their teamwork, students should seek to perform workplace team learning processes, specifically 1) sharing of ideas, 2) co-constructing ideas, and 3) conducting constructive conflict. Additionally, they should also 1) share their knowledge on how to complete tasks effectively (task learning), 2) approach members outside their team to learn new information (boundary crossing) and 3) experiment with new ways of working as a team (team learning). These processes can be done by 1) coordinating their task progress and 2) communicating ideas and progress with each other.

Finally, students should evaluate their team learning processes by 1) reflecting on their processes and completed tasks to find new ways of improving their teamwork and 2) communicating their mistakes with one another so that other team members do not repeat those mistakes. Additionally, they should also continuously evaluate how the team 1) generate and evaluate ideas, 2) make decisions, and 3) manage team conflicts, so that their design projects reflect the entire team's input.

Recommendations for studio leaders

While educators may intervene to manage student teams and resolve team troubles immediately, it prevents students from independently learning to address teamwork challenges and gaining teamwork experience crucial in their future careers. Instead, before groupwork commences, educators should facilitate discussions in student teams around the different team factors that impact teamwork (i.e. understanding). Additionally, educators should encourage students to be aware of the different types of team learning processes (i.e. applying) they can use during group work and review their team processes regularly (i.e. evaluating) to improve their teamwork skills. Finally, revisiting Tucker et al.'s IPO framework of effectiveness in student design teams, educators must consider the remaining factors, such as *Task Structure & Description* and *Team formation*, that impact student teamwork but lie outside the student's remit.

CONCLUSION

Groupwork provides design students with opportunities to collaborate but does not necessarily provide students with authentic teamwork experiences that they would find in the workplace. While researchers have examined how to teach and measure team learning in design studios and how team learning occurs in architecture practice, there is still no unified framework that provides students with guidance on how to re-create workplace team learning processes in design studios. By using a student-centered learning approach, team learning constructs found in architecture pedagogy and practice were analyzed, then

synthesized to provide students with a framework that guides them on what team factors to understand, what team learning processes to use in group work, and finally what to aspects of team processes they should evaluate to learn and improve their teamwork skills.

NOTES

[1] see e.g. Linus Tan, 'From Reflective Practitioner to Learning Professionals: The Role of Reflecting and Learning in Architecture Teams' (Melbourne, Victoria, Australia, Swinburne University of Technology, 2021), https://researchbank.swinburne.edu.au/items/e20941a5-21e3-4bfb-ab32-2a280e8b2823/1/; Richard Tucker et al., *Enhancing and Assessing Group and Team Learning in Architecture and Related Design Contexts: Final Report 2014.*, 2014.

[2] Tucker et al., *Enhancing and Assessing Group and Team Learning in Architecture and Related Design Contexts*.

[3] Richard Tucker, 'Teaching Teamwork in Design: A Framework for Understanding Effectiveness in Student Teams', in *Collaboration and Student Engagement in Design Education*, by Richard Tucker (IGI Global, 2017), 2, https://doi.org/10.4018/978-1-5225-0726-0.

[4] Brenda S. Gardner and Sharon J. Korth, 'A Framework for Learning to Work in Teams', *Journal of Education for Business* 74, no. 1 (September 1998): 28–33, https://doi.org/10.1080/08832329809601657; Richard E Yellen, MaryAnne Winniford, and Clive C Sanford, 'Extraversion and Introversion in Electronically-Supported Meetings', 1995, 12.

[5] Kimberly A. Freeman, 'Attitudes toward Work in Project Groups as Predictors of Academic Performance', *Small Group Research* 27, no. 2 (May 1996): 265–82, https://doi.org/10.1177/1046496496272004.

[6] D Caspersz, M Wu, and J Skene, 'Factors Influencing Effective Performance of University Student Teams', in *Proceedings of the 2003 AAnnual International Conference of the Higher Education Research and Development Society of Australasia* (Learning for an unknown future, Christchurch, New Zealand, 2003), 11; Claudia J. Ferrante, Steve G. Green, and William R. Forster, 'Getting More out of Team Projects: Incentivizing Leadership to Enhance Performance', *Journal of Management Education* 30, no. 6 (December 2006): 788–97, https://doi.org/10.1177/1052562906287968.

[7] Stephanie G. Adams, Laura C. Simon Vena, and Bianey C. Ruiz-Ulloa, 'A Pilot Study Of The Performance Of Student Teams', in *2002 Annual Conference Proceedings* (2002 Annual Conference, Montreal, Canada: ASEE Conferences, 2002), 7.83.1-7.83.13, https://doi.org/10.18260/1-2--10054.

[8] David A. Harrison et al., 'Time, Teams, and Task Performance: Changing Effects of Surface- and Deep-Level Diversity on Group Functioning', *Academy of Management Journal* 45, no. 5 (October 2002): 1029–45, https://doi.org/10.5465/3069328.

[9] Amanuel G Tekleab, Narda R Quigley, and Paul E Tesluk, 'A Longitudinal Study of Team Conflict, Conflict Management, Cohesion, and Team Effectiveness', *Group & Organization Management* 34, no. 2 (April 2009): 170–205, https://doi.org/10.1177/1059601108331218.

[10] Carsten K W De Dreu and Annelies E. M. Van Vianen, 'Managing Relationship Conflict and the Effectiveness of Organizational Teams', *Journal of Organizational Behavior* 22 (2001): 309–28, https://doi.org/10.1002/job.71.

[11] P. Badke-Schaub and E. Frankenberger, 'Analysing and Modelling Cooperative Design by the Critical Situation Method', *Le Travail Humain* 65, no. 4 (2002): 293, https://doi.org/10.3917/th.654.0293.

[12] Rianne C. Valkenburg, 'Shared Understanding as a Condition for Team Design', *Automation in Construction* 7, no. 2–3 (January 1998): 111–21, https://doi.org/10.1016/S0926-5805(97)00058-7.

[13] Kristin J. Behfar et al., 'The Critical Role of Conflict Resolution in Teams: A Close Look at the Links between Conflict Type, Conflict Management Strategies, and Team Outcomes.', *Journal of Applied Psychology* 93, no. 1 (2008): 170–88, https://doi.org/10.1037/0021-9010.93.1.170.

[14] Carsten K W De Dreu, 'Productive Conflict: The Importance of Conflict Management and Conflict Issues', in *Using Conflict in Organizations*, ed. Evert Van de Vliert (London: Sage, 1997), 9–22; Tekleab, Quigley, and Tesluk, 'A Longitudinal Study of Team Conflict, Conflict Management, Cohesion, and Team Effectiveness'.

[15] Linus Tan, 'Behaviours in Design Collaborations Insights from Team Learning Perspective', in *Proceedings of the Design Research Society 2020 Conference: Synergy*, vol. 3 (Design Research Society: Synergy, Brisbane, 2020), 1045–61, https://doi.org/10.21606/drs.2020.330.

[16] 'Grasping the Dynamic Complexity of Team Learning: An Integrative Model for Effective Team Learning in Organisations', *Educational Research Review* 5, no. 2 (January 2010): 111–33, https://doi.org/10.1016/j.edurev.2010.02.002.

[17] Amy C. Edmondson, 'The Local and Variegated Nature of Learning in Organizations: A Group-Level Perspective', *Organization Science* 13, no. 2 (April 2002): 128–46, https://doi.org/10.1287/orsc.13.2.128.530.

[18] Aleksander P. J. Ellis et al., 'Team Learning: Collectively Connecting the Dots', *Journal of Applied Psychology* 88, no. 5 (2003): 821–35, https://doi.org/10.1037/0021-9010.88.5.821.

[19] Amy Edmondson, 'Psychological Safety and Learning Behavior in Work Teams', *Administrative Science Quarterly* 44, no. 2 (1 June 1999): 350–83, https://doi.org/10.2307/2666999.

[20] Giles Hirst and Leon Mann, 'A Model of R&D Leadership and Team Communication: The Relationship with Project Performance', *R and D Management* 34, no. 2 (March 2004): 147–60, https://doi.org/10.1111/j.1467-9310.2004.00330.x.

[21] Cathy van Dyck et al., 'Organizational Error Management Culture and Its Impact on Performance: A Two-Study Replication', *Journal of Applied Psychology* 90, no. 6 (2005): 1228–40, https://doi.org/10.1037/0021-9010.90.6.1228.

[22] Joyce Rupert and Karen A. Jehn, 'Subgroup Perceptions, Conflict, and Team Learning', *SSRN Electronic Journal*, 2008, https://doi.org/10.2139/ssrn.1298644.

[23] Andreas Widmann, Regina H. Mulder, and Christoph König, 'Team Learning Behaviours as Predictors of Innovative Work Behaviour – a Longitudinal Study', *Innovation* 21, no. 2 (3 April 2019): 298–316, https://doi.org/10.1080/14479338.2018.1530567.

[24] Chantal M. J. H. Savelsbergh, Beatrice I. J. M. van der Heijden, and Rob F. Poell, 'The Development and Empirical Validation of a Multidimensional Measurement Instrument for Team Learning Behaviors', *Small Group Research* 40, no. 5 (October 2009): 578–607, https://doi.org/10.1177/1046496409340055.

[25] e.g. Peter Cauwelier, Vincent Michel Ribiere, and Alex Bennet, 'The Influence of Team Psychological Safety on Team Knowledge Creation: A Study with French and American Engineering Teams', *Journal of Knowledge Management* 23, no. 6 (12 August 2019): 1157–75, https://doi.org/10.1108/JKM-07-2018-0420; Piet van den Bossche et al., 'Social and Cognitive Factors Driving Teamwork in Collaborative Learning Environments: Team Learning Beliefs and Behaviors', *Small Group Research* 37, no. 5 (October 2006): 490–521, https://doi.org/10.1177/1046496406292938; Katrien Vangrieken, Filip Dochy, and Elisabeth Raes, 'Team Learning in Teacher Teams: Team Entitativity as a Bridge between Teams-in-Theory and Teams-in-Practice', *European Journal of Psychology of Education* 31, no. 3 (1 July 2016): 275–98, https://doi.org/10.1007/s10212-015-0279-0; Marlies Veestraeten, Eva Kyndt, and Filip Dochy, 'Investigating Team Learning in a Military Context', *Vocations and Learning* 7, no. 1 (April 2014): 75–100, https://doi.org/10.1007/s12186-013-9107-3.

[26] e.g. Tan, 'Behaviours in Design Collaborations Insights from Team Learning Perspective'; Linus Tan, 'Collaborative Cultures of Architecture Teams: Team Learning and Reflective Practice', *The Design Journal*, 4 January 2021, 1–8, https://doi.org/10.1080/14606925.2020.1864942; Tan, 'From Reflective Practitioner to Learning Professionals: The Role of Reflecting and Learning in Architecture Teams'.

[27] John B. Biggs and Catherine Tang, *Teaching for Quality Learning at University*, 4th ed. (Berkshire, England: Open University Press, 2011), https://doi.org/10.1097/00005176-200304000-00028.

[28] Richard M Felder and Rebecca Brent, 'Navigating the Bumpy Road to Student-Centred Instruction', *College Teaching* 44, no. 2 (1996): 43–47, https://www.jstor.org/stable/27558762.

[29] JA Hall and MNK Saunders, 'Adopting a Student-Centred Approach to Management of Learning', in *Aspects of Educational and Training Technology 29*, by Chris Bell, Mandy Bowden, and Andrew Trott, 1st ed. (Routledge, 1997), 85–94; Kirsti Lonka and Kirsi Ahola, 'Activating Instruction: How to Foster Study and Thinking Skills in Higher Education', *European Journal of Psychology of Education* 10, no. 4 (December 1995): 351–68, https://doi.org/10.1007/BF03172926; Gerard P Prendergast, 'Student-Centred Learning in the Large Class Setting', *Journal of Further and Higher Education* 18, no. 3 (1994): 48–62, https://doi.org/10.1080/0309877940180305.

[30] Mohd Zairul, 'A Thematic Review on Student-Centred Learning in the Studio Education', *Journal of Critical Reviews* 7, no. 02 (1 January 2020), https://doi.org/10.31838/jcr.07.02.95.

[31] 'Higher Education Students' Attitudes to Student-Centred Learning: Beyond "Educational Bulimia"?', *Studies in Higher Education* 28, no. 3 (August 2003): 321–34, https://doi.org/10.1080/03075070309293.

BIBLIOGRAPHY

Adams, Stephanie G., Laura C. Simon Vena, and Bianey C. Ruiz-Ulloa. 'A Pilot Study Of The Performance Of Student Teams'. In *2002 Annual Conference Proceedings*, 7.83.1-7.83.13. Montreal, Canada: ASEE Conferences, 2002. https://doi.org/10.18260/1-2--10054.

Badke-Schaub, P., and E. Frankenberger. 'Analysing and Modelling Cooperative Design by the Critical Situation Method'. *Le Travail Humain* 65, no. 4 (2002): 293. https://doi.org/10.3917/th.654.0293.

Behfar, Kristin J., Randall S. Peterson, Elizabeth A. Mannix, and William M. K. Trochim. 'The Critical Role of Conflict Resolution in Teams: A Close Look at the Links between Conflict Type, Conflict Management Strategies, and Team Outcomes.' *Journal of Applied Psychology* 93, no. 1 (2008): 170–88. https://doi.org/10.1037/0021-9010.93.1.170.

Biggs, John B., and Catherine Tang. *Teaching for Quality Learning at University*. 4th ed. Berkshire, England: Open University Press, 2011. https://doi.org/10.1097/00005176-200304000-00028.

Bossche, Piet van den, Wim H. Gijselaers, Mien Segers, and Paul A. Kirschner. 'Social and Cognitive Factors Driving Teamwork in Collaborative Learning Environments: Team Learning Beliefs and Behaviors'. *Small Group Research* 37, no. 5 (October 2006): 490–521. https://doi.org/10.1177/1046496406292938.

Caspersz, D, M Wu, and J Skene. 'Factors Influencing Effective Performance of University Student Teams'. In *Proceedings of the 2003 AAnnual International Conference of the Higher Education Research and Development Society of Australasia*, 11. Christchurch, New Zealand, 2003.

Cauwelier, Peter, Vincent Michel Ribiere, and Alex Bennet. 'The Influence of Team Psychological Safety on Team Knowledge Creation: A Study with French and American Engineering Teams'. *Journal of Knowledge Management* 23, no. 6 (12 August 2019): 1157–75. https://doi.org/10.1108/JKM-07-2018-0420.

De Dreu, Carsten K W. 'Productive Conflict: The Importance of Conflict Management and Conflict Issues'. In *Using Conflict in Organizations*, edited by Evert Van de Vliert, 9–22. London: Sage, 1997.

De Dreu, Carsten K W, and Annelies E. M. Van Vianen. 'Managing Relationship Conflict and the Effectiveness of Organizational Teams'. *Journal of Organizational Behavior* 22 (2001): 309–28. https://doi.org/10.1002/job.71.

Decuyper, Stefan, Filip Dochy, and Piet Van den Bossche. 'Grasping the Dynamic Complexity of Team Learning: An Integrative Model for Effective Team Learning in Organisations'. *Educational Research Review* 5, no. 2 (January 2010): 111–33. https://doi.org/10.1016/j.edurev.2010.02.002.

Dyck, Cathy van, Michael Frese, Markus Baer, and Sabine Sonnentag. 'Organizational Error Management Culture and Its Impact on Performance: A Two-Study Replication'. *Journal of Applied Psychology* 90, no. 6 (2005): 1228–40. https://doi.org/10.1037/0021-9010.90.6.1228.

Edmondson, Amy. 'Psychological Safety and Learning Behavior in Work Teams'. *Administrative Science Quarterly* 44, no. 2 (1 June 1999): 350–83. https://doi.org/10.2307/2666999.

Edmondson, Amy C. 'The Local and Variegated Nature of Learning in Organizations: A Group-Level Perspective'. *Organization Science* 13, no. 2 (April 2002): 128–46. https://doi.org/10.1287/orsc.13.2.128.530.

Ellis, Aleksander P. J., John R. Hollenbeck, Daniel R. Ilgen, Christopher O. L. H. Porter, Bradley J. West, and Henry Moon. 'Team Learning: Collectively Connecting the Dots'. *Journal of Applied Psychology* 88, no. 5 (2003): 821–35. https://doi.org/10.1037/0021-9010.88.5.821.

Felder, Richard M, and Rebecca Brent. 'Navigating the Bumpy Road to Student-Centred Instruction'. *College Teaching* 44, no. 2 (1996): 43–47. https://www.jstor.org/stable/27558762.

Ferrante, Claudia J., Steve G. Green, and William R. Forster. 'Getting More out of Team Projects: Incentivizing Leadership to Enhance Performance'. *Journal of Management Education* 30, no. 6 (December 2006): 788–97. https://doi.org/10.1177/1052562906287968.

Freeman, Kimberly A. 'Attitudes toward Work in Project Groups as Predictors of Academic Performance'. *Small Group Research* 27, no. 2 (May 1996): 265–82. https://doi.org/10.1177/1046496496272004.

Gardner, Brenda S., and Sharon J. Korth. 'A Framework for Learning to Work in Teams'. *Journal of Education for Business* 74, no. 1 (September 1998): 28–33. https://doi.org/10.1080/08832329809601657.

Hall, JA, and MNK Saunders. 'Adopting a Student-Centred Approach to Management of Learning'. In *Aspects of Educational and Training Technology 29*, by Chris Bell, Mandy Bowden, and Andrew Trott, 85–94, 1st ed. Routledge, 1997.

Harrison, David A., Kenneth H. Price, Joanne H. Gavin, and Anna T. Florey. 'Time, Teams, and Task Performance: Changing Effects of Surface- and Deep-Level Diversity on Group Functioning'. *Academy of Management Journal* 45, no. 5 (October 2002): 1029–45. https://doi.org/10.5465/3069328.

Hirst, Giles, and Leon Mann. 'A Model of R&D Leadership and Team Communication: The Relationship with Project Performance'. *R and D Management* 34, no. 2 (March 2004): 147–60. https://doi.org/10.1111/j.1467-9310.2004.00330.x.

Lea, Susan J., David Stephenson, and Juliette Troy. 'Higher Education Students' Attitudes to Student-Centred Learning: Beyond "Educational Bulimia"?' *Studies in Higher Education* 28, no. 3 (August 2003): 321–34. https://doi.org/10.1080/03075070309293.

Lonka, Kirsti, and Kirsi Ahola. 'Activating Instruction: How to Foster Study and Thinking Skills in Higher Education'. *European Journal of Psychology of Education* 10, no. 4 (December 1995): 351–68. https://doi.org/10.1007/BF03172926.

Prendergast, Gerard P. 'Student-Centred Learning in the Large Class Setting'. *Journal of Further and Higher Education* 18, no. 3 (1994): 48–62. https://doi.org/10.1080/0309877940180305.

Rupert, Joyce, and Karen A. Jehn. 'Subgroup Perceptions, Conflict, and Team Learning'. *SSRN Electronic Journal*, 2008. https://doi.org/10.2139/ssrn.1298644.

Savelsbergh, Chantal M. J. H., Beatrice I. J. M. van der Heijden, and Rob F. Poell. 'The Development and Empirical Validation of a Multidimensional Measurement Instrument for Team Learning Behaviors'. *Small Group Research* 40, no. 5 (October 2009): 578–607. https://doi.org/10.1177/1046496409340055.

Tan, Linus. 'Behaviours in Design Collaborations Insights from Team Learning Perspective'. In *Proceedings of the Design Research Society 2020 Conference: Synergy*, 3:1045–61. Brisbane, 2020. https://doi.org/10.21606/drs.2020.330.

———. 'Collaborative Cultures of Architecture Teams: Team Learning and Reflective Practice'. *The Design Journal*, 4 January 2021, 1–8. https://doi.org/10.1080/14606925.2020.1864942.

———. 'From Reflective Practitioner to Learning Professionals: The Role of Reflecting and Learning in Architecture Teams'. Swinburne University of Technology, 2021. https://researchbank.swinburne.edu.au/items/e20941a5-21e3-4bfb-ab32-2a280e8b2823/1/.

Tekleab, Amanuel G, Narda R Quigley, and Paul E Tesluk. 'A Longitudinal Study of Team Conflict, Conflict Management, Cohesion, and Team Effectiveness'. *Group & Organization Management* 34, no. 2 (April 2009): 170–205. https://doi.org/10.1177/1059601108331218.

Tucker, Richard. 'Teaching Teamwork in Design: A Framework for Understanding Effectiveness in Student Teams'. In *Collaboration and Student Engagement in Design Education*, by Richard Tucker, 1–27. IGI Global, 2017. https://doi.org/10.4018/978-1-5225-0726-0.

Tucker, Richard, Neda Abbasi, Graham R Thorpe, Michael J. Ostwald, Anthony P. Williams, Louise Wallis, and Sam Kashuk. *Enhancing and Assessing Group and Team Learning in Architecture and Related Design Contexts: Final Report 2014.*, 2014.

Valkenburg, Rianne C. 'Shared Understanding as a Condition for Team Design'. *Automation in Construction* 7, no. 2–3 (January 1998): 111–21. https://doi.org/10.1016/S0926-5805(97)00058-7.

Vangrieken, Katrien, Filip Dochy, and Elisabeth Raes. 'Team Learning in Teacher Teams: Team Entitativity as a Bridge between Teams-in-Theory and Teams-in-Practice'. *European Journal of Psychology of Education* 31, no. 3 (1 July 2016): 275–98. https://doi.org/10.1007/s10212-015-0279-0.

Veestraeten, Marlies, Eva Kyndt, and Filip Dochy. 'Investigating Team Learning in a Military Context'. *Vocations and Learning* 7, no. 1 (April 2014): 75–100. https://doi.org/10.1007/s12186-013-9107-3.

Widmann, Andreas, Regina H. Mulder, and Christoph König. 'Team Learning Behaviours as Predictors of Innovative Work Behaviour – a Longitudinal Study'. *Innovation* 21, no. 2 (3 April 2019): 298–316. https://doi.org/10.1080/14479338.2018.1530567.

Yellen, Richard E, MaryAnne Winniford, and Clive C Sanford. 'Extraversion and Introversion in Electronically-Supported Meetings', 1995, 12.

Zairul, Mohd. 'A Thematic Review on Student-Centred Learning in the Studio Education'. *Journal of Critical Reviews* 7, no. 02 (1 January 2020). https://doi.org/10.31838/jcr.07.02.95.

TOWARDS LONG-TERM PERSPECTIVES ON EXISTING BUILDINGS: DEVELOPING A GAME-BASED APPROACH USING HOTEL SCHATZALP AS A CASE STUDY

Author:
FABIAN KASTNER, AYDIN FARAJI, EDWIN ZEA ESCAMILLA, ROBERT W. SUMNER, STÉPHANE MAGNENAT

Affiliation:
SWISS FEDERAL INSTITUTE OF TECHNOLOGY, ETH ZURICH, SWITZERLAND

INTRODUCTION

This paper discusses on-going research on a review of serious games and a newly-developed serious game prototype intended to communicate environmental implications of building refurbishment to a young audience. On a global scale, the building sector is still responsible for 37% of energy-related greenhouse-gas emissions (GHG).[1] In Europe, the "renovation wave" and the needed increase of building renovation rates aim at increasing its energy efficiency[2] promoting an "energy-efficiency first" paradigm. Despite possible social and economic benefits of renovation or refurbishment actions such as healthy indoor climate and job creation, typical "deep renovation" targeting increased energy-efficiency can lead to the loss of architectural values and might not be the optimal environmental nor cost-effective approach.[3] Regarding life cycle environmental impacts (LCEI), the lifetimes of building components, their frequency of replacement,[4] and the extent of renovation activity[5] are crucial. Replacing damaged building components instead of repairing poses a problem for building preservation and beyond, especially since industrialized construction accelerated in the 1950s.[6]

However, building regulations in Europe mostly focused on operational energy efficiency.[7] Therefore, it is not surprising that currently improved operational energy efficiency is compensated by an increase of embodied GHG for new construction, resulting from the production and disposal of building materials.[8] Projections of future building material flows show that in Switzerland embodied GHG from materials typically used for refurbishments[9] will become dominant in 2050.[10] Therefore, reduction of embodied GHG beyond energy efficiency will be important to support the building sector's transformation towards net-zero. These aspects link to publications from different domains on limitations of energy efficiency (especially prebound and rebound effects),[11] long-term considerations as a guiding principle to sustainable development of the built environment,[12] and to demands of political initiatives.[13] Further, it raises the question of how to address these aspects in practice as well as in education in line with the sustainable development goal number 4 ("Quality Education").[14] A potential to develop innovative tools to disseminate best practices in dealing with the built environment from a life cycle-based perspective to a generation Z audience[15] and beyond can be seen. This follow-up group of "millennials" are often characterized as "digital natives"[16] and as more aware of the importance of environmental actions than previous generations.[17] However, the complex nature of life cycle assessment (LCA) inhibits its wide application in the praxis, and in education.

Integration of sustainability in architecture curricula in the US started in the early 1990s.[18] A shift in research from new construction towards the built environment and its embodied aspects can be marked from the 1990s onwards[19] with a remarkable increase from 2006 to 2013.[20] A promising way of research and teaching,[21] which gained momentum from 2010 onwards,[22] is characterized as a game-based approach. In Switzerland, an increased interest in games as cultural products is currently reflected at the national political level[23] and in national research projects.[24] Interestingly, many well-known simulation games dealing with the built environment such as *SimCity* and *Minecraft* using abstract block visuals aim at doing almost the opposite of triple-A games focusing on virtual realities.[25] In architecture research, various connections between games and spaces were investigated.[26] Recently a special emphasis is put on serious games.[27]

Distinguishing between entertainment games and serious or educational games can be important to overcome a generalized discussion on the ambivalent field of games.[28] Games and play beyond leisurely entertainment can be characterized on an axis of "open, free, and exploratory play" and "formalized, rule-based, goal-oriented" games.[29] Defining characteristics of games can be given with a goal, rules, feedback system and voluntary participation.[30] Further, serious games typically show specific references to reality.[31] To this end, the modern distinction between "work" and "play" might blur.[32] From a didactic perspective, utilizing serious games towards initiating a process of reflection is emphasized by different constructivist theory strands[33], which dominate current learning theory by emphasizing an active and constructive learning process.[34] A constructivist approach can be described in iterative steps and may involve: concrete experience, observations and reflections, abstract conceptualization and generalization, and testing implications of concepts in new situations[35] – showing considerable differences in comparison with widely adopted linear models such as variations of Bloom's taxonomy (1. remember, 2. understand, 3. apply, 4. analyse, 5. evaluate, 6. create).[36]

Recently, multiple works investigated the connection between higher education teaching and LCA using Bloom's revised taxonomy.[37] For instance, Viere et al. propose a framework for LCA competency linked to Bloom's learning outcomes. LCA competency is structured into different levels with increasing difficulties from basic concepts in level 1 to method advancement in level 5. Each of the levels is linked to a specific learning outcome.[38] Currently, the inclusion of iterative learning processes and the combination of low-level competencies with higher-level learning outcomes are not discussed in-depth. For these aspects, different research approaches seem necessary to investigate the potential of serious games. Overall, a potential of serious games might include supporting abstract learning by providing a meaningful contextualization of theoretical concepts.[39]

LITERATURE REVIEW ON SERIOUS GAMES

First, a systematic literature review is presented to analyse the status-quo of serious games in the given context. Using a keyword search on Scopus and additional snowballing, 37 papers published from 2006 to 2021 including 35 serious games on buildings and sustainability in a broad sense were found (see Table 1 with applied search strings). This selection was reduced to 21 papers on serious games that target a young audience. It is important to note that games which did not result in academic publications, are not covered and are subject to further research. However, the literature sample provides the necessary data for an analysis of the research intents and contexts (testing and development) of serious games.

String number	S1		S2		S3		S4		S5	
String core	Energy	OR	Green	OR	Renovation	OR	Use phase	OR	LCA	OR
	CO_2	OR	Sustainable	OR	Refurbishment	OR	LCA	OR	Life cycle	AND
	Climate	AND	Sufficiency	OR	Retrofit	OR	Life cycle	AND		
			Resource	OR	Transformation	AND				
			Conservation	AND						
String addition	Building	OR	Building	OR	Building	OR	Building	OR	Game	AND
	Household	AND	Household	AND	Household	AND	Household	AND	Serious	OR
	Game	AND	Game	AND	Game	AND	Game	AND	Educational	OR
	Serious	OR	Serious	OR	Serious	OR	Serious	OR	Learning	OR
	Educational	OR	Educational	OR	Educational	OR	Educational	OR		
	Learning	OR	Learning	OR	Learning	OR	Learning	OR		
Number of Publications	9		15		4		0		7	

Table 1. Applied search strings and associated results.

Key questions on the literature were defined as follows:

1. Who is the target audience and what are the conceptions of sustainability in publications on serious games?

2. What are the intended research objectives to be achieved with serious games on sustainability and buildings?

While no research papers were found for serious games on building LCA, a wider search for serious games on LCA in general resulted in seven relevant publications. Thereby, all publications targeting a younger audience (4 works) were primarily developed for civil engineering students (see Table 2). An overview of all different target groups is given in Figure 1. The largest part of the works (16 works) target students in higher education. Fewer publications target middle or high school students (5 works) and a similar number does not specify the target group (6 works). Overall, 10 different fields contributed to the research body while a major part of the works mostly originated in the fields of computer science (10), economics (6), architecture (8), and engineering (4) with a minor part of the studies conducted in interdisciplinary teams (8).
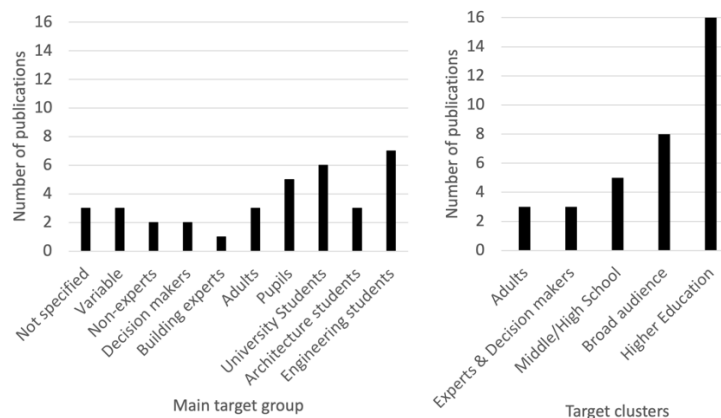

Figure 1. Target audience of selected serious games.

An analysis of the topics and objectives for the selected works is presented in Table 2. The review shows that serious games for younger audiences focusing on LCA, are not investigated in the context of buildings so far. Research on serious games dealing with LCA of materials majorly target engineering students, highlighting a need for further research in the field of architecture, where literacy on LCA is not of minor relevance. Considerable differences exist in how serious games frame sustainability (energy efficiency, environmental assessment, sustainability principles,[40] etc.). Multiple serious games focus on operational energy use, without addressing the connection to embodied environmental impacts. Regarding serious games for middle or high school, a minor share of the research works target raising awareness.[41] It is questioned whether raising awareness should be the focus of research objectives rather

than enhancing learning with respect to environmental awareness of generation Z members. A major part of the research works targets testing on usability, motivation, behaviour change[42], learning outcomes[43], or multiple of these objectives[44]. Evidence on learning effects through game-based approaches are presented for analogue[45] and digital games.[46] Finally, works also discuss the setting of games as a crucial element.[47]

Target Clusters	Nr.	First Author	Topic	Sustainability Objective	Type	Research Objective with Game
High/Middle School Students	1	Puttick (2018)	Cimate change	Causes of climate change	sg	Assessing learning effects on climate change while creating games
	2	Bang (2006)	Household managment	Operational Energy Efficiency	sg	Raising awareness and promoting an energy-aware lifestyle
	3	Hasibuan (2011)	Cultural Heritage Protection	Heritage Preservation	sg	Assessing students' perceptions on learning, attractivity and ease-of-learning
	4	Gustafsson (2009)	Household managment	Electrcitiy awareness	sg	Encouraging long term behaviour change
	5	Cuccurullo (2013)	Household managment	Waste generation	sg	Assessing students' learning efficacy & perception, and teachers' opinions
University Students	6	Ellahi (2017)	New construction	Eco-friendly construction	sg	Supplementing conventional business education, assessing learning outcomes
	7	Ortega (2019)	City Planning	Resource management	sg	Integration in teaching module on sustainability
	8	Bontchev (2021)	Cultural Heritage Protection	Climate resilience	sg	Identifying factors contributing to raising awareness
	9	Despeisse (2018)	Leadership in manufacturing	Eco-efficiency	bg	Raising awareness and improve skills & knowledge
	10	Korman (2010)	Construction management	Material efficiency	sg	Enhancing construction management education
	11	Iturizza (2019)	City resilience dynamics	Parameters of resilience	sg	Investigating Operationalization of Climate Resilience
Architecture students	12	Ayer (2014, 2016)	Exterior Wall Redesign	Material efficiency	ar	Investigating students' perceptions and improving skills
	13	Şahbaz (2018)	Architectural heritage	Heritage preservation	sg	Supporting teaching on historical buildings, improving learning experience
	14	Juan (2015)	City development	Resource management	bg	Assessing learning motivation, learning effects, and attractiveness for teaching
	15	Reinhart (2015)	New construction	Operational Energy Efficiency	sg	Improving students' skills on low-energy design
(Civil) Engineering students	16	Duin (2011)	Global Manufacturing	Sustainability Pillars	rpg	Investigating the integration within a learning platform
	17	Whalen (2018)	Circular Economy	Material criticality	bg	Investigating students' reflections on the content
	18	Tehran (2013)	Global Manufacturing	LCA in manufacturing	rpg	Investigating teachers' perception of learning effectiveness
	19	Perini (2017, 2018)	Manufacturing	LCA in manufacturing	sg	Testing effects on learning and motivation
	20	Dib (2014)	Green Buildings	LEED concept	sg	Assessing students' perceptions on usability, quantifying learning effects
	21	Oliveira (2013)	Manufacturing management	LCA in manufacturing	sg	Assessing three game designs and their pedagogical underpinnings

Table 2. Cluster overview of literature sample.[48]

METHOD

In this document, a prototype game, developed by the authors in an interdisciplinary team,[49] and its pilot usability testing is presented. The prototype consists of a bottom-up simulation composed of different subsystems (energy demand, condition of components, guest model). The simulation is written in the Rust programming language[50], using the Bevy game engine[51] and the egui framework.[52]

As a case study heritage object, the Hotel Schatzalp in Davos (Switzerland) was chosen because of its uninterrupted popularity and long history of low-impact transformations since its completion in 1900.[53] The objective of this prototype is that the player can iteratively analyse and evaluate environmental implications of actions while gaming, using life cycle environmental impacts (LCEI) and costs (LCC). The player can test different materials as new building components while considering their LCEI, component lifetimes, and preserving existing components. Thereby, the player is being challenged to ensure the long-term preservation of the hotel by managing repairs, replacements, and renovation activities. Therefore, the prototype model simulates the condition decay of 11 building components (such as interior layout and insulation components) – which is a current research topic[54] – and the hotel's heating energy consumption[55] using a combination of datasets[56]. Regarding LCEI and LCC, the building model uses a simplified connection between embodied and operational life cycle impacts: $LCEI = \sum EI_{production,i} + \sum EI_{disposal,i} + EI_{heating}$ and $LCC = \sum C_{repair,i} + \sum C_{replace,i} + \sum C_{renovate,i} + \sum C_{heating,i}$.[57]

The gameplay allows the player to take the role of the hotel manager. The challenge is to transform the building over the long-term and at the same time not go bankrupt by losing guests. The quantity of guests dynamically changes depending on the player's actions, who needs to develop a way to accommodate as many hotel guests as possible to generate revenue by evaluating environmental and

financial impacts of decisions on new and existing building components. Further, the player is given a carbon budget for the duration of the simulation until the year 2050. If the budget is consumed, the game is lost. Therefore, the game evaluates the player's actions on the cumulative life cycle impacts in terms of global warming potential (GWP in kg CO_2-eq.), costs (CHF), overall condition state, and material composition, which in turn informs the number of hotel guests. Each of the guest types corresponds to one of the following building qualities such as comfort, environmental impacts in terms of GWP, original material composition and age of building components.[58] The player can act on building components by selecting them on a specific building level (group of rooms, floor, building level) and by clicking on a *replace* or *repair* icon in the menu bar. By presenting data via icons, numbers, and text within the prototype (see Figure 3) references to quantitative life cycle impacts are established. Each building component[59] is associated with a set of parameters.[60] The availability of materials and technologies such as insulation and heating systems evolves over time, aiming at creating a thematic reference to reality and an intriguing gameplay at the same time.
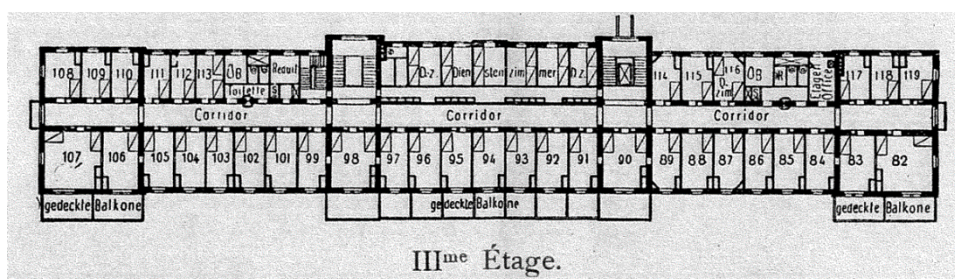

Figure 2. Original floorplan layout of Hotel Schatzalp from Swiss architects Pfleghard & Häfeli.[61]

The condition model for building components consists of a minimum and a maximum lifetime curve, defined with cubic polynomials based on models from literature[62] and expected components' lifetimes.[63] Based on these two curves, the actual condition at each point in time is calculated. If the player does not act, the condition state decreases according to the minimum lifetime curve starting from 100%. If the player chooses to repair, the condition of a component increases immediately to a higher level. The new condition state after the repair is calculated based on the sum of a share of the maximum and actual condition state at the specific time. The building's carbon budget is computed based on a bottom-up model of minimal environmental impacts for the predefined set of possible actions over time, and a margin of 20%. As such, the player is engaged to find climate-friendly strategies based on regular repairs and replacements while considering the availability of different materials and technologies.
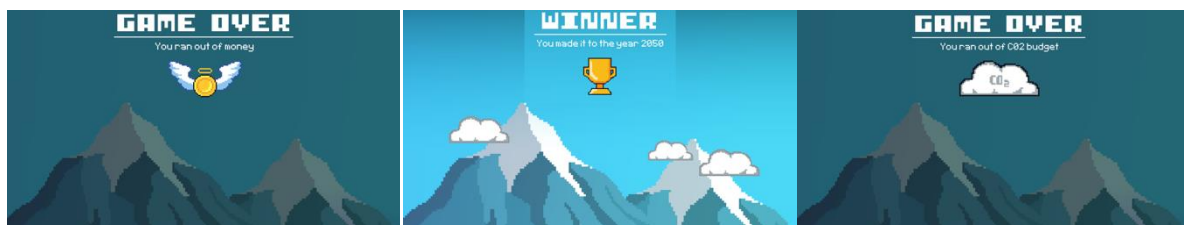

Figure 3. Different win and lose scenarios within the prototype game.[64]

Pilot study: usability testing

In an experimental setup, a pilot study with two groups of generation Z members was conducted: architecture students from ETH Zurich (group 1) and pupils on the move to higher education (group 2). The pilot study on the prototype is based on the System Usability Scale (SUS) with a scoring system from 0 (worst) to 100 (best imaginable).[65] The aim was to test the prototype's general usability and to

collect learnings from the study execution. The pilot study included: brief introduction to the prototype and its objectives, gaming session, answering of questionnaire on usability and player's profile. [66] The hypothesis was that the higher educational level as well as the background in architecture of group 1 would lead to a smaller entry hurdle to the utilization of the prototype as an educational tool. Therefore, higher usability ratings of group 1 were expected.
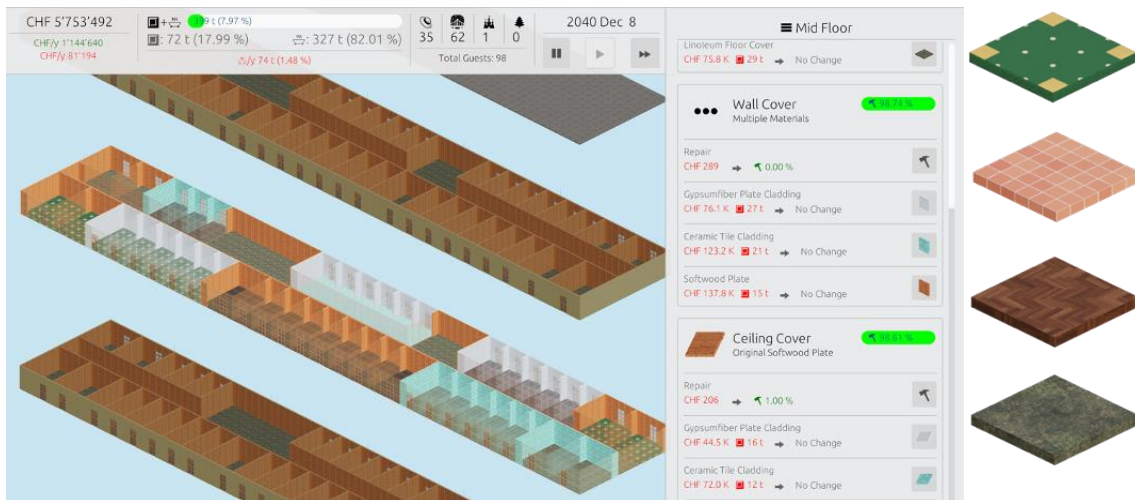

Figure 4. Left: Screenshot from the prototype game. Right: Icons for different floor components.[67]

RESULTS FROM USABILITY TEST

Overall, 12 architecture students (group 1, average age 23.5) and 13 pupils (group 2, average age 17.5), male and female, participated in the pilot session. The sessions were majorly conducted in a controlled environment in person or via zoom.[68] In contrast to the hypothesis, the results show that the usability ratings of the pupils (average score of 65) were considerably higher compared to the group of architecture students (average score of 55).

More specifically, almost no students answered that they regularly play on mobile phones or computers whereas the pupils irregularly play on mobile phones. Regarding the participants' backgrounds, all of the pupils and most of the students had never attended a course on LCA before. Interestingly, multiple students agreed that they would need to learn a lot before they could get going with the system while the pupils majorly disagreed or strongly disagreed. Further, most of the students and pupils disagreed that the prototype was unnecessarily complex. Multiple students and pupils answered that they would need more information on the topic and on the game, as well as support from a technical person to be able to use the prototype. Only some of the students but most of the pupils agreed that they would like to frequently use the prototype. Finally, most of the participants concluded that the various functions are well integrated and that the prototype was consistent.

DISCUSSION

Although there are clear limitations of the pilot study such as the differences in settings, the small sample of participants and the brief introduction to the prototype[69], multiple findings can be discussed. First, the answers indicate the need to further engage a young audience with life cycle assessment of buildings as not only the pupils but also the students reported no prior knowledge on LCA. The participant's answers on the connectedness and consistency of the prototype show its potential as a research tool. In contrast to the pupils, most of the students had previously shown little interest in games, which could explain why some of the students felt uncomfortable while gaming despite the prototype's

consistency. Further research with a larger and broader sample could demonstrate how to reach different subgroups of generation Z. Specifically, further investigation could show if pupils outperform students in terms of learning outcomes because the former feel more confident with games despite their lower level of education. In general, the results indicate that differentiating between subgroups of generation Z according to their digital literacy – which is not necessarily related to their level of education – might be important to effectively reach out.[70]

Connecting to the question of "on-boarding" the player, further investigation is needed on the interface design and with different settings, which change the games' role compared to the utilization as a stand-alone tool. Moving further from an interactive simulation to a game during the prototype's development, it is crucial to investigate the transfer of underlying data and models to the prototype to guarantee a scientifically sound and fun experience at the same time. To that end, it is important to mention that the prototype includes simplifications of LCEI and LCC data.[71] Further, the amount of available building components and characteristics is limited and simplified. However, these decisions can be justified with the prototype's primary aim to provide a reliable basis for the players' iterative exploration of preserving existing components while efficiently selecting new materials with a focus on the long-term.

CONCLUSION AND OUTLOOK

This paper discusses literature on serious games and a newly-developed game prototype. Literature on serious games in the given context offers the potential to reflect on innovative didactic approaches and to extend pedagogical frameworks including linear models of learning. Further research on utilizing serious games towards effective learning can be conducted by also reviewing commercial games not covered in scientific publications but included in app stores, game platforms, and archives. The introduced prototype allows players to iteratively analyse and evaluate economic and environmental implications within the complex interplay of maintenance, replacements, and refurbishment by systematically connecting building life cycle impacts. Thereby, a research gap on serious games in the given context was addressed by contextualizing effects of prolonged component lifetimes through regular maintenance with considerable impacts from "deep renovation". Thus, the prototype aims at a differentiated representation of building transformations focusing on the long-term. Further research on its application can be conducted within different theoretical frameworks such as "anchored instruction" or productive failure[72]. Further development of the prototype includes the transfer of realistic renovation scenarios to the gameplay based on parametric design. Finally, the pilot study indicates that differentiating between subgroups of generation Z might be crucial. However, the results signal a low entry hurdle of the prototype and its potential utilization without any prior knowledge on buildings or sustainability. Given this potential, the use of serious games to actively expand the players' decision-making space by connecting environmental assessment, preservation and heritage seems worth further investigation.

NOTES

[1] United Nations Environment Programme, "2021 Global Status Report for Buildings and Construction: Towards a Zero-Emission, Efficient and Resilient Buildings and Construction Sector" (Nairobi, 2021).

[2] "Renovation wave" European Commission, accessed May 20, 2022, https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en.

[3] Alina Galimshina et al., "What Is the Optimal Robust Environmental and Cost-Effective Solution for Building Renovation? Not the Usual One," *Energy and Buildings* 251 (2021): 111329.

[4] Kyriaki Goulouti et al., "Uncertainty of Building Elements' Service Lives in Building LCA; LCC: What Matters?," *Building and Environment* 183 (October 2, 2020).

[5] Galimshina et al., "What Is the Optimal Robust Environmental and Cost-Effective Solution for Building Renovation? Not the Usual One."

[6] Silke Langenberg, "Das Konzept 'Ersatz'? Probleme Bei Der Reparatur Industriell Gefertigter Bauteile," *Technikgeschichte* 79, no. 3 (2012): 255–72.

[7] H. Birgisdottir et al., "IEA EBC Annex 57 'Evaluation of Embodied Energy and CO_{2eq} for Building Construction,'" *Energy and Buildings* 154 (2017): 72–80.

[8] Martin Röck et al., "Embodied GHG Emissions of Buildings – The Hidden Challenge for Effective Climate Change Mitigation," *Applied Energy* 258 (2020): 114107.

[9] The two terms "refurbishment" and "renovation" are used synonymously in this paper.

[10] Niko Heeren and Stefanie Hellweg, "Tracking Construction Material over Space and Time: Prospective and Geo-Referenced Modeling of Building Stocks and Construction Material Flows," *Journal of Industrial Ecology* 23, no. 1 (2019): 253–67.

[11] Horace Herring, "Energy Efficiency—a Critical View," *Energy* 31, no. 1 (2006): 10–20. Elizabeth Shove, "What Is Wrong with Energy Efficiency?," *Building Research and Information* 46, no. 7 (2018): 779–89.

[12] Uta Hassler and Niklaus Kohler, "Umbau – Die Zukunft Des Bestands," in *Towards a Sustainable Development of the Built Environment*, ed. Uta Hassler (Zürich: vdf Hochschulverlag AG at ETH Zurich, 2011), 14–21.

[13] Climatestrike Switzerland, "Climate Action Plan," 2021. See https://admin.climatestrike.ch/uploads/Climate_Action_Plan_1_0_7ba47e3b16.pdf, accessed October 10, 2022.

[14] Especially, sustainable development goal number 4.7 targets "[…] knowledge and skills needed to promote sustainable development […]" for all learners. See https://sdgs.un.org/goals/goal4, accessed August 20, 2022.

[15] Generation Z can be defined as the follow-up group of "millennials", born after 1996, who are now between the ages of 10 and 25. Kim Parker and Ruth Igielnik, "On the Cusp of Adulthood and Facing an Uncertain Future: What We Know About Gen Z So Far," *Pew Research Center*, 2020. See https://www.pewresearch.org/social-trends/2020/05/14/on-the-cusp-of-adulthood-and-facing-an-uncertain-future-what-we-know-about-gen-z-so-far-2/, accessed August 22, 2022.

[16] Marc Prensky, "Digital Natives, Digital Immigrants," *On the Horizon* 9, no. 5 (2001).

[17] Parker and Igielnik, "On the Cusp of Adulthood and Facing an Uncertain Future: What We Know About Gen Z So Far."

[18] James Wright, "Introducing Sustainability into the Architecture Curriculum in the United States," *International Journal of Sustainability in Higher Education* 4, no. 2 (2003): 100–105.

[19] Sebastian Moffatt and Niklaus Kohler, "Conceptualizing the Built Environment as a Social–Ecological System," *Building Research & Information* 36, no. 3 (June 1, 2008): 248–68.

[20] Birgisdottir et al., "IEA EBC Annex 57 'Evaluation of Embodied Energy and CO2eq for Building Construction.'"

[21] Ulrich Götz, "Higher Education and the Transformation of Gaming," in *Not At Your Service. Manifestos for Design.*, ed. Franke Björn and Hansuli Matter (Basel: Birkhäuser, 2021), 107–24.

[22] Although earlier examples of serious games from the 1990s exist (e.g.: Chris Crawford's *Balance of the Planet*) as also shown by Jon E. Froehlich, "Gamifying Green: Gamification and Environmental Sustainability," in *The Gameful World: Approaches, Issues, Applications*, ed. Steffen Walz and Sebastian Deterding (Cambridge, Massachusetts: The MIT Press, 2015).

[23] Schweizer Bundesrat, "Games. Ein Aufstrebender Bereich Des Kulturschaffens" (Bern, 2018).

[24] The simulation game *Post-fossil cities* was currently developed in a research program funded by the Swiss National Science Foundation (SNSF). See publication: Sarah Zurmühle et al., "Developing a Configutation System for a Simulation Game in the Domain of Urban CO2 Emissions Reduction," in *Advances and New Trends in Environmental Informatics. Digital Twins for Sustainability*, ed. Andreas Kamilaris et al. (Springer Nature Switzerland, 2021), 165–79.

[25] Ludger Hovestadt, Urs Hirschberg, and Oliver Fritz, eds., *Atlas of Digital Architecture : Terminology, Concepts, Methods, Tools, Examples, Phenomena* (Basel: Birkhäuser, 2020).

[26] Matthias Noell, "Des Architekten Liebstes Spiel: Baukunst Aus Dem Baukasten," in *Spiele / Games (Figurationen : Gender, Literatur, Kultur; 5,1)*, ed. Caroline Torra-Mattenkott (Köln, 2004). Steffen P. Walz, "Topwards a Ludic Architecture. The Space of Play and Games" (ETH Zurich, 2010); Andri Gerber and Ulrich Götz, eds., *Architectonics of Game Spaces. The Spatial Logic of the Virtual and Its Meaning for the Real.* (Bielefeld: Transcript, 2019).

[27] Marta Brković Dodig and Linda N. Groat, *The Routledge Companion to Games in Architecture and Urban Planning : Tools for Design, Teaching, and Research* (New York, NY: Routledge, 2020); Mélanie van der Hoorn, *Serious Fun: Architecture & Games* (Rotterdam: nai010 publishers, 2022).

[28] Dominik Petko, "Unterrichten Mit Computerspielen : Didaktische Potenziale Und Ansätze Für Den Gezielten Einsatz in Schule Und Ausbildung," *Medienpädagogik*, 2008.

[29] Steffen P Walz and Sebastian Deterding, eds., *The Gameful World : Approaches, Issues, Applications* (Cambridge, Massachusetts: MIT Press, 2015).

[30] Jane McGonigal, *Reality Is Broken: Why Games Make Us Better and How They Can Change the World* (London: Vintage, 2012).

[31] References to reality can be thematic, logical-mathematical, etc. See: Petko, "Unterrichten Mit Computerspielen : Didaktische Potenziale Und Ansätze Für Den Gezielten Einsatz in Schule Und Ausbildung." "Unterrichten Mit Computerspielen : Didaktische Potenziale Und Ansätze Für Den Gezielten Einsatz in Schule Und Ausbildung."

[32] Victor Turner, "Liminal to Liminoid, in Play, Flow, and Ritual: An Essay in Comparative Symbology," *Rice Institute Pamphlet – Rice University Studies* 60, no. 3 (1974): 53–92.

[33] Current constructivist strands are based on works by Kurt Lewin, Jean Piaget, and John Dewey. See: David Kolb, *Experiential Learning : Experience as the Source of Learning and Development* (Pearson Education, 2014).

[34] Wolfgang Schnotz, "Wissenserweb Mit Multimedia," *Unterrichtswissenschaft* 29, no. 4 (2001).

[35] Kolb, *Experiential Learning : Experience as the Source of Learning and Development*.

[36] Tobias Viere et al., "Teaching Life Cycle Assessment in Higher Education," *International Journal of Life Cycle Assessment* 26, no. 3 (2021): 511–27.

[37] Viere et al.; Nuno Cosme et al., "Learning-by-Doing: Experience from 20 Years of Teaching LCA to Future Engineers," *International Journal of Life Cycle Assessment* 24, no. 3 (2019): 553–65; Vedaraman Sriraman, Anthony Torres, and Araceli Martinez Ortiz, "Teaching Sustainable Engineering and Industrial Ecology Using a Hybrid Problem-Project Based Learning Approach," *Journal of Engineering Technology* 34, no. 2 (2017): 8–15; Bastien Roure et al., "Systematic Curriculum Integration of Sustainable Development Using Life Cycle Approaches: The Case of the Civil Engineering Department at the Université de Sherbrooke," *International Journal of Sustainability in Higher Education* 19, no. 3 (2018): 589–607.

[38] E.g.: level 1 is corresponding to the first learning outcome (remember) in the taxonomy derived from Bloom.

[39] This approach can be described as "anchored instruction" and is based on the theory of "situated learning". See: Petko, "Unterrichten Mit Computerspielen : Didaktische Potenziale Und Ansätze Für Den Gezielten Einsatz in Schule Und Ausbildung." Finally, "ludic learning space" could allow "[…] players to come back to the familiar experience with a fresh perspective." [39] and thus, enhancing considerations on environmental sustainability in contrast to green gamification elements. Green gamification can be seen as a different approach discussed in: Froehlich, "Gamifying Green: Gamification and Environmental Sustainability." Examples for "green gamification" are "eco-feedback" devices such as gamified smart meters as well as games that encourage energy saving behavior such as *Energy Battle*: Daphne Geelen et al., "Exploring the Use of a Game to Stimulate Energy Saving in Households," *Journal of Design Research* 10, no. 1–2 (2012). Gamification has been criticized frequently, for instance: Ian Bogost, "Why Gamification Is Bullshit," in *The Gameful World: Approaches, Issues, Applications*, ed. Steffen P Walz and Sebastian Deterding (The MIT Press, 2015).

[40] Jose Sanchez, "Developing an Architectural Simulation Video Game.," *Real Time - Proceedings of the 33rd ECAAD Conference* 1 (2015): 89–97.

[41] Magnus Bang, Carin Torstensson, and Cecilia Katzeff, *The PowerHouse: A Persuasive Computer Game Designed to Raise Awareness of Domestic Energy Consumption*, ed. Wijnand Ijsselsteijn, Yvonne de Kort, and Cees Midden, *Lecture Notes in Computer Science: Persuasive Technology Technology* (Eindhoven: Springer, 2006); Boyan Bontchev et al., "'Let Us Save Venice'—An Educational Online Maze Game for Climate Resilience," *Sustainability (Switzerland)* 14, no. 1 (2021).

[42] Byron Reeves et al., "Increasing Energy Efficiency With Entertainment Media: An Experimental and Field Test of the Influence of a Social Game on Performance of Energy Behaviors," *Environment and Behavior* 47, no. 1 (2015): 102–15; Anton Gustafsson, Magnus Bång, and Mattias Svahn, "Power Explorer - A Casual Game Style for

Encouraging Long Term Behavior Change among Teenagers," *ACM International Conference Proceeding Series*, 2009, 182–89.

43 Stefano Perini et al., "Learning and Motivational Effects of Digital Game-Based Learning (DGBL) for Manufacturing Education –The Life Cycle Assessment (LCA) Game," *Computers in Industry* 102 (2018): 40–49; Yi Kai Juan and Tseng Wei Chao, "Game-Based Learning for Green Building Education," *Sustainability (Switzerland)* 7, no. 5 (2015): 5592–5608; Gillian Puttick and Eli Tucker-Raymond, "Building Systems from Scratch: An Exploratory Study of Students Learning About Climate Change," *Journal of Science Education and Technology* 27, no. 4 (2018): 306–21; Eray Şahbaz and Aysun Özköse, "Experiencing Historical Buildings through Digital Computer Games," *International Journal of Architectural Computing* 16, no. 1 (2018): 22–33; Thomas Korman and Hal Johnston, "Enhancing Construction Management Education Though the Use of a Virtual Construction Company Simulation System," *IMETI 2010 - 3rd International Multi-Conference on Engineering and Technological Innovation, Proceedings* 2 (2010): 30–34; Christoph F Reinhart et al., "Lessons Learned from a Simulation-Based Approach to Teaching Building Science to Designers," *Proceedings of Building Simulation 2015: 14th Conference of International Building Performance Simulation Association, Hyderabad, India* 1 (2015): 1126–33.

44 Hazar Dib and Nicoletta Adamo-Villani, "Serious Sustainability Challenge Game to Promote Teaching and Learning of Building Sustainability," *Journal of Computing in Civil Engineering* 28, no. 5 (2014): 1–11; Mélanie Despeisse, "Teaching Sustainability Leadership in Manufacturing: A Reflection on the Educational Benefits of the Board Game Factory Heroes," *Procedia CIRP* 69, no. May (2018): 621–26; Juan and Chao, "Game-Based Learning for Green Building Education."; Perini et al., "Learning and Motivational Effects of Digital Game-Based Learning (DGBL) for Manufacturing Education –The Life Cycle Assessment (LCA) Game."

45 Katherine A. Whalen et al., "'All They Do Is Win': Lessons Learned from Use of a Serious Game for Circular Economy Education," *Resources, Conservation and Recycling* 135, no. June 2017 (2018): 335–45.

46 Perini et al., "Learning and Motivational Effects of Digital Game-Based Learning (DGBL) for Manufacturing Education –The Life Cycle Assessment (LCA) Game."

47 Şahbaz and Özköse, "Experiencing Historical Buildings through Digital Computer Games."

48 Legend to table: sg = digital simulation games, bg = board games, ar = augmented reality simulation games, rpg = role playing game.

49 The project team involved chairs from three different departments of ETH Zurich: Department of Architecture, Department of Computer Science, and the Department of Civil, Environmental and Geomatic Engineering.

50 See https://www.rust-lang.org, accessed May 26, 2022.

51 See https://bevyengine.org, accessed May 26, 2022.

52 See https://github.com/emilk/egui, accessed May 26, 2022.

53 Unknown, "Sanatorium Schatzalp Bei Davos: Erbaut von Pfleghard & Häfeli, Architekten," *Schweizerische Bauzeitung* 39/40, no. 2 (1902): 29. Although the interior layouts of the guest rooms changed continuously since 1900 and today present a rich selection of different materials from different times, many original characteristics and most importantly, the structure in reinforced concrete have been preserved. The composition of the guest rooms was documented through on-site inspections and compared with existing documentation of the heritage object to inform the database of the prototype.

54 For component lifetimes, a minimum and a maximum lifetime curve are defined by a cubic polynomial based on Sébastien Lasvaux et al., "DUREE Project, Analysis of Lifetimes of Building Elements in the Literature and in Renovation Practices and Sensitivity Analyses on Building LCA & LCC," 2019., combined with a repair model based on Abolfazl Farahani, Holger Wallbaum, and Jan Olof Dalenbäck, "Optimized Maintenance and Renovation Scheduling in Multifamily Buildings–a Systematic Approach Based on Condition State and Life Cycle Cost of Building Components," *Construction Management and Economics* 37, no. 3 (2019): 139–55.f and

55 The heating demand calculation is based on a simplified calculation according to SIA 380/1, "Heizwärmebedarf" (2016).

56 See https://www.kbob.admin.ch/kbob/de/home/themen-leistungen/nachhaltiges-bauen/oekobilanzdaten_baubereich.html, accessed May 20, 2022. Embodied and operational GHG emissions for building components and the heating system are taken from the KBOB dataset. KBOB data is a frequently used data source for LCA of buildings in Switzerland, based on the ecoinvent database (see: https://ecoinvent.org, accessed May 20, 2022). Further sources include: Österreichisches Institut für Baubiologie und -ökologie (IBO), ed., *Details for Passive Houses: Renovation: A Catalogue of Ecologically Rated Constructions for Renovation* (Berlin, Boston: Birkhäuser, 2016).; Bauteilkatalog, https://www.bauteilkatalog.ch/Home, accessed April 19, 2022; Hiberatlas, https://www.hiberatlas.com/en/welcome-1.html, accessed March 28, 2022.

57 Inflation and discounting are not considered in the given formulas.

58 The calculation of *building comfort* is based on the condition of all building's components and the thermal performance of the building envelope. The calculation of *building ecology* is based on a carbon budget for

operational and embodied GHG emissions. The calculation within the context of heritage objects is based on a high proportion of original building components or replaced components with comparable materiality and an average age of the sum of all components compared to the maximum age of the sum of all components.

[59] Relevant building components are included such as interior floor, wall, and ceiling cover, insulation in the building envelope, exterior façade cover, roofing, window frame and glazing, and the heating system.

[60] Parameters feature a description, lifetimes (y), LCEI (kg CO_2-eq./m^2), costs (CHF/m^2), conductivity (m^2K/W), availability (y), and component age (y).

[61] The illustration shows a copy of a floorplan (3rd floor) of the Hotel Schatzalp, presumably from the early years of the hotel. The undated document was retrieved from Dokumentationsbibliothek Davos (Switzerland).

[62] Lasvaux et al., "DUREE Project, Analysis of Lifetimes of Building Elements in the Literature and in Renovation Practices and Sensitivity Analyses on Building LCA & LCC." Retrieved from:
https://www.aramis.admin.ch/Texte/?ProjectID=38626; Farahani, Wallbaum, and Dalenbäck, "Optimized Maintenance and Renovation Scheduling in Multifamily Buildings–a Systematic Approach Based on Condition State and Life Cycle Cost of Building Components."

[63] CRB ed., "LCC Handbuch, Instandhaltung Und Instandsetzung von Bauwerken" (2012); SIA 2032, "Graue Energie – Ökobilanzierung Für Die Erstellung von Gebäuden" (2018).

[64] Credits: Fraser Rothnie. Game Technology Center, ETH Zurich.

[65] The system usability scale includes 10 short questions according to the Likert scale (from 1 *strongly disagree* to 5 *strongly agree*). John Brooke, "SUS: A Retrospective," *Journal of Usability Studies* 8, no. 2 (2013): 29–40.

[66] The first minutes of the study started with an introduction on the prototype and its objectives. Afterwards, the students participated in a gaming session using a web-app of the prototype. At the end of this first session, the participants were asked to answer an online questionnaire written with Google forms including questions on usability (part 1) and general questions on the player's profile and views (part 2). The survey included questions on the study participants' profile, their study background, gaming experience, two questions on LCA in education, and final comments on the prototype

[67] Credits: Violaine Fayolle. Game Technology Center, ETH Zurich.

[68] To increase the sample size of group 1, additional tests were conducted online in an uncontrolled environment.

[69] Detailed video trailers including animations and narratives can be used to engage the player already before gaming.

[70] In addition, it may be important to consider that environmental awareness may not necessarily imply LCA literacy, as well as digital natives might not necessarily be considered digitally literate.

[71] An important simplification includes the usage of data representing the current assessment of life cycle environmental impacts of building materials which do not include projections in past fabrication processes (and especially energy supply) or relevant future developments in materials research.

[72] Manu Kapur and Katerine Bielaczyc, "Designing for Productive Failure," *Journal of the Learning Sciences* 21, no. 1 (2012): 45–83.

BIBLIOGRAPHY

Bang, Magnus, Carin Torstensson, and Cecilia Katzeff. *The PowerHouse: A Persuasive Computer Game Designed to Raise Awareness of Domestic Energy Consumption.* Edited by Wijnand Ijsselsteijn, Yvonne de Kort, and Cees Midden. *Lecture Notes in Computer Science: Persuasive Technology Technology.* Eindhoven: Springer, 2006.

Birgisdottir, H., A. Moncaster, A. Houlihan Wiberg, C. Chae, K. Yokoyama, M. Balouktsi, S. Seo, T. Oka, T. Lützkendorf, and T. Malmqvist. "IEA EBC Annex 57 'Evaluation of Embodied Energy and CO2eq for Building Construction.'" *Energy and Buildings* 154 (2017): 72–80.

Bogost, Ian. "Why Gamification Is Bullshit." In *The Gameful World: Approaches, Issues, Applications*, edited by Steffen P Walz and Sebastian Deterding. The MIT Press, 2015.

Bontchev, Boyan, Albena Antonova, Valentina Terzieva, and Yavor Dankov. "'Let Us Save Venice'—An Educational Online Maze Game for Climate Resilience." *Sustainability (Switzerland)* 14, no. 1 (2021).

Brooke, John. "SUS: A Retrospective." *Journal of Usability Studies* 8, no. 2 (2013): 29–40.

Climatestrike Switzerland. "Climate Action Plan," 2021.

Cosme, Nuno, Michael Z. Hauschild, Christine Molin, Ralph K. Rosenbaum, and Alexis Laurent. "Learning-by-Doing: Experience from 20 Years of Teaching LCA to Future Engineers." *International Journal of Life Cycle Assessment* 24, no. 3 (2019): 553–65.

CRB ed. LCC Handbuch, Instandhaltung und Instandsetzung von Bauwerken (2012).

Despeisse, Mélanie. "Teaching Sustainability Leadership in Manufacturing: A Reflection on the Educational Benefits of the Board Game Factory Heroes." *Procedia CIRP* 69, no. May (2018): 621–26.

Dib, Hazar, and Nicoletta Adamo-Villani. "Serious Sustainability Challenge Game to Promote Teaching and Learning of Building Sustainability." *Journal of Computing in Civil Engineering* 28, no. 5 (2014): 1–11.

Dodig, Marta Brković, and Linda N. Groat. *The Routledge Companion to Games in Architecture and Urban Planning : Tools for Design, Teaching, and Research*. New York, NY: Routledge, 2020.

Farahani, Abolfazl, Holger Wallbaum, and Jan Olof Dalenbäck. "Optimized Maintenance and Renovation Scheduling in Multifamily Buildings–a Systematic Approach Based on Condition State and Life Cycle Cost of Building Components." *Construction Management and Economics* 37, no. 3 (2019): 139–55.

Froehlich, Jon E. "Gamifying Green: Gamification and Environmental Sustainability." In *The Gameful World: Approaches, Issues, Applications*, edited by Steffen Walz and Sebastian Deterding. Cambridge, Massachusetts: The MIT Press, 2015.

Galimshina, Alina, Maliki Moustapha, Alexander Hollberg, Pierryves Padey, Sébastien Lasvaux, Bruno Sudret, and Guillaume Habert. "What Is the Optimal Robust Environmental and Cost-Effective Solution for Building Renovation? Not the Usual One." *Energy and Buildings* 251 (2021): 111329.

Geelen, Daphne, David Kayson, Stella Boess, and Han Brezet. "Exploring the Use of a Game to Stimulate Energy Saving in Households." *Journal of Design Research* 10, no. 1–2 (2012).

Gerber, Andri, and Ulrich Götz, eds. *Architectonics of Game Spaces. The Spatial Logic of the Virtual and Its Meaning for the Real.* Bielefeld: Transcript, 2019.

Götz, Ulrich. "Higher Education and the Transformation of Gaming." In *Not At Your Service. Manifestos for Design.*, edited by Franke Björn and Hansuli Matter, 107–24. Basel: Birkhäuser, 2021.

Goulouti, Kyriaki, Pierryves Padey, Alina Galimshina, Guillaume Habert, and Sébastien Lasvaux. "Uncertainty of Building Elements' Service Lives in Building LCA; LCC: What Matters?" *Building and Environment* 183 (October 2, 2020).

Gustafsson, Anton, Magnus Bång, and Mattias Svahn. "Power Explorer - A Casual Game Style for Encouraging Long Term Behavior Change among Teenagers." *ACM International Conference Proceeding Series*, 2009, 182–89.

Hassler, Uta, and Niklaus Kohler. "Umbau – Die Zukunft Des Bestands." In *Towards a Sustainable Development of the Built Environment*, edited by Uta Hassler, 14–21. Zürich: vdf Hochschulverlag AG at ETH Zurich, 2011.

Heeren, Niko, and Stefanie Hellweg. "Tracking Construction Material over Space and Time: Prospective and Geo-Referenced Modeling of Building Stocks and Construction Material Flows." *Journal of Industrial Ecology* 23, no. 1 (2019): 253–67.

Herring, Horace. "Energy Efficiency—a Critical View." *Energy* 31, no. 1 (2006): 10–20.

Hoorn, Mélanie van der. *Serious Fun: Architecture & Games*. Rotterdam: nai010 publishers, 2022.

Hovestadt, Ludger, Urs Hirschberg, and Oliver Fritz, eds. *Atlas of Digital Architecture : Terminology, Concepts, Methods, Tools, Examples, Phenomena*. Basel: Birkhäuser, 2020.

Juan, Yi Kai, and Tseng Wei Chao. "Game-Based Learning for Green Building Education." *Sustainability (Switzerland)* 7, no. 5 (2015): 5592–5608.

Kapur, Manu, and Katerine Bielaczyc. "Designing for Productive Failure." *Journal of the Learning Sciences* 21, no. 1 (2012): 45–83.

Kolb, David. *Experiential Learning : Experience as the Source of Learning and Development*. Pearson Education, 2014.

Korman, Thomas, and Hal Johnston. "Enhancing Construction Management Education Though the Use of a Virtual Construction Company Simulation System." *IMETI 2010 - 3rd International Multi-Conference on Engineering and Technological Innovation, Proceedings* 2 (2010): 30–34.

Langenberg, Silke. "Das Konzept 'Ersatz'? Probleme Bei Der Reparatur Industriell Gefertigter Bauteile." *Technikgeschichte* 79, no. 3 (2012): 255–72.

Lasvaux, Sébastien, Morgane Giorgi, Joanne Lesage, Guy Wagner, Didier Favre, Pierryves Padey, Blaise Périsset, et al. "DUREE Project, Analysis of Lifetimes of Building Elements in the Literature and in Renovation Practices and Sensitivity Analyses on Building LCA & LCC," 2019.

McGonigal, Jane. *Reality Is Broken: Why Games Make Us Better and How They Can Change the World*. London: Vintage, 2012.

Moffatt, Sebastian, and Niklaus Kohler. "Conceptualizing the Built Environment as a Social–Ecological System." *Building Research & Information* 36, no. 3 (June 1, 2008): 248–68.

Noell, Matthias. "Des Architekten Liebstes Spiel: Baukunst Aus Dem Baukasten." In *Spiele / Games (Figurationen : Gender, Literatur, Kultur; 5,1)*, edited by Caroline Torra-Mattenkott. Köln, 2004.

Österreichisches Institut für Baubiologie und -ökologie (IBO), ed. *Details for Passive Houses: Renovation: A Catalogue of Ecologically Rated Constructions for Renovation*. Berlin, Boston: Birkhäuser, 2016.

Parker, Kim, and Ruth Igielnik. "On the Cusp of Adulthood and Facing an Uncertain Future: What We Know About Gen Z So Far." *Pew Research Center*, 2020.

Perini, Stefano, Rossella Luglietti, Maria Margoudi, Manuel Oliveira, and Marco Taisch. "Learning and Motivational Effects of Digital Game-Based Learning (DGBL) for Manufacturing Education –The Life Cycle Assessment (LCA) Game." *Computers in Industry* 102 (2018): 40–49.

Petko, Dominik. "Unterrichten Mit Computerspielen : Didaktische Potenziale Und Ansätze Für Den Gezielten Einsatz in Schule Und Ausbildung." *Medienpädagogik*, 2008.

Prensky, Marc. "Digital Natives, Digital Immigrants." *On the Horizon* 9, no. 5 (2001).

Puttick, Gillian, and Eli Tucker-Raymond. "Building Systems from Scratch: An Exploratory Study of Students Learning About Climate Change." *Journal of Science Education and Technology* 27, no. 4 (2018): 306–21.

Reeves, Byron, James J. Cummings, James K. Scarborough, and Leo Yeykelis. "Increasing Energy Efficiency With Entertainment Media: An Experimental and Field Test of the Influence of a Social Game on Performance of Energy Behaviors." *Environment and Behavior* 47, no. 1 (2015): 102–15.

Reinhart, Christoph F, Jeffrey Geisinger, Timur Dogan, and Emmanouil Saratsis. "Lessons Learned from a Simulation-Based Approach to Teaching Building Science to Designers." *Proceedings of Building Simulation 2015: 14th Conference of International Building Performance Simulation Association, Hyderabad, India* 1 (2015): 1126–33.

Röck, Martin, Marcella Ruschi Mendes Saade, Maria Balouktsi, Freja Nygaard Rasmussen, Harpa Birgisdottir, Rolf Frischknecht, Guillaume Habert, Thomas Lützkendorf, and Alexander Passer. "Embodied GHG Emissions of Buildings – The Hidden Challenge for Effective Climate Change Mitigation." *Applied Energy* 258 (2020): 114107.

Roure, Bastien, Chirjiv Anand, Véronique Bisaillon, and Ben Amor. "Systematic Curriculum Integration of Sustainable Development Using Life Cycle Approaches: The Case of the Civil Engineering Department at the Université de Sherbrooke." *International Journal of Sustainability in Higher Education* 19, no. 3 (2018): 589–607.

Şahbaz, Eray, and Aysun Özköse. "Experiencing Historical Buildings through Digital Computer Games." *International Journal of Architectural Computing* 16, no. 1 (2018): 22–33.

Sanchez, Jose. "Developing an Architectural Simulation Video Game." *Real Time - Proceedings of the 33rd ECAAD Conference* 1 (2015): 89–97.

Schnotz, Wolfgang. "Wissenserweb Mit Multimedia." *Unterrichtswissenschaft* 29, no. 4 (2001).

Schweizer Bundesrat. "Games. Ein Aufstrebender Bereich Des Kulturschaffens." Bern, 2018.

Shove, Elizabeth. "What Is Wrong with Energy Efficiency?" *Building Research and Information* 46, no. 7 (2018): 779–89.

SIA 2032. Graue Energie – Ökobilanzierung für die Erstellung von Gebäuden (2018).

SIA 380/1. Heizwärmebedarf (2016).

Sriraman, Vedaraman, Anthony Torres, and Araceli Martinez Ortiz. "Teaching Sustainable Engineering and Industrial Ecology Using a Hybrid Problem-Project Based Learning Approach." *Journal of Engineering Technology* 34, no. 2 (2017): 8–15.

Turner, Victor. "Liminal to Liminoid, in Play, Flow, and Ritual: An Essay in Comparative Symbology." *Rice Institute Pamphlet – Rice University Studies* 60, no. 3 (1974): 53–92.

United Nations Environment Programme. "2021 Global Status Report for Buildings and Construction: Towards a Zero-Emission, Efficient and Resilient Buildings and Construction Sector." Nairobi, 2021.

Unknown. "Sanatorium Schatzalp Bei Davos: Erbaut von Pfleghard & Häfeli, Architekten." *Schweizerische Bauzeitung* 39/40, no. 2 (1902): 29.

Viere, Tobias, Ben Amor, Nicolas Berger, Ruba Dolfing Fanous, Rachel Horta Arduin, Regula Keller, Alexis Laurent, et al. "Teaching Life Cycle Assessment in Higher Education." *International Journal of Life Cycle Assessment* 26, no. 3 (2021): 511–27.

Walz, Steffen P. "Topwards a Ludic Architecture. The Space of Play and Games." ETH Zurich, 2010.

Walz, Steffen P, and Sebastian Deterding, eds. *The Gameful World : Approaches, Issues, Applications*. Cambridge, Massachusetts: MIT Press, 2015.

Whalen, Katherine A., Cecilia Berlin, Johanna Ekberg, Ilaria Barletta, and Peter Hammersberg. "'All They Do Is Win': Lessons Learned from Use of a Serious Game for Circular Economy Education." *Resources, Conservation and Recycling* 135, no. June 2017 (2018): 335–45.

Wright, James. "Introducing Sustainability into the Architecture Curriculum in the United States." *International Journal of Sustainability in Higher Education* 4, no. 2 (2003): 100–105.

Zurmühle, Sarah, João S. V. Gonçalves, Patrick Wäger, Andreas Gerber, and Lorenz M. Hilty. "Developing a Configutation System for a Simulation Game in the Domain of Urban CO2 Emissions Reduction." In *Advances and New Trends in Environmental Informatics. Digital Twins for Sustainability*, edited by Andreas Kamilaris, Andreas Wohlgemuth, Kostas Karatzas, and Ioannis N. Athanasiadis, 165–79. Springer Nature Switzerland, 2021.

ADVANTAGES AND DISADVANTAGES OF REMOTE LEARNING: A CASE OF DESIGN WORKSHOP

Author:
NERANTZIA JULIA TZORTZI, RITA MARIA CRISTINA LUIGIA MUSACCHIO, OZGE OGUT

Affiliation:
POLITECNICO DI MILANO, ITALY

INTRODUCTION

COVID-19 pandemic has been a stress test in many fields including education from one point, however, it is also an opportunity to see how the current education system is fragile and to have test for a whole remote learning.

Remote learning can be confusing with the following phrases: distant learning, online learning, digital learning, and virtual learning. Godschalk and Lacey,[1] defined remote learning as a process of teaching and learning that relies on a mode of delivery that is available anytime and anywhere to suit the needs of individual students; selective use of communication tools to facilitate self-learning as well as group learning experiences; and collaborative learning approaches that encourage student-to-student and faculty-to-student interaction. On the other hand, some scholars are conflicting by the statement of The Digital learning process does not merely represent a learning system in the literature.

Remote learning in history

To interpret the reflection of COVID-19 pandemic on education, it is important to understand the development in remote teaching activities (figure 1). In learning and teaching activities in general, the very first milestone is the invention of writing, that we can date back to approximately 5000 years old. From technological aspect, a crucial invention that played a very big role in the discipline of education is invention of printing. This machine has a long story of evolution but the very first one, the ancestor, can be dated back to 500 years ago to German goldsmith Johannes Gutenberg who is credited with inventing the printing press around 1436.[2]

Even though most people have the impression that remote learning almost emerged with this final pandemic, it is not a fact, it is only an increase. In figure 1 some technological development regarding computer networks and correspondingly the pioneer in online education is presented. In the early years, academics and educators had limited access to computer networks. Nonetheless, many of the scientific researchers involved in early experiments with ARPANET were also academics, and by starting to link their students with the larger knowledge community, they introduced e-mail and computer conferencing into their courses.[3] Educational adoption of computer networking began in the mid-1970s, following closely upon the invention of e-mail in 1971 and computer conferencing in 1971. One of the earliest examples was the Canadian ReÂseau d'Ateliers PeÂdagogique Pilot (RAPPI) network, which linked schoolchildren and teachers in over 70 secondary schools in Canada, France, England, and Italy. RAPPI used the computer conferencing system at the University of British Columbia and Canada for

information exchange.[4] As access to computers and networks continued to grow from the early 1980s, online collaborative learning started to be existing.
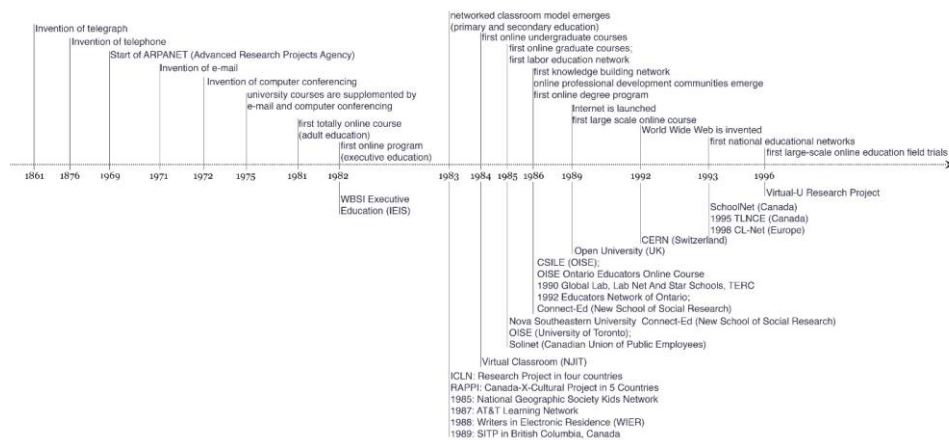
Invention of telegraph
Invention of telephone
Start of ARPANET (Advanced Research Projects Agency)
Invention of e-mail
Invention of computer conferencing
university courses are supplemented by e-mail and computer conferencing
first totally online course (adult education)
first online program (executive education)

networked classroom model emerges (primary and secondary education)
first online undergraduate courses;
first online graduate courses;
first labor education network
first knowledge building network
online professional development communities emerge
first online degree program
Internet is launched
first large scale online course
World Wide Web is invented
first national educational networks
first large-scale online education field trials

1861 1876 1969 1971 1972 1975 1981 1982   1983 1984 1985 1986   1989   1992   1993   1996

WBSI Executive Education (IEIS)

Virtual-U Research Project
SchoolNet (Canada)
1995 TLNCE (Canada)
1996 CL-Net (Europe)
CERN (Switzerland)
Open University (UK)
CSILE (OISE);
OISE Ontario Educators Online Course
1990 Global Lab, Lab Net And Star Schools, TERC
1992 Educators Network of Ontario;
Connect-Ed (New School of Social Research)
Nova Southeastern University Connect-Ed (New School of Social Research)
OISE (University of Toronto);
Solinet (Canadian Union of Public Employees)
Virtual Classroom (NJIT)
ICLN: Research Project in four countries
RAPPI: Canada-X-Cultural Project in 5 Countries
1985: National Geographic Society Kids Network
1987: AT&T Learning Network
1988: Writers in Electronic Residence (WIER)
1989: SITP in British Columbia, Canada

Figure 1. History of remote teaching, produced after.[5]

Learning during previous pandemics

The Covid-19 was not the first health crisis humanity have faced. There were many epidemics and pandemics before such as the flu pandemic in 1918 and swine flu in 2009. During both epidemics, institutions of higher education (IHEs) were able to contain the viruses on campuses and maintain continuity of education.[6] First of all, during these previous epidemics, student populations were smaller. In 1918, morale played a factor. At that time, many citizens were serving in WWI. Their sacrifices overshadowed the sacrifices required by those whose education was inconvenienced.[7] Regarding swine flu, Self-isolation on campus was possible, and classes continued safely through restructuring and by adding a distance-learning component.[8]

In 2009, the Centers for Disease Control (CDC) created guidelines for IHEs to follow in the event of a pandemic. Unfortunately, the H1N1 influenza virus hit before most plans were solidified. But The H1N1 virus was managed with an abundance of caution and was contained within most campuses and controlled by the institutions. Very few institutions needed to shut down. so based on previous studies the big success was due to high engagement of students.[9] Guidelines were updated in 2017 by the American College Health Association (ACHA), and academic affairs were also addressed. One guideline was to develop and disseminate alternative procedures for completing coursework such as through web-based instruction or lessons and assignments delivered by mail.[10]

Remote learning in design fields after COVID-19 Pandemic

This new pandemic, COVID-19, showed us it is much more important to be proactive than reactive. Because the spread was much faster/unpredictable and the from medical point of view it was more serious the results. And it was an inevitable action to shut down the institutions, academies, universities due to inevitable quarantine. The response to this shutdown showed that we are not so ready in educational institutions to move remote learning.

Due to quarantine, social distancing measures, and disruption in academic schedule, students are likely to suffer from psychological problems such as future anxiety, stress, anger, loneliness, and boredom. A sudden disruption in education amid COVID-19 may result in the feeling of future anxiety that makes a student highly anxious and threatened about the future, the excess of which considered a psychological disorder. Many students were found worried and uncertain about exams, graduation, receiving an academic degree in time. They were also worried about an individual and family's health. This

phenomenon is likely to affect the student's ability to cope with the changing circumstances and respond to the forced immersion into digital learning, which is altogether different from traditional classroom teaching.

The COVID-19 pandemic and its related control measures have forced many higher educational institutes to migrate their teaching into virtual space. For most schools of architecture design studio is the central pedagogical approach; its migration to virtual space raises a few issues.[11] Virtual Design Studio has been a part of architectural pedagogy for more than two decades.[12] The approached to remote learning in design studios in the literature is conflicting. As Gokhale and Vaze,[13] investigated the Impact of the pandemic on Architectural Education, they reviewed both positive and negative aspects. Architectural education is moving towards digitalization, where students are using the simulation-based design process to incorporate experimentation and thinking through making.[14] Virtual Design Studio has shown significant potential in creating a more connected, multicultural, and interdisciplinary environment for learning.[15] Last but not least, the students of today are those who have been born and raised with digital communication media, they are the native speakers of the language of digital space[16] and technology has become cheaper, more accessible, and an inseparable part of everyday life. Despite all these positive approaches, there are also negative approaches that says this teaching method is not effective in deign fields. For instance, the design studio is not a mere classroom but is a way of life and poses an interconnected intrinsic socio-spatial character.[17] Design studio education aimed at the initiation of creativity achieved with enhanced social interaction and collaboration.[18] The design studio is a social learning space where teaching and learning processes occur in the face-to-face mode in a physical space.[19] A study, conducted after COVID-19 pandemic stated that design education is not only about problem-solving and design products; it is also about developing a social character, a communicable identity with the capacity to observe and make peer connections.[20]

MATERIALS AND METHODS
The case: Workshop Briefing

An intense design workshop, Special topics in Landscape design, that is one of the elective workshops for master students to attend in Politecnico di Milano (POLIMI), in the program of Sustainable Architecture and Landscape Design.[21] It is structured on the platform of a professional design office with individual and collaborative modes of working. In each edition, it explores the conceptual framework that guided the production of forms in today's landscape architectural practice through a multidisciplinary approach. Pin-ups and design critiques contribute to the process.

The last (2021) edition is called as the 'Green vs Grey'. And guidelines were given to students in order to transform the historical city centre of Piacenza into a network of sustainable urban landscape. The purpose of the workshop is to find ways of improving the city's resilience to climate change, enhancing the public realm, and increasing connectivity in the city centre. This course aims to examine the ways of incorporating more green spaces with as specific focus on vertical green systems. The course showed the historical use, the characteristics, and benefits of vertical greenery. It further analysed their use on the city of Piacenza, to find methods of using them in other public spaces in historic towns. Students were expected to explore, evaluate, and practice all forms of design and planning communication: graphic representation, verbal presentation, and critique discussions. The syllabus consists of introductory lectures as well as an intensive studio work to comprehend the principles and concepts behind evaluating, analyzing, and designing vertical and open spaces.

In the framework of this workshop, many speakers (from Italy, Greece, Cyprus, UK, America, Australia) who are expects in their fields are invited to give a lecture on several topics about greening in built environment, green infrastructures e.g., urban parks and vertical greenery, benefits of greenery like air purification or biodiversity enhancement. The poster (see figure 2) included all the

intercontinental invited speakers' lectures with timeline, as well we a brief introduction of the workshop. The invited guests' lectures are organized open to everyone, so this poster is shared on social media channels, as well as official communication channels of POLIMI, to let invite other possible interested audience to enhance the collaboration and share the knowledge as much as possible.

Figure 2. Workshop poster used to disseminate (Ogut, O., 2021)

Questionnaire content

The questionnaire consists of 6 classes of questions besides the introductory questions i.e., (1) Interest for this course, (2) Teaching, (3) Lecturers, (4) Supplementary educational activities, (5) Infrastructures for this course, (6) Overall satisfaction for this course. For each of the ensuing questions, the students were asked to choose one of the four available answers (strongly disagree, partly disagree, partly agree, and strongly agree), which refer to the numeric values 1, 2, 3, and 4 respectively to run statistical analysis. OriginPro version 2018[22] used to conduct the statistical analysis. Questions are listed below:

Introductory Questions:
-Cross out your lesson-attendance rate for this course.
-Estimate the average number of students attending classes in this course at distance.
-How big is the individual workload required in this course?
-What percentage of the workload did you covers so far?
-If less than 25% specify a reason.

	Interest for the Course
1	You are interested in the course subject (regardless of how it is carried out).
	Teaching
2	Your prerequisites were good enough for an adequate understanding of the subject.
3	The teaching was carried out consistently with the plan on the course website page.
4	There were no useless subject-reiterations from other courses you attended.
5	The required workload in this course is proportioned to the awarded credits.
6	The educational material (either recommended or supplied) is adequate.
	Lecturers
7	The lecturer is able to motivate my interest in the subject.
8	The lecturer clearly explains the subject.
9	Lectures enhance the learning process.
10	Exam modalities and procedures are clear.
11	The educational material was provided in due time by lecturers.
12	Classes comply with the scheduled timetable.
13	Lecturers are available for clarifications and explanations.
	Supplementary Educational Activities
14	Supplementary activities match with classes.
15	Attending non-class activities (trainings, tutorials, laboratories, etc.) is beneficial to the learning process.
16	Trainers/tutors clearly and effectively explain the subject.
	Infrastructures for the Course
17	Lecture rooms are adequate for listening and reading.
18	Seats are available in lecture rooms.
19	Room and equipment for supplementary activities (trainings, laboratories, seminars, etc.) are adequate
	Overall Satisfaction for the Course
20	Overall, you are satisfied with the course implementation.

Table 1. List of questionnaires

The three academic years, in other words three editions of the workshop is included for analysis. And three different situations are compared: (1) PRE-COVID: Only in-person,[23] (2) POST-COVID: Only online, and (3) POST-COVID hybrid -both in person and online-. Number of participants are shown in table 2, for the 3 cases it is 27, 33, and 41 respectively.

Academic year	Teaching Mode	Attended students
2018-2019	PRE-COVID	29
2019-2020	POST-COVID (only online)	33
2020-2021	POST-COVID (hybrid)	41

Table 2. Number of participants to questionnaires n academic years

RESULTS AND DISCUSSION
Outcome of the workshop
The program of the workshop explored ways of analysis and evaluation methods, focusing on the character of the given landscapes. Using the knowledge gained from the previous studio and courses, as well as from concurrently running courses, students will engage in advanced landscape design

processes by representing the landscape design and the characteristic details from specific works in vertical walls and open spaces and they will explore the contemporary examples including drawings and construction details, three-dimensional actual and computational models, digital media, written descriptions, and analyses. In figures 3 the location of two project areas, in figure 4 some analysis, and in figure 5 some design solutions are presented from the last edition as final multi scale outcomes done by student groups. Groups consisted of 3 to 4 students that also contribute to social skills of students such as ability to work in teams in an international environment since the students were from different countries.
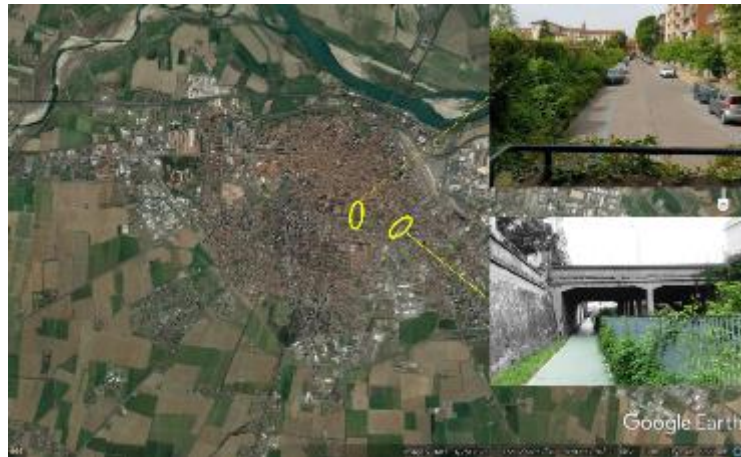
Figure 3. Location of two project areas in Piacenza
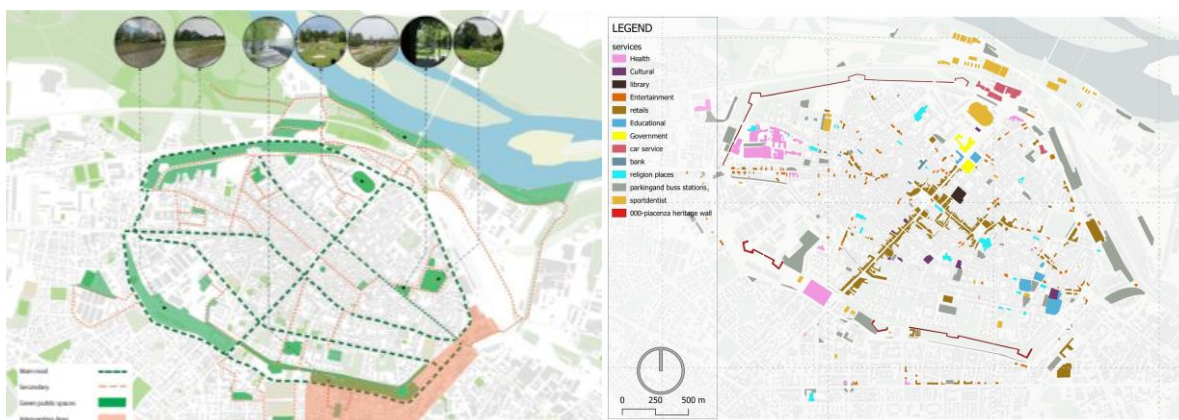
Figure 4 Mobility and public areas, and function analysis

Figure 5. masterplans for project area 1 and a detail

Statistical analysis

All the answers to questions are analyzed by their first and third quartiles, median, and mean as represented with box plots in figures 3, 4, 5, and 6. Possible maximum and minimum values are 4 and 1 respectively.

Questions numbered 17, 18, and 19 are not proper to the academic year 2019-2020 since these questions are related to classroom conditions and the workshop was held only online on that year. Similarly in the academic year of 2020-2021, since not all the students attended in person. Therefore, these questions are excluded to interpret the evaluation of the effect of COVID-19 pandemic.
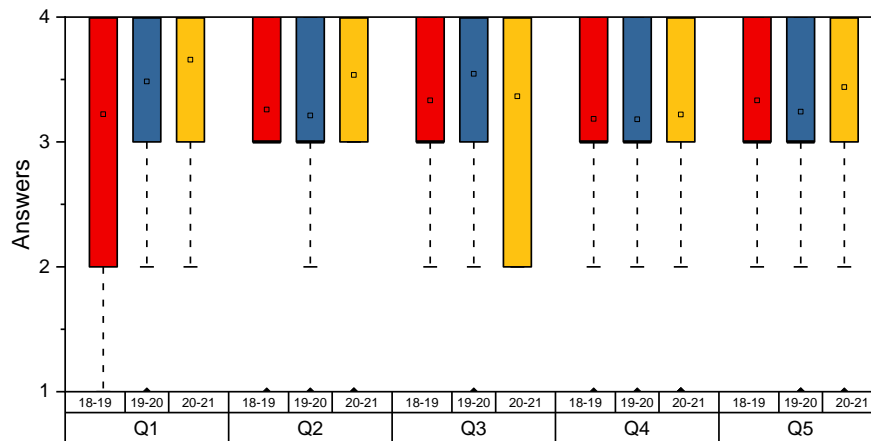
Figure 6 . Box plots of questions 1 to 5 in three different teaching moods (derived from OriginPro 2018)
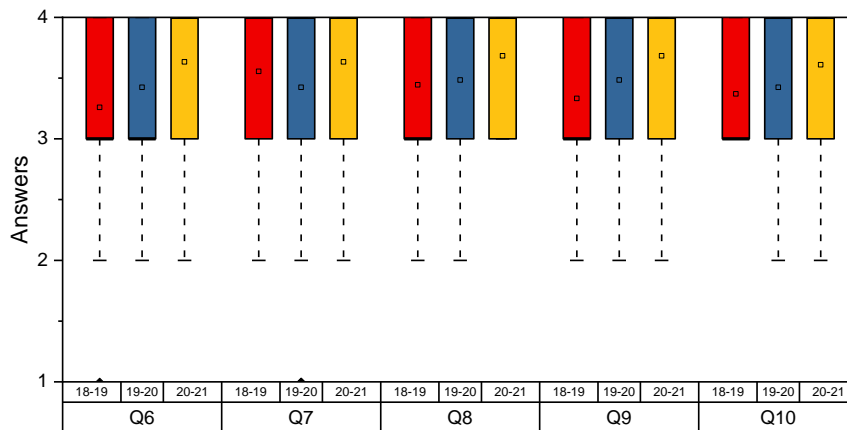
Figure 7. Box plots of questions 6 to 10 in three different teaching moods (derived from OriginPro 2018)
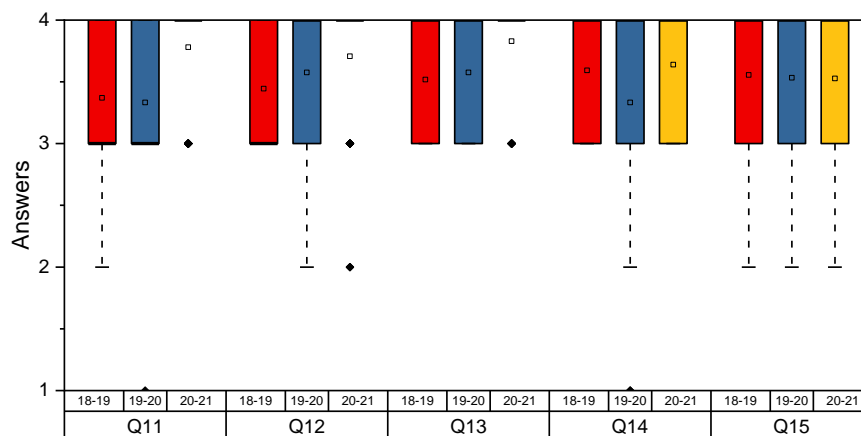
Figure 8. Box plots of questions 11 to 15 in three different teaching moods (derived from OriginPro 2018)
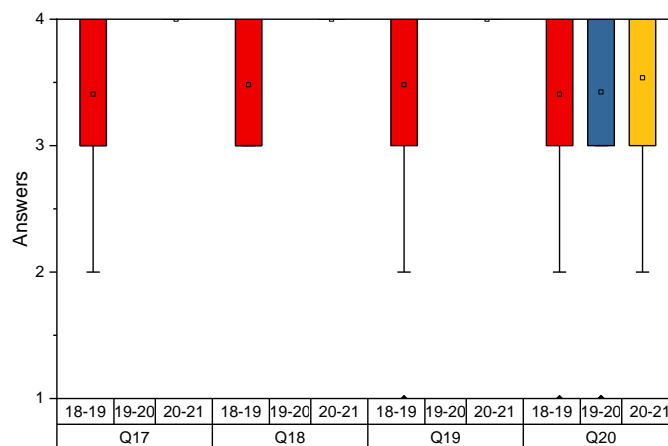
Figure 9. Box plots of questions 16 to 20 in three different teaching moods (derived from OriginPro 2018)

The results mostly showed that students are satisfied more in the academic year 2020-2021 when the workshop was conducted both online and in person. This result is reasonable due to the fact that this method of teaching allows students to choose the attendance way that makes them more comfortable. In other words, the students were free to choose whether they want to be online, and in-person and this flexibility made both students give high scores. If means are ordered from smallest to largest, the only in-person and only online editions change the order of the first and second.

Despite the overall highest satisfaction in the hybrid teaching, there is one exception. In questions numbered 3 (i.e., There were no useless subject-reiterations from other courses you attended.) the only online edition has the highest mean. However, the answers to this question are based on students' previous studios and lectures and based on the content of each course.

CONCLUSION

The COVID-19 Pandemic has caused many changes and in all the aspects of life, including the education with a required paradigm shift. All academic institutes and schools had to switch from face-to-face education to remote learning during the quarantine period, even after in order to reduce and prevent the spread of the virus. This change was mandatory and unplanned. Academicians, lecturers, and students had conflicts if this shift from face-to-face to remote since it has both pros and cons.[24] In

the case of abovementioned workshop held in POLIMI 'Special Topics in Landscape Design' that previously held in person and similar research was carried out[25] during the 2018-2019 academic year, showed the challenges in remote teaching on design fields, as well as opportunities that can be benefited. Mandatory device ownership and internet access, together with technical problems regarding internet and electricity connection are always a challenge/disadvantage in remote learning both for lecturers and students. There are some relative problems such as home conditions (e.g., the existence of a baby) or more specifically for the lecturers, if they follow the traditional methods, they had to improve their digital skills. There are also disadvantages about the effectiveness of teaching because there is no possible way to check the students' condition even if they turn their camera on. In addition, some students became 'shy' after the pandemic when social in person interact is lacking.

Despite all these disadvantages, remote learning in a very effective solution for the international teaching activities since it makes the limits of time and space disappear. It makes the access easier to the materials and decreases the cost of travelling, obtaining materials, printing booklets or boards.

Sustainable Development Goals are defined by UN Agenda 2030[26] which is a commitment to achieve sustainable development by the year of 2030 world-wide, ensuring that no one is left behind. They are 17 SDGs that include 169 targets. Remote learning corresponds especially with goal 4[27] (i.e., Quality Education) and targets 4.3. (i.e., by 2030, ensure equal access for all women and men to affordable and quality technical, vocational, and tertiary education, including university) and 4.4. (i.e., by 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs, and entrepreneurship). This new paradigm shift can correspond to target 4.3. by reducing barriers to have education at different levels, including university as well. It can also contribute to achieve target 4.4. by supporting individuals to obtain both technical and vocational skills.

NOTES

1 David R. Godschalk, and Linda Lacey. "Learning at a Distance." *Journal of Planning Education and Research,* no. 20 (4). (2016): 476–489. https://doi.org/10.1177/0739456X0102000411.

2 Fran Rees, Johannes Gutenberg: Inventor of the Printing Press (Capstone, 2006). https://books.google.no/books?hl=tr&lr=&id=8kmsUImcv50C&oi=fnd&pg=PA9&dq=Rees,+F.+2006.+Johannes+ Gutenberg:+Inventor+of+the+PrintingRees,+F.+Capstone.+press.+Capstone.&ots=ZwiDAoXDU5&sig=gcxQZO1r xUI5lp11TPo-MfLPHpc&redir_esc=y#v=onepage&q&f=false.

3 Stephen J. Lukasik,. "Why the Arpanet Was Built." *IEEE Annals of the History of Computing,* no. 33 (3). (2011): 4–21. https://doi.org/10.1109/MAHC.2010.11.

4 Linda Harasim, "Shift Happens: Online Education as a New Paradigm in Learning." *The Internet and Higher Education,* no. 3 (1–2. (2000): 41–61. https://doi.org/10.1016/S1096-7516(00)00032-4.

5 Linda Harasim, "Shift Happens: Online Education as a New Paradigm in Learning", 2000.

6 Kenneth Ronkowitz and Lynnette Condro Ronkowitz. "Online Education in a Pandemic: Stress Test or Fortuitous Disruption?" *American Journal of Economics and Sociology,* no. 80 (1): (2021):187–203. https://doi.org/10.1111/AJES.12377.

7 Bill Cozens. 2020. "102 Years Ago, the Spanish Flu Hit Campus. What Can It Teach Us about Pandemics? - The Daily Tar Heel." *Daily Tar Heel March 16 (Student Newspaper, University of North Carolina).*, March 16, 2020, https://www.dailytarheel.com/article/2020/03/spanish-flu-1918-0317.

8 Richard Lovegrove, Bruce Harper, and Andrew Adkins. "We've Been Here before | Virginia Tech Magazine." 2020. https://www.archive.vtmag.vt.edu/sum20/feature-1918-flu.php.

9 Kimball-Baker, Kathleen, Jill DeBoer, and Amy Becker LaFrance. "H1N1 & Higher Ed: Lessons Learned." Minneapolis. November 2010. https://www.cidrap.umn.edu/sites/default/files/downloads/big102webfinal_0.pdf.

10 American College Health Association (ACHA). "Emergency Planning Guidelines for Campus Health Services: An All-Hazards Approach." Silver Spring, MD. August 2017
https://www.acha.org/documents/resources/guidelines/ACHA_Guidelines_Emergency_Planning_AllHazards_App roach.pdf.

11 Aminreza Iranmanesh and Zeynep Onur. "Mandatory Virtual Design Studio for All: Exploring the Transformations of Architectural Education amidst the Global Pandemic." *International Journal of Art & Design Education,* no. 40 (1). (2021): 251–67. https://doi.org/10.1111/JADE.12350.

12 Tadeja Zupancic Strojan and Michael Mullins. "The Identity of Place in Virtual Design Studios." *Journal of Architectural Education,* no. 56 (1). (2002):15–21. https://doi.org/10.1162/104648802321019137.

13 Vasudha Gokhale and Madhura Vaze. "Investigating the Impact of COVID-19 on Architectural Education from Students Perspective." *International Journal of Architecture, Engineering and Construction,* no. 10 (2). (2020): 1-11. https://doi.org/10.7492/IJAEC.2021.013.

14 Ming Tang and Mara Marcu. "Physics Simulation and Form Seeking in Architecture Design Education." *International Journal of Architecture, Engineering and Construction,* no. 4 (4). (2015): 184-192. https://doi.org/10.7492/IJAEC.2015.019.

15 Helena Webster. "Architectural Education after Schön: Cracks, Blurs, Boundaries and Beyond." *Journal for Education in the Built Environment,* no. 3 (2). (2008): 63–74. https://doi.org/10.11120/jebe.2008.03020063.

16 Aminreza Iranmanesh and Zeynep Onur, "Mandatory Virtual Design Studio for All: Exploring the Transformations of Architectural Education amidst the Global Pandemic." 2021.

17 Thomas A. Dutton. "Design and Studio Pedagogy." *Journal of Architectural Education,* no. 41 (1). (1984): 16–25. https://doi.org/10.1080/10464883.1987.10758461.

18 Nerantzia Tzortzi (Georgi J.) et al., "The Plan(t)Ed Cube: A Hands-on Educational Approach." *2017 Annual Conference of the Council of Educators in Landscape Architecture (CELA)*, edited by Yang B. and Chen S. Beijing.(2017). https://www.researchgate.net/publication/339352063_CELA_Conference_Proceeding_CELA_Conference_Proce edings.; Nerantzia Tzortzi (Georgi J.), Cristina Musacchio, and Meta Bardha. "A Cultural Heritage Workshop with International Students as a Teaching Tool in Landscape Architecture." *Lessons from the Past, Visions for the Future: Celebrating One Hundred Years of Landscape Architecture Education in Europe*, edited by Lei Gao and Shelley Egoz, Norway: School of Landscape Architecture, Norwegian University of Life Sciences, Norwegian University of Life Sciences. (2019): 241–43. https://www.researchgate.net/publication/336613262_A_cultural_heritage_workshop_with_international_students _as_a_teaching_tool_in_landscape_architecture.; Nerantzia Tzortzi (Georgi J.), S Vyzoviti, and E Dova. "From the Landform to the Living Wall: Introducing 3D Digitisation Processes into Landscape Design Education." *Book*

of Abstracts, ECLAS 2021, STOP AND THINK ECLAS, edited by Burcu Yigit Turan and Sara Westerdahl, Uppsala: ECLAS Conference (2021): 89. https://www.slu.se/globalassets/ew/org/inst/sol/la/eclas2020/eclas2021-book-of-abstracts.pdf. ; Bhzad Sidawi, "Design Studio Education to Foster Creativity: Influential Factors Revealed by a Case Study of the University of Dammam." *Undefined,* no. 2 (4). (2013): 280-291.
 https://doi.org/10.7492/IJAEC.2013.025.

[19] Ashraf M. Salama and Nicholas Wilkinson. "Design Studio Pedagogy: Horizons for the Future, Ashraf M. Salama and Nicholas Wilkinson (Editors)." *International Journal of Architectural Research: ArchNet-IJAR* 1 (3) (2007): 194–206.
https://www.academia.edu/2990044/Design_Studio_Pedagogy_Horizons_for_the_Future_Ashraf_M_Salama_and_Nicholas_Wilkinson_Editors_2007.

[20] Rebecca McLaughlan and Ishita Chatterjee. "What Works in the Architecture Studio? Five Strategies for Optimising Student Learning." *International Journal of Art & Design Education,* no. 39 (3). (2020): 550–564. https://doi.org/10.1111/JADE.12303.

[21] "Sustainable Architecture and Landscape Design: POLIMI." Accessed September 18, 2022. https://www.polimi.it/en/international-prospective-students/laurea-magistrale-programmes-equivalent-to-master-of-science/programme-catalogue/sustainable-architecture-and-landscape-design.

[22] "OriginPro Software for Graphing & Analysis." Accessed September 18, 2022. https://www.originlab.com/2018.

[23] Nerantzia Tzortzi (Georgi J.), Cristina Musacchio, and Meta Bardha. "A Cultural Heritage Workshop with International Students as a Teaching Tool in Landscape Architecture." 2019.

[24] Vasudha Gokhale and Madhura Vaze. "Investigating the Impact of COVID-19 on Architectural Education from Students Perspective." 2020.

[25] Nerantzia Tzortzi (Georgi J.), Cristina Musacchio, and Meta Bardha. "A Cultural Heritage Workshop with International Students as a Teaching Tool in Landscape Architecture." 2019.

[26] "Take Action for the Sustainable Development Goals - United Nations Sustainable Development." United Nations (UN). 2020. Accessed September 18, 2022.
https://www.un.org/sustainabledevelopment/sustainable-development-goals/.

[27] "Sustainable Development Goal 4 (SDG 4) | Education within the 2030 Agenda for Sustainable Development." Global Education Cooperation Mechanism (GCM). Accessed September 18, 2022.
 https://www.sdg4education2030.org/the-goal.

BIBLIOGRAPHY

American College Health Association (ACHA). "Emergency Planning Guidelines for Campus Health Services: An All-Hazards Approach." Silver Spring, MD. August 2017.
https://www.acha.org/documents/resources/guidelines/ACHA_Guidelines_Emergency_Planning_AllHazards_Approach.pdf.

Cozens, Bill. "102 Years Ago, the Spanish Flu Hit Campus. What Can It Teach Us about Pandemics? - The Daily Tar Heel." *Daily Tar Heel March 16 (Student Newspaper, University of North Carolina).*, March 16, 2020. https://www.dailytarheel.com/article/2020/03/spanish-flu-1918-0317.

Dutton, Thomas A. "Design and Studio Pedagogy." *Journal of Architectural Education,* no. 41 (1). (1984): 16–25. https://doi.org/10.1080/10464883.1987.10758461.

Global Education Cooperation Mechanism (GCM). "Sustainable Development Goal 4 (SDG 4) | Education within the 2030 Agenda for Sustainable Development." Accessed September 18, 2022. https://www.sdg4education2030.org/the-goal.

Godschalk, David R., and Linda Lacey.. "Learning at a Distance." *Journal of Planning Education and Research* 20 (4). (2016): 476–489. https://doi.org/10.1177/0739456X0102000411.

Gokhale, Vasudha and Madhura Vaze. "Investigating the Impact of COVID-19 on Architectural Education from Students Perspective." *International Journal of Architecture, Engineering and Construction,* no. 10 (2). (2020): 1-11. https://doi.org/10.7492/IJAEC.2021.013.

Harasim, Linda, "Shift Happens: Online Education as a New Paradigm in Learning." *The Internet and Higher Education,* no. 3 (1–2). (2000): 41–61. https://doi.org/10.1016/S1096-7516(00)00032-4.

Iranmanesh, Aminreza, and Zeynep Onur. "Mandatory Virtual Design Studio for All: Exploring the Transformations of Architectural Education amidst the Global Pandemic." *International Journal of Art & Design Education,* no. 40 (1). (2021): 251–67. https://doi.org/10.1111/JADE.12350.

Kimball-Baker, Kathleen, Jill DeBoer, and Amy Becker LaFrance. "H1N1 & Higher Ed: Lessons Learned." Minneapolis. November 2010.
https://www.cidrap.umn.edu/sites/default/files/downloads/big102webfinal_0.pdf.

Lovegrove, Richard, Bruce Harper, and Andrew Adkins. "We've Been Here before | Virginia Tech Magazine." 2020. https://www.archive.vtmag.vt.edu/sum20/feature-1918-flu.php.

Lukasik, Stephen J. "Why the Arpanet Was Built." *IEEE Annals of the History of Computing,* no. 33 (3). (2011): 4–21. https://doi.org/10.1109/MAHC.2010.11.

McLaughlan, Rebecca, and Ishita Chatterjee. "What Works in the Architecture Studio? Five Strategies for Optimising Student Learning." *International Journal of Art & Design Education,* no. 39 (3). (2020): 550–564. https://doi.org/10.1111/JADE.12303.

Originlab. "OriginPro Software for Graphing & Analysis." Accessed September 18, 2022.
https://www.originlab.com/2018.

Politecnico di Milano. "Sustainable Architecture and Landscape Design: POLIMI." Accessed September 18, 2022.
https://www.polimi.it/en/international-prospective-students/laurea-magistrale-programmes-equivalent-to-master-of-science/programme-catalogue/sustainable-architecture-and-landscape-design.

Rees, Fran, Johannes Gutenberg: Inventor of the Printing Press. Capstone, 2006.
https://books.google.no/books?hl=tr&lr=&id=8kmsUImcv50C&oi=fnd&pg=PA9&dq=Rees,+F.+2006.+Johannes+Gutenberg:+Inventor+of+the+PrintingRees,+F.+Capstone.+press.+Capstone.&ots=ZwiDAoXDU5&sig=gcxQZO1rxUI5lp11TPo-MfLPHpc&redir_esc=y#v=onepage&q&f=false.

Ronkowitz, Kenneth, and Lynnette Condro Ronkowitz. "Online Education in a Pandemic: Stress Test or Fortuitous Disruption?" *American Journal of Economics and Sociology,* no. 80 (1): (2021): 187–203.
https://doi.org/10.1111/AJES.12377.

Salama, Ashraf M., and Nicholas Wilkinson. "Design Studio Pedagogy: Horizons for the Future, Ashraf M. Salama and Nicholas Wilkinson (Editors)." *International Journal of Architectural Research: ArchNet-IJAR,* no. 1 (3) (2007): 194–206.
https://www.academia.edu/2990044/Design_Studio_Pedagogy_Horizons_for_the_Future_Ashraf_M_Salama_and_Nicholas_Wilkinson_Editors_2007.

Sidawi, Bhzad. "Design Studio Education to Foster Creativity: Influential Factors Revealed by a Case Study of the University of Dammam." *Undefined,* no. 2 (4). (2013): 280-291. https://doi.org/10.7492/IJAEC.2013.025.

Strojan, Tadeja Zupancic, and Michael Mullins. "The Identity of Place in Virtual Design Studios." *Journal of Architectural Education,* no. 56 (1). (2002):15–21. https://doi.org/10.1162/104648802321019137.

Tang, Ming, and Mara Marcu. "Physics Simulation and Form Seeking in Architecture Design Education." *International Journal of Architecture, Engineering and Construction,* no. 4 (4). (2015): 184-192.
https://doi.org/10.7492/IJAEC.2015.019.

Tzortzi N. (Georgi J.), Cristina Musacchio, and Bardha Meta. "A Cultural Heritage Workshop with International Students as a Teaching Tool in Landscape Architecture." *Lessons from the Past, Visions for the Future: Celebrating One Hundred Years of Landscape Architecture Education in Europe*, edited by Lei Gao and Shelley Egoz, Norway: School of Landscape Architecture, Norwegian University of Life Sciences, Norwegian University of Life Sciences. (2019): 241–43.
https://www.researchgate.net/publication/336613262_A_cultural_heritage_workshop_with_international_students_as_a_teaching_tool_in_landscape_architecture.

Tzortzi N (Georgi J.), A Sivitanidou, E Dova, and A.M. Vissilia. "The Plan(t)Ed Cube: A Hands-on Educational Approach." In *2017 Annual Conference of the Council of Educators in Landscape Architecture (CELA)*, edited by Yang B. and Chen S. Beijing. (2017).
https://www.researchgate.net/publication/339352063_CELA_Conference_Proceeding_CELA_Conference_Proceedings.

Tzortzi N. (Georgi J.), S Vyzoviti, and E Dova. "From the Landform to the Living Wall: Introducing 3D Digitisation Processes into Landscape Design Education." *Book of Abstracts, ECLAS 2021, STOP AND THINK ECLAS*, edited by Burcu Yigit Turan and Sara Westerdahl, Uppsala: ECLAS Conference (2021): 89.
https://www.slu.se/globalassets/ew/org/inst/sol/la/eclas2020/eclas2021-book-of-abstracts.pdf.

United Nations (UN). 2020. "Take Action for the Sustainable Development Goals - United Nations Sustainable Development." Accessed September 18, 2022. https://www.un.org/sustainabledevelopment/sustainable-development-goals/.

Webster, Helena. "Architectural Education after Schön: Cracks, Blurs, Boundaries and Beyond." *Journal for Education in the Built Environment,* no. 3 (2). (2008): 63–74. https://doi.org/10.11120/jebe.2008.03020063.

LEARNING BY TEACHING: HOW STUDENTS BECAME TEACHERS AT THE VISUAL ARTS DEPARTMENT, UNIVERSITY OF LILLE

Author:
MARINE ALLIBERT, CARLIJN JUSTE

Affiliation:
UNIVERSITY OF LILLE, FRANCE
UNIVERSITY OF LILLE, FRANCE AND GRONINGEN UNIVERSITY, NETHERLANDS

INTRODUCTION

This article relates to an experimental teaching methodology we tested together in 2021 teaching a methodology course for undergraduate students in the Visual Arts Department at the Lille University. As we are not researchers in Education Sciences, we are presenting here a rather personal account of this specific experience in which we, as teachers, were taking a step back and students were preparing and teaching in turn the different classes. One of us, Marine Allibert, mainly teaches artistic practice as artist and curator and the other, Carlijn Juste, received an education in art history and teaches theoretical and methodological courses. When we met to teach three groups of the same course, the confrontation of our different didactics brought us to question our teaching methodologies and our position as educators. From this discussion came the desire of an experimental angle allowing us to engage students in active and reflective learning.

In France, two types of education coexist in the Visual Arts. The curriculum proposed by Art Schools (École Supérieure d'art) favour an approach centred on artistic practice for a selected group of students,[1] whereas University seeks to balance theoretical and practical teaching contents.[2] The French university system is still part of a democratic tradition favouring access to education for all. Thus, students enrol on the basis of their baccalaureate degree. Universities proceed to a ranking rather than a selection through a competitive process. As a result approximately 60% of baccalaureate holders attend university[3]. Therefore our students come from a wide variety of backgrounds and academic levels, making it difficult to adopt teaching to the individual needs of the students. Methodology courses, like the one in which our experience took place, play an important role in balancing their skills.

In our past teaching experiences, we have been confronted with frequent difficulties: high absence rates and little participation during class, difficulties to foster independent and autonomous thinking, difficulties to take a critical distance to the teachers, very little use of books and journals or little initiative when it comes to finding information complementary to the classes. In the Visual Arts Department, we are also confronted with high failure rates, especially at the beginning of the course. In addition, students are not used to expressing themselves in class. We saw some of these difficulties reinforced by the global COVID crisis, forcing us to adapt to online teaching. By changing the framework in which our teaching took place, we hoped students take a critical stance to information instead of bluntly repeating the knowledge given by the teacher. How can we further involve students

in their learning and improve their autonomy in this particular context? Will a revolutionary approach allow us to reverse the current difficulties?

This teaching experiment took place while our university was shut down for several months between March 2020 and September 2021. At that time, when teaching took place online only, the necessity to learn independently was emphasized and cooperation among students became a social factor to remedy their social isolation. Here, we will outline the theoretical framework, the experimental set-up and the evaluation of our experiment.

THEORETICAL FRAMEWORK

The history of thought and knowledge knows many advocates of critical and independent thinking (Plato, Rousseau, Stiegler) and alternative pedagogical currents are putting the individual interests of the learners in the centre of their teaching (Freinet, Decroly, Montessori, Sudbury School, etc.). However, most of these alternative pedagogies focus on the education of children and not on higher education. Looking for a solid theoretical framework, we found a powerful reading in Jacques Rancière's *The Ignorant Schoolmaster*[4].

In Rancière's world-famous book, first published in 1987, the French philosopher dissects the 'universal education' forged at the end of the nineteen century in Belgium by Professor Jacotot. Fleeing France during the Post-revolution restoration of the monarchy, Jacotot developed an unorthodox method of teaching French to Flemish students[5], without being able to speak Flemish himself. Jacotot asked students to translate a bilingual book by Fenelon that then was discussed during lectures. After some time, students were able to learn by themselves with success. Jacotot realised that by using this method, students developed both autonomy and confidence. Rancière analyses the relationship of domination at play in the pedagogical order between the 'master explainer' and the 'learner'. According to him, this relationship plays on the wrong assumption that the learner needs the teacher's explanation in order to understand. This 'pedagogical myth' shatters the learner's confidence in their own abilities. On the contrary, Rancière defends the ability of everyone to learn independently and demands for the strengthening of the intellectual emancipation of the learner. According to him, only by taking his own intelligence out of the student-teacher relationship, the students were able to confront their own intelligence with the one of the book and thus regain confidence in their own ability to learn.[6]

It is important to note the writing of this book is correlated to the great French student strike of 1986 reacting to a proposed reform questioning equal access to education for all.[7] Jacques Rancière, among others, feeds the discourse on education and equality. *The Ignorant Master* put the equality of intelligences as the starting point of the pedagogical relationship rather than as the result of education. The idea of an 'ignorant schoolmaster is radical. It would be necessary to qualify this by recalling that the teacher is certainly a facilitator, accompanying the learner in the navigation of knowledge, but he is also the motor of the willingness to learn. Patricia Verdeau[8] relates the position of the ignorant teacher to a relationship rather didactical than pedagogical. The ignorance of the teacher is not that of the one who does not know.[9] The teacher is equipped with knowledge. The teacher creates the conditions for learning by putting the student's will into tension. This posture tends to generate an experimental situation that causes the learner to shift in motivation. By entrusting our students with the choice and responsibility for the group's learning, we sought to sharpen their willingness and commitment to their studies.

While Rancière's proposition gave us the theoretical foundation for our project it does not offer a readily applicable methodology. Our experiment also took up notions of Jean-Charles Cailliez's *La classe renversée (the Do-It-Yourself Class)*[10]. In opposition to the flipped classroom, where students acquire academic knowledge on their own and time in the classroom is reserved for exercises, Cailliez, professor for cellular biology and vice president of the Catholic University in Lille, proposes students to become

themselves teachers. The position of student and teacher are thus reversed: divided in groups, students learn the subject matter in collaboration with others, compose the contents of the lessons, write chapter of a handbook and teach in turn to their fellow students and teacher. Student-teachers also conceive exercises for the exams that are selected and graded by the teacher alone.

The model of this pedagogical experiment is the business company; students are producing knowledge in business units and Jean-Charles Cailliez takes on a position of a business manager ensuring that content production is swift and that results are ready within the given deadlines. What was interesting for us was Cailliez's observation of a significant change in the posture of the students. Students moved from a position of consumers of knowledge to one of active participation in the construction of classes. He observed that especially students with poor results were more engaged in their learning and gained confidence in their own abilities. However, for our own experiment we were less interested in the business model proposed by Cailliez because it reproduces the hierarchical system between student and teacher and supposes an unequal distribution of capabilities. Rancière's proclamation of equality of all intelligences and self-empowerment seemed more appealing to us since we were interested in flattening hierarchies in the classroom. We also wanted to encourage autonomous and self-determined learning, all the more important in a context, where teaching only took place online. However, Cailliez provided an example for a concrete experimental setup. There are several teachers who have already experimented with this approach in different disciplines and different settings.[11] Similar approaches have been used in Germany since the 1980s.[12] Being able to rely on a method that has already proven some success was reassuring both for us and for our students who had to embrace the project for it to work. The specific context of Visual Arts education and our department in particular facilitated the implementation of new approaches. The Visual Arts are still a rather new academic field with a variety of pedagogical approaches, fostering creativity and exploration. Sylvain Fabre points out that teaching Visual Arts have the possibility to introduce a new relation to norms; to identify and create an awareness of norms and normative phenomena, and also the possibility to play around with rules.[13] This relative openness of the Visuals Arts gave us the possibility to introduce new pedagogic methods and bypass teaching standards with more ease. The Visual Arts Department of Lille University, we could also rely on the confidence of the teaching staff and the cooperation of our students keen on active learning.

SET-UP

We build on this theoretical framework for the set-up of a methodological course, aiming at the acquisition of oral and methodological skills, we taught to undergrad students in the second semester of 2020-21. We taught this course of twenty-four hours spread over eight sessions to two groups of fifty (group one and two) and one group of twenty-five students (group three). The first three classes were dedicated to the elaboration of the lessons by the students, the next four to the teaching and the last class was used to grade students' individual homework and to evaluate the teaching methodology. In the first session we exposed our critique on our conventional modes of teaching and explained to students why we wanted to try something different. Obtaining the students' approval for the set-up seemed crucial for their engagement and ultimately for the success of the experiment. In this session students also chose the topics of the courses they were going to teach and were divided into groups of five to twelve students, each responsible for a three hours session and for the assessment of each learning.[14] Art learning and this course in particular are well suited for this kind of exercise as each lecturer can select the content of their courses. So why not let the students follow their own interests within a certain framework?

During the preparation of the pedagogical contents, the students worked in groups in separate ZOOM rooms, which were visited by the teacher in following their progress and giving them custom-made advice. In addition, we addressed to the whole groups to provide practical tools such as reminders on

the importance of problematisation and of structuring the discourse. Then, each session of student-led lectures focused on specific topics. Those were chosen and refined by the students themselves following our proposals for cross-cutting topics, to be considered from the contemporary arts and requiring a critical and societal stance.[15] Group three for example, decided to address issues of gender, ecology and morality in contemporary art while in group one and two students also talked about censorship or digital art. The resources and teaching materials of each group were published on the online platform of the University of Lille (Moodle) and served as a course record. During their teaching, the students became familiar with the ZOOM application and other online tools such as Padlet or Discord. We introduced a number of tools and strategies facilitating group work and the students then chose the platforms themselves.[16] Even though we encouraged students to think of different ways to communicate with their learners, most of them reproduced the familiar lecture model. Thus, they themselves were confronted with a passive audience and had difficulties engaging in dialogue with the learners.

For the evaluation we agreed on skills and range of knowledge to assess. Each teaching group were asked to design an assignment. They proposed as exercises the analysis of works of art from their lectures, the critical examination of a certain aspect of their presentation, multiple choice exams or even the creation of an artistic piece in relation to the subject of the class. Group three was graded on the nature of the pedagogical content and the development of their oral skills by the teacher, while groups one and two assessed each course in consultation with the learners at the end of the sessions.[17] In these two groups the assignments were graded by the teacher in addition to the grades given by the students, while in group three, the student-teachers graded their learners and these grades were taken into account in the assessment of the semester.

EVALUATION OF THE TEACHING EXPERIMENT

The quality of teaching is usually measured by its results. We grade students, evaluate acquired knowledge and compare it to other students or former results. Assessing the learning curve of our students was difficult because our course did not aim at the acquisition of hard knowledge, facts that we could test but at the acquisition of softer skills, like being independent and self-determined in their relationship to their learning, being able to question critically, to work collaboratively and to solve problems autonomously. Furthermore, we did not know most of the students before the semester and the course was part of a new curriculum, giving us a lot of liberty, but also making it difficult to compare it to other teaching methodologies. Finally, teaching via Zoom still was rather new to us, our colleagues and the students.

However, we could observe that students indeed were very much engaged in the course, especially in the preparation phase, the first three sessions. Discussions here were vivid and most students participated well. Students pointed out that teaching a class was a lot of work for them, but that it was also a very gratifying experience and that they felt responsible for the quality of the classes they taught and the learning of other students. Feeling responsible not only for one's own learning, but also for the learning of others constitutes one major difference between this experiment of the Do-It-Yourself Class and oral presentations students usually do in class. We felt that this responsibility was also very motivating for the students. According to Rancière the emancipated student can learn anything on his own if he is willing to. However, in order to be willing to learn, you have to declare yourself capable, thus have confidence in your own ability to acquire new knowledge.[18] One of the results of this experimental teaching methodology was the increase of the students confidence in their ability to learn. Students saw themselves capable because they were put in a situation where they had to figure things out on their own.

In an online questioner, we elaborated on our own initiative,[19] we asked students to evaluate their learning experience and to compare it to other more traditional set-ups. Sixty-three students responded

to forty-six questions treating categories like the overall experience, the acquisition of specific skills, the difficulties encountered or the willingness to participate in such a course again in the future.[20]

Our first question was whether students did learn more or less, both knowledge and soft skills, than in an ordinary set-up. The answers showed a strong cleavage among students with nineteen out of sixty-three answered having learned less and twenty-five students more, nine of them much more than in an ordinary set-up. Unfortunately the questioner does not reflect which students estimated having learned better. Are they the ones on the top of the class or the ones who had difficulties keeping up in the traditional lecture model?

In order to obtain a more differentiated image of the experience we also asked students to evaluate different aspects of their learning. A majority estimated the quality of their knowledge acquisition good or very good and only two persons thought it was bad. We expected students to learn mostly through the preparation of their own class, but nineteen of them declared having learned better also in the position of the learner than in a lecture given by a professor. This might have been because students could address their audience on a horizontal level, using a language everyone was familiar with. Students also implemented a lot of multimedia content, many videos and audio feeds, or mentions of Netflix series most of them had seen in order to introduce a certain topic or question they could then apply to the visual arts. However and here we saw the inexperience of the student-teachers, the contents were often not questioned in much depth and the classes often lacked some theoretical foundations. Nonetheless, students showed themselves capable to find and confront information, to prioritize and structure it and to prepare it in a way that could easily be understood by others. We did not expect students to create new knowledge, but we were very much astonished by the quantity of information they researched and assimilated for their classes.

When asked if they thought the set-up being adapted to acquiring oral and methodological skills, which was the aim of the course fixed by the course programme, most of the students said yes. A large majority of them acquired new methodological skills in collaboration with other students. Thus, this experiment was a good means to foster collaboration among students. The questioner indicates that some of our initial goal, engaging the students with the content of their learning on a meaningful level, foster communication and an open atmosphere in class, re-enforcing the students' capability to learn on their own or with their peers were achieved on some level. However, some students also indicated having learned less efficiently than in a conventional lecture set-up. This leaves us with the question, how to weight positive and negative feedback. Do the students having had a positive experience outweigh the students for whom the experience was unsuccessful?

Besides renewing the way students learn, this teaching experiment also induced some change in our position as teachers. Since students choose themselves the subjects for their classes, subjects we were not experts of, we needed to do ourselves research in order to be able to guide students and assist in their decision-making. We also had to listen very closely to the students and develop a greater attentiveness their needs. In the preparation phase we exchanged a lot with the groups. This allowed us to identify common difficulties that we then could address in the group or the panel. Our teaching therefore had to be much more flexible. Instead of presenting information that we had prepared in advance, we had to adapt to the actual needs of the specific group of students we were confronted with.

CONCLUSION

Teaching theoretical and methodological contents in the Visual Arts in France we are often confronted with a mute classroom. Even though there are courses in place that should be based on exercises and interaction, most students are not used to speak up in class, maybe because they do not feel legitimated or because they are afraid of saying something wrong. It is our conviction that the reason for this difficulty is not to be found in the individual student but that it is a direct result of the structural

framework of education in France. Even though there are examples of teachers trying different, innovative approaches, many courses are based on a lecture model with the teacher speaking from a pedestal, students taking notes quietly and reproducing the information given by the teachers in the exams. This vertical student-teacher-relation is reinforced by the framework in which education is taking place. By changing this framework, it was our hope to engage with our students on a more meaningful level.

The experimental teaching methodology we tested showed success. Students presented an active and engaged attitude even though teaching took place online. Instead of learning by constraint, students took on responsibility for their own education and for the instruction of others. We observed that the responsibility was in fact shared by the teacher who orchestrates the class and the student-teachers as part of a system of solidarity where intelligences cooperate. Students had to think of means for communicating information, for maintaining the attention of an audience and to supervise the progression of their learners. By taking on the position of a teacher, students had to critically think about means for gathering, assimilating and transmitting knowledge. In a situation where the teacher-student relation was further deteriorated by the worldwide COVID crisis, the students' capability to learn autonomously was reinforced.

Despite the enthusiasm that Jacotot's 'universal method' may arouse, Rancière notes that it is not a model adaptable to the scale of society.[21] Similarly, we do not believe that our pedagogical experience is systematically applicable to all programmes and all people. For us, this experiment had the merit to produce a critical distanciation for all parties in the experiment: for teachers as well as students.

Teaching to some of these students again this year we could not notice an alteration in the students' behaviour lasting beyond our teaching experiment. However, this does not make us question the efficiency of our method, but it makes us think that one course is not enough to provoke a lasting change in student behaviour. Instead of imposing one educational model above all others, as it is mainly the case in France, we would like to argue for the possibility to confront students, and children and learners of all ages, with a variety of different pedagogical methodology. This experimentation of different teaching models would help students to obtain a more critical relation to their learning and to figure out which way of learning suites them and their specific situation at a given point in time.

Student Assessment of the Teaching Experiment[22]

What do you think of your overall learning (knowledge and skills) in the Do it yourself class?

I have learned a lot less than in another course device	2
I learned a little less than in another course device	17
I learned as much as in another course device	20
I learned a little more than in another course device	16
I learned more than in another course device	9
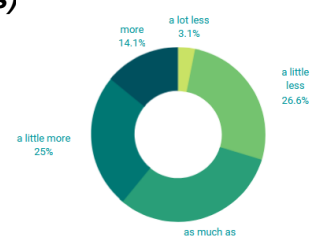
Did you acquire new knowledge during the preparation of the course for which you were co-leader?

Yes	58
No	4

Did you acquire new skills during the preparation of the course for which you were co-leader?

Yes	55
No	7

Can you estimate the effectiveness of the teaching you received as a learner in Do It Yourself Class compared to a regular academic setting?

I learned:

less	5
a little less	18
as much	23
a little more	11
much more	6
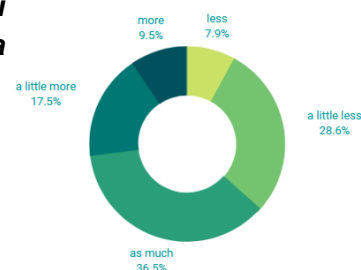
Does this Do-It-Yourself Class seem appropriate to you for acquiring oral skills?

No	3
A little	14
Yes	44

Does this Do-It-Yourself Class seem appropriate to you for acquiring methodological skills?

No	11
A little	29
Yes	22

How did you acquire these methodological skills ? (multiple responses possible)

I did not acquire new methodological skills	7
I acquired these new skills alone	17
I acquired these new skills in collaboration with my group	40
I acquired these new skills through the support of my teacher	13

with the teacher's support 16.9%
none 9.1%
on my own 22.1%
with my team 51.9%
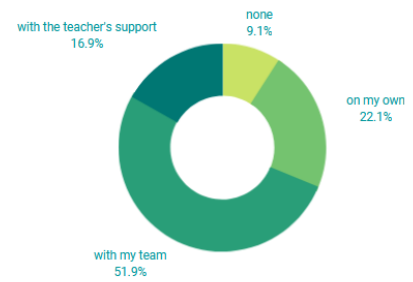
Do you think you would benefit from experiencing a flipped classroom again? (multiple responses possible)

Yes, but in a different theoretical course	29
Yes, but in a different practical course	22
No, one experience is enough	15
No, I would have preferred to take this course in a more traditional format	12

Yes, but in a different theoretical course 29
37.2%
No, I would have preferred to take this
15.4%
No, one experience is enough
19.2%
Yes, but in a different practical course
28.2%
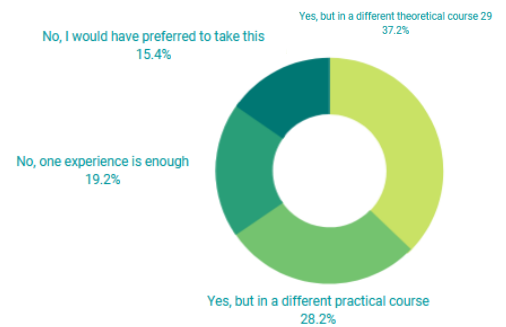
Did you work diligently in this class?

Yes	55
No	6

Do you think this is because of the experimental set-up?

Not at all	25
Probably	29
Completely	7

Did you feel responsible for the quality of your teaching?

Probably	22
Completely	40

NOTES

[1] Entrance to a French art school is conditioned by an entrance exam highlighting both artistic skills and intellectual curiosity.

[2] Historically in France the teaching of artistic practice and theoretical knowledge on art is split in two separate institutions. Artistic techniques were thought at the Royal Academy for Painting and Sculpture (Académie royale de peinture et de sculpture) and then at the Beaux Arts that later transformed to Arts Schools (École Supérieure des Arts). The teaching of theoretical and historical knowledge on art took place at universities. The first chair for art history in France was founded at the Sorbonne in 1876. In 1969 Visual Arts Departments were created as Units for Research and Education (Unité de recherche et d'éducation – UFR) at French universities in the attempt to reconcile artistic practice, theoretical knowledge, knowledge of contemporary art and artistic creation in general. The Visual Arts Track at university thus associates artistic practice with reflections and discourses on art. (Virgine Ruppin, "Les arts plastiques en France. Une discipline scolaire en mutation," Spirale – Revue de recherche en éducation 58 (2016); Michela Passini, *L'œil et l'archive: Une histoire de l'histoire de l'art,* (Paris: La Découverte, 2017).

[3] The process of providing access to knowledge to a wide audience results in a high failure rate for the Bachelor degree students. See Monique Canto-Sperber, "Chapitre II. Le système universitaire français," in *L'oligarchie de l'excellence. Les meilleures études pour le plus grand nombre*, ed. Monique Canto-Sperber (Paris: Presses Universitaires de France, 2017).

[4] Jacques Rancière, *Le maître ignorant. Cinq leçons sur l'émancipation intellectuelle* (Paris: Fayard, 1987).

[5] Jacotot asked students to translate a bilingual book by Fenelon and that then was discussed during lectures.

[6] Jacques Rancière (1987): 25.

[7] Centrist and pro-liberal government introduced new law imposing a selection at the entrance of the university to reduce the failure rate at the end of the undergraduate degree. This student movement was the largest since May 1968. Rancière's Marxist theories on education influenced reforms in French governmental education policy, especially after the election of socialist François Mitterrand in 1981. Rancière's presumption of equality of all intelligences was used to challenge the educational system in place, aiming at elite excellence in expense of an educational equality for all. Alain Savary, Mi nester for education under Mitterrand introduces Zones for Priority Education (Zone d'éducation prioritaire, ZEP) with additional funding for weak districts, existing until today. The reforms also aimed at the creation of a new, open atmosphere at schools able to take 'the whole personality' of the child into account. Jean-Pierre Chevènement, Minister for education after Savary put a hold to these reforms returning to more conservative educational politics (Kristin Ross, Translator's introductionto *The Ignorant Schoolmaster: Five Lessons in Intellectual Emancipation* Jacques Rancière, (Stanford Carolina: Stanford University Press, 1991), xii-xv.

Despite these Reforms, French school system is still based on elitist selection increasing inequality amongst the education received by pupils (Ulrich Wickert, *Um Frankreich zu lieben, muss man es kennen* (Munich: PIPER, 2021).

[8] Patricia Verdeau, "Entre le maître et l'élève. Étude sur Le maître ignorant de Jacques Rancière," Le Télémaque, vol. 44, no. 2 (2013): 49-60.

[9] "For Rancière there is no there is no method to emancipate students. All methods can either dumb down or emancipate. What seems more important is the egalitarian relationship between teacher and pupil. […] An ignorant master is a master who can know an infinite number of things, but he puts the egalitarian relationship in the driver's seat. He is not more competent than the one in front of him. This is possible no matter how much knowledge one may have". Patricia Verdeau, (2013): 55. Translated by the authors.

[10] Jean-Charles Cailliez, *La classe renversée - L'Innovation pédagogique par le changement de posture,* (Paris: Elipses, 2019); Jean-Charles Cailliez, "Classe Renversée et Innovation Managériale," paper presented at the conference TEDx, Viroflay, March 9, 2018, accessed April 21, 2022,
 https://www.youtube.com/watch?v=el1cqKf76Q8.

[11] Cailliez uses this methodology since several yeas to teach microbiology in 3rd year undergrad level. It has since been used for teaching a variety of academic disciplines including Intercultural Management at EM Lyon Business School (Catou Faust, "« Classe renversée » : pourquoi laisser les clés de la classe aux étudiants," Innovation pédagogique, accessed May 30, 2022, https://www.innovation-pedagogique.fr/article4511.html.)

[12] The *Lernen durch Lehren* (LdL) approach a was conceptualized in the middle of the 1980s by Jean-Pol Martin, professor for French as foreign language at Eichstätt University and teacher at Willibald high school, both situated in south-east Germany. Martin primarily wanted students to participate more actively in class, increase their motivation and engagement. Martin mentions that all these goals were achieved. Especially the increase in

motivation was exceptional. The LdL methodology was first used for teaching foreign languages only, before being adopted to other domains. (Jean-Pol Martin, "Lernen durch Lehren: Konzeptualisierung als Glücksquelle," in *Das große Handbuch Unterricht & Erziehung in der Schule,* ed. Olaf-Axel Burow, Stefan Bornemann (Kronach/Cologne: Carl Link Verlag, 2018) 345–360; Simon Kolbe, "Learning by Teaching - a Resource Orientated Approach Towards Mordern Inclusive Education," in *New Trends and Promising Directions in Modern Education. New Perspectives*, ed. Mevlüt Aydogmus (Meram/Konya: Palet Yayinlari Verlag, 2021), 234-255.

[13] For more information, see Sylvain Fabre, "Didactique des arts plastiques : la question de la matrice disciplinaire," *Recherches en didactiques* 19 (2015): 39-50; Virginie Ruppin, "Les arts plastiques en France: Une discipline scolaire en mutation," Spirale – *Revue de recherche en éducation* 25 (2016): 159-173.

[14] In the two courses with many participants, the groups were quite large. Therefore, the groups were divided into three sub-groups, each of which took charge of a part of the class with a specific subchapter elaborated by the students. For example one group decided to work on censorship and divided the three hours of class into three blocks ('definition of censorship and historical developments', 'artists' reactions to censorship' and 'new, contemporary forms of censorship'). Each of these blocks was prepared and taught by a group of three to four students.

[15] In the first session we provided a list of subjects as starting point for students to augment and adjust. Students then voted on a selection of four subjects to be worked on.

16 Many students in group one and two used Discord for communication and Google Docs to work on texts and presentations collaboratively.

[17] In these groups a discussion on the quality of the teaching took place during the last five-teen minutes of each session, trying to identify what went well and what could be approved. At the beginning it was difficult for the students to pronounce critique on the work of others. Giving them the possibility to grade themselves and others made it easier for them to reflect on the quality of their work. Students became quickly more critical with one another and often assigned lower grades than their teacher.

[18] Jacques Rancière, *The Ignorant Schoolmaster: Five Lessons in Intellectual Emancipation,* trans. Kirstin Ross (Stanford Carolina: Stanford University Press, 1991), 18.

[19] While in other countries it is common use that classes are evaluated by students, in France this is still very unusual. Since the set-up of this course was experimental, it was important for us to obtain feedback from the students. This helped us to get a clearer image of their side of the experience and determine the success of the set-up. We used this survey as a tool for analysing the experience and communicating to the educational community.

[20] An extract of the questioner has been translated by the authors and is published alongside this paper. The full questioner can be accessed on demand.

[21] Jacques Rancière (1987): 174-197.

[22] The here presented graphs are a selection of a questioner we designed for the evaluation of the teaching experiment. All questions were asked in French and translated by the authors for this publication. Response options with 0 responses are not represented. The full data set can be accessed on demand by the authors.

BIBLIOGRAPHY

Cailliez, Jean-Charles. *La classe renversée - L'Innovation pédagogique par le changement de posture.* Paris: Elipses, 2019.

Cailliez, Jean-Charles. "Classe Renversée et Innovation Managériale." Paper presented at the conference TEDx, Viroflay, March 9, 2018. Accessed April 21, 2022, https://www.youtube.com/watch?v=el1cqKf76Q8.

Canto-Sperber, Monique. "Chapitre II. Le système universitaire français." In *L'oligarchie de l'excellence. Les meilleures études pour le plus grand nombre,* edited by Monique Canto-Sperber, 63-144. Paris: Presses Universitaires de France, 2017.

Fabre, Sylvain. "Didactique des arts plastiques: la question de la matrice disciplinaire." Recherches en didactiques 19 (2015) : 39-50.

Faust, Catou. "« Classe renversée » : pourquoi laisser les clés de la classe aux étudiants." Innovation pédagogique. Accessed May 30, 2022, https://www.innovation-pedagogique.fr/article4511.html.

Kolbe, Simon. "Learning by Teaching - a Resource Orientated Approach Towards Mordern Inclusive Education." In *New Trends and Promising Directions in Modern Education. New Perspectives,* edited by Mevlüt Aydogmus, 234-255. Meram/Konya: Palet Yayinlari Verlag, 2021.

Martin, Jean-Pol. "Lernen durch Lehren: Konzeptualisierung als Glücksquelle." In *Das große Handbuch Unterricht*

& Erziehung in der Schule, edited by Olaf-Axel Burow, Stefan Bornemann, 345–360. Kronach/Cologne: Carl Link Verlag, 2018.

Passini, Michela. *L'œil et l'archive: Une histoire de l'histoire de l'art.* Paris: La Découverte, 2017.

Ross, Kristin. Translator's introduction to *The Ignorant Schoolmaster: Five Lessons in Intellectual Emancipation,* by Jacques Rancière, vii-xxiii. Stanford: Stanford University Press, 1991.

Ruppin, Viginie. *"*Les arts plastiques en France: Une discipline scolaire en mutation." *Spirale – Revue de recherche en éducation* 25 (2016):159-173.

Rancière, Jacques. *Le maître ignorant, 5 leçons de l'émancipation intellectuelle*. Paris: Fayard, 1987.

Rancière, Jacques. *The Ignorant Schoolmaster: Five Lessons in Intellectual Emancipation*. Translated by Kirstin Ross. Standford: Stanford University Press, 1991.

Verdeau, Patricia. "Entre le maître et l'élève. Étude sur *Le maître ignorant* de Jacques Rancière." *Le Télémaque* 44 (2013): 49-60.

Wickert Ulrich, *Um Frankreich zu lieben, muss man es kennen*. Munich: PIPER, 2021.

ARCHITECTURAL DESIGN-RESEARCH: A PATH TOWARDS AN INNOVATIVE TRANSDISCIPLINARY PEDAGOGY

Author:
FEDERICO WULFF[1], MAMUNA IQBAL[2]

Affiliation:
[1] WELSH SCHOOL OF ARCHITECTURE, CARDIFF UNIVERISTY, UK
[2] DEPARTMENT OF ARCHITECTURE, UNIVERSITY OF ENGINEERING AND TECHNOLOGY, PAKISTAN

INTRODUCTION

This paper focuses on the importance of Architectural Design Research (ADR) pedagogies to impart transdisciplinary learning, responding to contemporary global challenges. Transdisciplinary learning set the agenda and enables students to go beyond the conventional boundaries of architectural design to explore real challenges faced by communities. This study claims that architectural design research provides pedagogical grounds to explore this agenda. The most important question might be "why architectural design research?"

The exploration starts with the idea of Empathy that is at the heart of transdisciplinary learning, it allows students to explore what is important to investigate. In a world that is focused on and is divided by political radicalization and nationalistic agendas, pedagogical approaches around the notion of Empathy would bring changes on the community level that can trigger an impact on the society.

Another key aspect dictating the idea of transdisciplinary learning is the reflective practice, rooted in Schön's concept of "reflection on action" [1], it allows students to critically analyse their learning process. Blythe and Schaik[2] discuss that reflection is part of the designing process. In this study it is used as a tool to steer students towards empathetic thinking and to be more responsive to all cross-disciplinary requirements of the project, including social, cultural, contextual, environmental, political, technological, economic, historical, and philosophical approaches. So, critical thinking helps to understand the architectural design research process as a methodology or in this case as a pedagogy, that helps achieve transdisciplinary learning. Figure 1 provides a relationship of the ideas of empathy reflective practice, and design research and shows how ADR is at the heart of transdisciplinary learning. ADR is conceived as a set of exploratory tools, techniques, and methods for producing new design knowledge conceived as innovative solutions to challenging, open-ended, and rapidly-evolving contemporary crises. The process of Designing could only be intended as Research when it produces new knowledge that would go beyond site-specific solutions, called design projects, and the new knowledge thus produced could be replicated elsewhere, always under an adaptative process to new contexts.

This study explores how this architectural design research pedagogy is perceived and practiced in the two scenarios of Masters in Architectural Design (MA AD) at Welsh School of Architecture (WSA), Cardiff University, UK, and 3rd-year studio at the Department of Architecture (DoA), University of

Engineering and Technology (UET), Lahore, Pakistan. Finally, it will discuss the findings in the two contexts that provide opportunities for new explorations in the Architectural Design Research (ADR) pedagogical field.
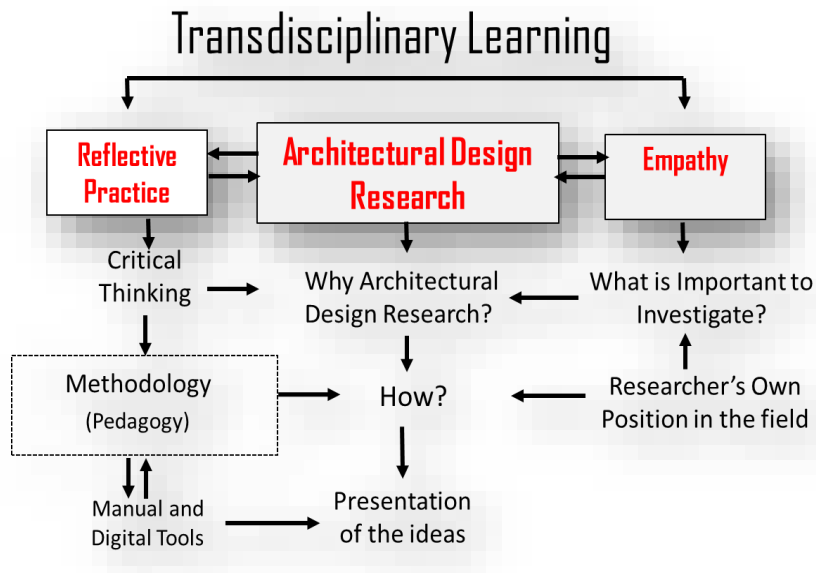

Figure 1. Relationship between transdisciplinary learning and ADR

LITERATURE REVIEW AND THE RESEARCH GAP

This study explores the importance of ADR in the literature and discusses its importance as a theoretical framework as well as a pedagogical approach.

Frayling's[3] triad of architectural design research analyses the relationships between research and design, focusing on their different 'into', 'for', and 'through' links. "Into" design research would mean looking into the precedent, and "for" would mean to research for design intervention. Whereas "through" design research is taking a problem from the world outside the boundaries of architectural design and using design to address this problem. It deals with the "otherness", the issues of society not often looked into through conventional design practices. This idea is strengthened by Fraser[4], where the role of ADR is highlighted as a critical practice, it makes a case for ADR being a legitimate research area in its own right that produces new knowledge. Coyne[5] supports the transdisciplinary nature of ADR by saying that architecture draws inevitably from disciplines outside its immediate orbit. He explains that design-led research seeks to understand the world and develop exposure to the "others" such as other cultures, through direct intervention by the researcher.

Till[6] talks about the misconceptions about design research over the years that treats ADR as an alien entity that cannot be seen in conjunction with other disciplines, or in contrast a field that needs to seek validation from other disciplines, or finally a field so different that cannot conform to the normal practices of research. In contrast, Till explains that design research works with real-life issues by defining the particular paradigm and methodologies for each inquiry, hinting at the transdisciplinary nature of ADR. Moreover, he also provides a pedagogical way by stating that it should be conscious of the interactions of different functions of a building, including buildings being structural entities, environmental modifiers, and function socially, culturally, and economically. Verbeke[7] identifies the re-iterative process of ADR by saying that design research conceives the action of designing as a vehicle

to develop an understanding of issues and for advancing knowledge. Design research is not a linear process, it has to be updated and modified repeatedly, results are used to gain knowledge and insight for further improvements, and this ever-lasting refining process never stops. New knowledge is generated through this process. For Verbeke, that is the key difference between design research from conventional research.

In this reiterative process of knowledge generation through design research cycles, literature talks about the "knowledge input" that is to learn from the pre-existing knowledge which marks the starting point of a design research process. However, a detailed literature review highlights that the importance of this pre-existing knowledge or 'state of the art' of a topic that would be explored by a literature review process hasn't been explored deeply enough. This identified gap in the existing literature on architectural design research is what this research seeks to address. The focus is to explain the authors' experience with their ADR pedagogical approaches for the production of new knowledge and to promote transdisciplinary learning through a detailed analysis of the two contexts (MAAD and UET). Within this context, the role of the design research literature review processing will be discussed in detail.

DESIGN RESEARCH AS A TOOL TO PRODUCE NEW KNOWLEDGE

How the discipline of Design might be used for producing replicable knowledge beyond its site-specific contexts? How would this innovative knowledge produced by design be able to respond to contemporary challenges such as climate change, migration, social inequality, political radicalization, and urban conflicts? As a first step for responding to these questions, a preliminary exploration of the multiple relationships between design and research, grounded on Frayling[8], has been outlined as follows:

Linearity from Research to Design

A well-established conventional approach explored for decades and present in a number of Postgraduate Masters in Architectural Design and other MA in Urban Design worldwide. This approach is based on design decisions justified by previous conventional research outcomes. The research appears here as a distinctive realm from design, so it could not be considered design research.

Design as the idea's test-bed, or 'design laboratory'

This second approach places design as a core knowledge-producer through the elaboration of iterative cycles of 'Design Scenarios', where conceptual ideas are tested through design in accordance to specific contexts. These successive design explorations, conceived as conceptual and contextual 'test-beds', are diagnosed and refined in multiple iterative cycles.

The starting point is the Architectural Design Research translation of ideas extracted from the student's initial literature review into space, program, tectonics, or conceptual, systemic, and relational diagrams. In the next section, a detailed explanation will be given about how the design research processing of the students' literature review could lead to these successive and incrementally-refined design scenarios.

3Design as Research in its own right

In some cases, the action of designing might constitute research in its own right. For reaching this innovative level by the direct action of designing, the design researcher should have previously reached an advanced intellectual position that would include a previous extensive knowledge of the research topic(s). In addition, a thorough acknowledgment of the multi-layered nature of this context would also

be required, including a long-standing experience and close contact with its inhabitants and engaged stakeholders.

OUR DESIGN RESEARCH PEDAGOGY

The pedagogical approach presented in this paper aims to train the students in four subsequent stages from the design research processing of their literature review to the architectural design research production, articulated in successive and incrementally-refined iterative cycles (Figure 2). Within this context, the role of their first initial literature review design research processing is two-fold: on the one hand, it is conceived as a way of gaining knowledge over the 'state of the art' of the students' research topic derived from their previously-formulated Research Questions (RQs), which would include works of built and unbuilt architecture relevant to their research topic, seen as equal references to journal papers or books. On the other, it constitutes a means for identifying the gaps in knowledge (RGs) of the student's research topics. It is within the territory of these RGs where the students' Research Questions (RQs) should be reformulated for enabling a thorough investigation of these unexplored territories, supported by a more detailed and specific second literature review located at the edges of their RG. Under this approach, the students' RQs and related RAs will be conceived as advanced versions of what they would have called their 'design concepts' during their previous conventional architectural studies. As such, the students' successive 'Design Scenarios' should respond in coherence with these Research Questions (RQs) and related Research Aim (RA). Additionally, and in parallel to this process, their RQs and RAs will constantly evolve and be reformulated several times according to the students' learning journeys. In each of these iterative cycles, their conceptual and contextual frameworks will be revisited and informed by new ideas coming from a deeper and more specific literature review, and from additional layers of understanding and interpretation of their sites and contexts. The conclusion of these cycles will be reached when an adequate level of architectural design research quality will be achieved, able to respond to the students' refined RQs and close to their final RA. This methodological framework allows a resilient approach from multiple conceptual standpoints and site-specific constraints and challenges. It has been successfully applied for several years in the different Design Research Units of the Masters of Architectural Design (MA AD) at the Welsh School of Architecture (WSA) , with excellent and varied results.

The four stages (Figure 2) could be summarised as:

Stage 1. ADR literature review processing

From the ideas processed in the Literature review to its architectural translation. There are at least four different ways of translating in architectural terms the ideas from each student's literature review: spatial, programmatic, material, and tectonic translations, and as well conceptual, systemic, and relational translations, which would be expressed graphically with diagrams.
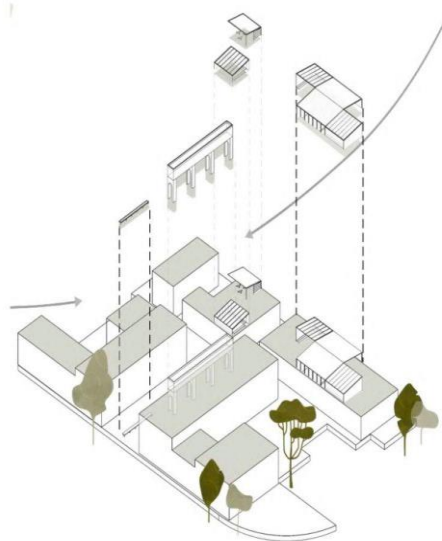
At this stage, the students should extract the most relevant ideas from their literature review and translate them graphically or with physical models into architectural terms. Sometimes, these ideas could be translated into varied spatial atmospheres or spatial organizations. Sometimes, the ideas are related to the definition of a programme of permanent uses and/or temporary activities. In other cases, some ideas could express material approaches and how a material or materials could be assembled together for articulating a specific architectural language able to express what the project is about and is looking for. Finally, some ideas, while relevant for the topic and for its architectural expression, could remain

From the Literature Review processing to the D-R iterative process of the architectural production:
The Four Design-Research (D-R) Steps

1. People's empowerment - Right and voice

① – ② A community can be called a place to vote, a place where people of different cultures can have their rights.

③ – ④ Tents, shade structure, seating, etc. can provide hospitable condition to people.

⑤ The construction of an orderly internal street allows for a more fluid route.

Rather than building temporary spaces, a long-term event space will continue to attract more people to speak out, communicate and interact with each other, thus creating a continuous intercultural interaction.

Stage 1. D-R Literature Review Processing: 4 different kinds of architectural translations of the ideas from the literature review.

Stage 2. Filtering + Adapting: Stage 1 D-R translations to the specificities of your site and context, including its people.

Version IV
Stacking & Terrace

+

Version III
Center connection

+

Version II
Layering

+

Version I
Linking blocks

Stage 3. Assembling:
Stage 1 D-R translations that have been filtered + adapted to site + context in Stage 2 will be assembled together in coherence to RQs and RA.

Resulting in a coherent
First D-R preliminary proposal.
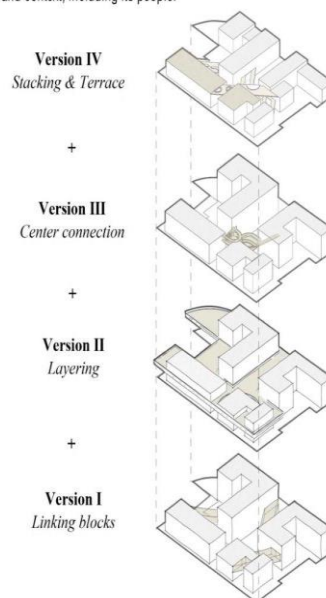
Stage 4. Diagnose:
First D-R preliminary proposal diagnosed/self-assessed, according to:
• The students' RQs and RA
• The main ideas from their conceptual framework
• Their responses to their site and context's challenges, including people's needs.

Iterative Cycles of the four D-R Steps: increasingly refined proposal.

Figure 2.The four stages in ADR Process from the literature review processing to the iterative cycles of architectural production

theoretical or systemic and thus would require drawing or model-making diagrams that would express and clarify the project's conceptual approach(es).

Stage 2: Filtering + Adapting

These translations will be confronted with the projects' site-specific requirements. This would be done through a series of 'Applicability Drawings' conceived as a filtering process where the contextual relevance of these translations will be tested. Subsequently, the ADR translations identified as relevant will be adapted to the context, including its local people's visions and needs that could participate in co-design processes.

Stage 3: Assembling

Those contextually-adapted translations will then be assembled together, in coherence with what the students' project is looking for, as defined by their RQs and RA. This assembling process could be compared to the conventional design process at the stage when different kinds of spatial, material, or programmatic design decisions are combined together in coherence with the project's 'design concept'. In ADR, the coherence of this 'assemblage' process is given by the RQs and related RA, and would result in a first preliminary ADR proposal.

Stage 4: Diagnose

This first proposal would be then self-assessed or diagnosed from a reflective practice approach[9], according to the extent of its success in responding to the students' RQs and RA, the relevance of the ideas forming its conceptual framework, and the quality of its responses to their site and context's challenges. The outcomes of this self-assessment-diagnosis will result in positive architectural outcomes to be kept and the identification of potentials not fully developed, mistakes, weaknesses, and gaps in knowledge. The conclusions of this diagnosis will give clear guidance on what needs to be revisited in a second ADR proposal: improving the depth and accuracy of the literature review's references and its associated ADR analytic methods and/or revisiting the contextual analysis by incorporating more subtle elements that were not fully addressed on the first ADR proposal.

This would result in a second iterative process by revisiting again these four ADR stages, to come up with a more refined, sharper, and higher quality architectural design research proposal, that would be the students' second version of their ADR project. This iterative process, as explained in Figure 3, will be developed in several cycles until the students' will reach an advanced and high-quality ADR project at multiple scales, able to respond to the final version of their research questions and research aims.
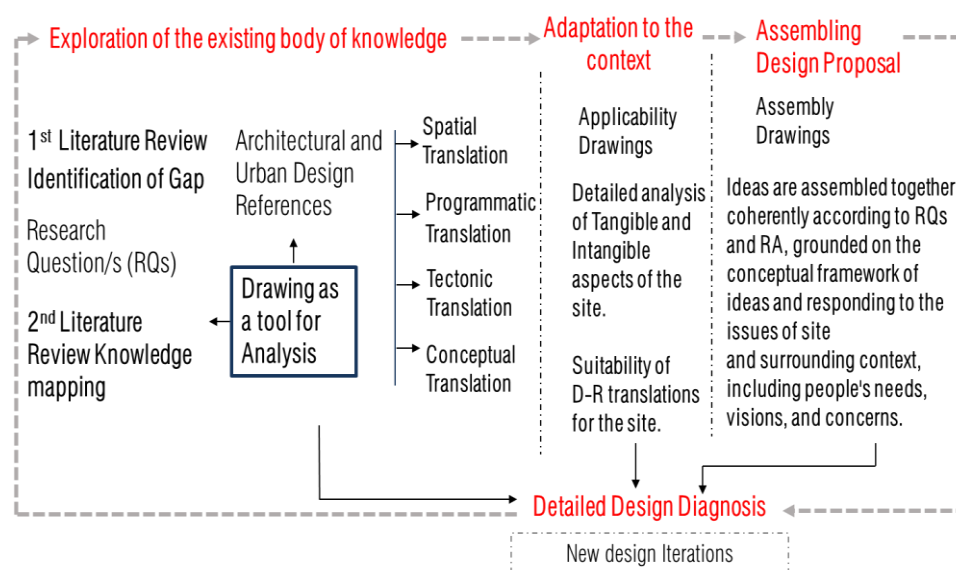
Figure 3. The iterative cycles of the four steps ADR Process

IMPLEMENTATION OF DESIGN RESEARCH PEDAGOGY IN PAKISTAN'S CONTEXT

The implementation of ADR pedagogy in the context of DoA UET, Lahore, Pakistan, is a very different and much more challenging experience as compared to MA AD. In addition to the challenges of the implementation of ADR tools discussed above, there are some added layers of complexities. The most important of these challenges is breaking the stereotypical approach toward what is believed to be design research. In the conventional practices of architectural learning in Pakistan, students are encouraged to conduct some research at the beginning of the project. This research, however, is focused on informing the design decisions, as Frayling explained, this is research "for" design and does not focus on generating new knowledge "through" design. Also as mentioned above in the section "Design research as a tool to produce new knowledge" this practice represents linearity from research to design and cannot be identified as design research. However, teachers and students alike consider this to be the architectural design research, so, the difficulty is introducing the non-conventional and innovative approach of ADR in this context.

Moreover, students' demographics and their early education play a very important role in their perception of design research. In Pakistan, early education is very stratified based on the socioeconomic classes[10], students with expensive private education tend to be more focused on critical and reflective thinking. Whereas the public early education system is based on rote learning, failing to inculcate critical thinking abilities[11].

These students tend to perceive learning as an objective process, with a focus on the tangible aspects of architectural design, for example, space planning, tectonic strategies, etc. There is some focus on understanding the issues in society, however, it is often considered an extra aspect of architecture or not explored deeply enough. Moreover, often the final design interventions are devoid of representing these issues. So, when the students are taught the importance of empathy and to focus a big part of their research on the issues arising from it, a feeling of distrust is found among them. A feeling that this is not the "real architecture" and the perception that they should be designing large-scale complex structures with a focus on aesthetics and function. This approach not only shows the negative effects of a lack of critical thinking abilities but also represents a colonial mindset. Here the focus is not on creating architecture as an answer to real-life issues in the local context, but to create architecture that fits globally, an attempt to conform to the beauty standards of the west. The new wave of so-called digital design in Pakistan is an example of this colonial mindset where students are encouraged to use the latest digital tools without questioning the purpose of final interventions and how they are responding to the local context. The issue is not to take inspiration from the global context, in fact, ADR strongly encourages approaching the world knowledge, the issue is not to translate this knowledge to the local context.

Moreover, the learning process in architectural studios in Pakistan is based on the Mystery-Mastery approach (Argyris, 1981). The absence of clear pedagogical methods and the lack of discussion among tutors and with students about the issue of learning leads to students having to figure out the mystery of becoming the masters of design. Here the stratified early education plays a big role and students with pre-existing critical thinking abilities as well as English communication skills, resulting from their expensive early education, tend to excel in the studio.

ADR is a solution to decolonize the learning process and impart the post-colonial and critical thinking abilities in students. In this study third-year, DoA UET students were given a project where they can start to inculcate the social and cultural issues by being closer to the local communities, they were encouraged to practice empathy and observe what design interventions would be needed in these communities (Figure 4, a). To induce critical thinking, they were taught to use drawing as an analytical tool to report their findings from the case studies and literature (Figure 4, b). They learned to produce the final interventions in response to these findings (Figure 4, c), and finally to reflect upon these

interventions as part of a detailed design diagnosis (Figure 4, d). However, they did not get to work on the reiterations of their design interventions.

In the next phase of this study, the researcher will work on how to better work on creating mutual trust and understanding with and among students for ADR learning, also the project will be designed in two semesters to allow the reiterations of design.

Figure 4.Examples of students' work from DoA UET

DISCUSSION AND CONCLUSION

The importance of design research as transdisciplinary pedagogy becomes clear form the literature, this current study takes this idea further and emphasizes on the importance of design research as a mean to produce new knowledge. As an original contribution, it highlights the role of literature review and the way it contributes in the four steps of design research. The implementation of these four steps in two context (Cardiff and Lahore) highlights its potential as an innovative pedagogical method for transdisciplinary learning. However, the issue arising from the implementation of this pedagogical approach in Lahore's context, as well as for overall better understanding of the potential, limitations, and the different directions this pedagogical method can take require further investigations.

To move further, the institutional collaboration between MA AD WSA and DoA UET discussed in this paper is in the process of being reinforced through the preparation of a proposal for an international academic collaboration funding programme of the Welsh Government. The proposal aims to promote a transdisciplinary collaboration in research and teaching between Architectural Design Research pedagogies, urban design, architectural cooperation projects, sustainable architecture and low carbon strategies, and heritage preservation.

For the last three years, MA AD has conceived a series of ADR Pedagogic Labs aimed at sharing Architectural Design Research pedagogic experiences, and at promoting intellectual debates with the MA AD team and the involvement of international academics. This forum has been shared with DoA

UET, with a stable and active participation of Dr. Mamuna Iqbal. Data generated from this pedagogic lab has provided the first set of information for the current paper that was explored further through its implementation in the two contexts. As a next step, the authors of this article are preparing a journal article on a detailed comparative study between recent experiences in western Europe and Pakistan in ADR pedagogies and the different collaboration strands that have been envisaged for the future. This would be the first step toward the preparation of an application for a Research Project on post-colonial approaches to ADR pedagogies.

A joint MA AD-DoA ADR Unit is being conceived for next 2022-2023 Academic Year, focusing in Lahore as the intervention context and working with local communities on heritage reactivation as a socio-economic catalyser, from socially-inclusive and intercultural approaches related to contemporary architecture. This would set up the grounds for a joint application on Architectural Design Research methods applied to contemporary approaches in socially-inclusive heritage, to funding bodies such as UN-Habitat, the World Bank or International Cooperation Agencies.

NOTES

1 Schon, Donald A. "How professionals think in action." The Reflective Practitioner (1983).

2 Blythe, Richard, and Leon van Schaik. "What if Design Practice Matters?" In Design Research in Architecture, pp. 53-70. Routledge, (2013).

3 Frayling, Christopher. "Research in art and design (Royal College of Art Research Papers, vol 1, no 1, 1993/4)." (1994).

4 Fraser, Murray, ed. "Design Research in Architecture: an overview." (2013).

5 Coyne, Richard. "Even more than architecture." In *Design Research in Architecture*, pp. 185-204. Routledge, 2013.

6 Till, Jeremy. "Three myths and one model." *Building Materials (Dublin)* 17 (2007): 4-10.

7 Verbeke, Johan. "This is research by design." In *Design research in architecture*, pp. 137-160. Routledge, 2013.

8 Frayling, Christopher. "Research in art and design (Royal College of Art Research Papers, vol 1, no 1, 1993/4)." (1994).

9 Ehn, Pelle, and Peter Ullmark. "Educating the reflective design researcher." *Practice Based Design Research* (2017): 77-86.

10 Iqbal, Mamuna, and Andrew Roberts. "Teachers' perception of students' performance in the architectural design studio in the light of Bourdieu." *British Journal of Sociology of Education* 40, no. 8 (2019): 1154-1169.

11 Iqbal, Mamuna, Usman Awan, and Mutahir Awan. "JRAp." *Department of Architecture & Planning, NED University of Engineering & Technology, City Campus Maulana Din Muhammad Wafai Road, Karachi.* 31, no. 2: 38. (2022).

BIBLIOGRAPHY

Argyris, Chris. "Teaching and learning in design settings." *Architecture education study* 1 (1981): 551-660.

Blythe, Richard, and Leon van Schaik. "What if Design Practice Matters?" In *Design Research in Architecture*, pp. 53-70. Routledge, (2013).

Coyne, Richard. "Even more than architecture." In *Design Research in Architecture*, pp. 185-204. Routledge, 2013.

Fraser, Murray, ed. "Design Research in Architecture: an overview." (2013).

Frayling, Christopher. "Research in art and design (Royal College of Art Research Papers, vol 1, no 1, 1993/4)." (1994).

Iqbal, Mamuna, and Andrew Roberts. "Teachers' perception of students' performance in the architectural design studio in the light of Bourdieu." *British Journal of Sociology of Education* 40, no. 8 (2019): 1154-1169.

Iqbal, Mamuna, Usman Awan, and Mutahir Awan. "JRAp." *Department of Architecture & Planning, NED University of Engineering & Technology, City Campus Maulana Din Muhammad Wafai Road, Karachi.* 31, no. 2: 38. (2022).

Leon van, Schaik 'Design Practice Research, the Method'. In Verbeke Johan. (ed.) *Reflections*, Brussels: Sint Lucas. University of Leuven, 2009.

Schon, Donald A. "How professionals think in action." *The Reflective Practitioner* (1983).

Till, Jeremy. "Three myths and one model." *Building Materials (Dublin)* 17 (2007): 4-10.

Vaughan, Laurene, ed. *Practice-based design research*. Bloomsbury Publishing, 2017.

Verbeke, Johan. "This is research by design." In *Design research in architecture*, pp. 137-160. Routledge, 2013.

ARCHITECTURAL EDUCATION: METHODS FOR INTEGRATING CLIMATE CHANGE DESIGN (CCD) IN THE CURRICULUM

Author:
SARAH O'DWYER,[1] EMMA GEOGHEGAN,[1] ESSI NISONEN,[2] RAUL CASTANO-DE LA ROSA,[2] SOFIE PELSMAKERS,[2] IOANNIS LYKOURAS,[3] ELIZABETH DONOVAN,[4] MARCO ALVISE BRAGADIN,[5] CATERINA MORGANTI,[5] UGO MARIA CORAGLIA[5]

Affiliation:
TU DUBLIN,[1] TAMPERE UNIVERISTY,[2] TALTECH,[3] AARHUS SCHOOL OF ARCHITECTURE, [4] BOLOGNA UNIVERSITY.[5]

INTRODUCTION

The design and construction of buildings are responsible for 40% of the EU's energy use with an associated 36% CO_2 emissions,[1] significantly contributing to the climate emergency. Thus, the EU aims for climate neutrality by 2050,[2] but this needs to be achieved much sooner to avoid exacerbated damage and other related crises and to ensure climate justice.[3] However, in architectural education, a significant gap in Climate Change Design CCD) knowledge, skills and competencies exist for both students and educators and is one of the biggest challenges in the construction industry, as noted by the IPCC.[4] Over 4000 architects in 18 countries declared 'a biodiversity and climate emergency'[5] with over 2500 architecture students and teachers globally signing the 'architecture education declares' action with a 'call for a curriculum change'.[6]

This paper, as part of the transnational ARCH4CHANGE EU Erasmus + funded project *'Digital climate change curriculum for architectural education: methods towards carbon neutrality,* presents findings from a systematic literature review, focusing on the barriers and successful pedagogical methods to meet this urgent challenge in architecture education.

Research focus

There is a need for teacher training to upskill teachers in CCD as the typical pedagogical approaches in schools of architecture, their cultures, and employment contracts result in many practitioner educators being employed (with less experience and skill in wider pedagogical theories and methods).[7] The term CCD is relatively new, and publications mainly refer to 'sustainability; therefore, the term sustainability is used in this paper, as a proxy for CCD. This paper focuses on the educator, rather than the students they teach; to understand barriers and opportunities, skills and attributes needed for CCD,

The need for this enquiry is confirmed by a recent literature review by Boarin and Martinez-Molina,[8] which explores the integration of sustainability issues in higher education across the globe.

This paper focuses on the "how" rather than the "what" in terms of sustainability integration, with a specific set of research questions. Questioning the architecture educators' role, responsibilities, skills,

and attributes, and concentrating on the approaches that successfully integrate CCD into architectural education, rather than evaluating all approaches.

As a result, four research questions are posed, around which the paper is structured:

RQ1: What pedagogies and teaching methods facilitate the successful integration of sustainable design in architectural education?
RQ2: What skills and competencies are needed by educators to integrate [these] sustainable design pedagogies and teaching methods?
RQ3: What are the barriers and challenges for upskilling educators to attain these skills and competencies?
RQ4: How can these barriers be overcome; as related to teacher competencies, skills and knowledge?

Table 1: Research Questions (RQ) 1-4

METHODOLOGY AND LIMITATIONS

In order to identify, interpret and analyse the existing research on the defined research questions, a Systematic Literature Review was conducted. Four main steps were defined to conduct the systematic literature review, (1) commencing with the research questions (RQ1, RQ2, RQ3, and RQ4), following with (2) the definition of keywords and selection of databases, (3) consideration of inclusion and exclusion criteria, and (4) assessment of the quality of the included studies.

Five databases were selected (Art & Architecture Source, Scopus/Elsevier, Jstor, Education collection (ProQuest), Teacher Reference Center (EBSCO), Arts & Humanities Database (ProQuest)) based on their trustworthiness, ability to include a range of sources from journal papers to conference proceedings and their relevance to the research focus.

Keywords were linked with particular research questions and developed into an initial repository of publications, as presented in Tables 1-4. There was no limit to the document type in order to understand as widely as possible. There was also no geographic restriction, including both undergraduate and postgraduate courses. As exclusion criteria, the search was limited to 2005 to present and in the English language as being most representative for most authors publishing in this field, to focus on literature published since the launch of the United Nations Decade of Education for Sustainable Development in 2005[9] and being more recent, more likely to focus on the "how", the purpose of this review. From this initial systematic search using the keywords, 87 publications were retrieved. As the sampling was relatively small, no further exclusion of publications was undertaken. However, upon detailed review, 16 were eliminated due to duplication or irrelevance within the document beyond the relevant keyword in the title. The relatively limited number of publications is in line with previous findings, which see the area of sustainability integration specific to architectural education mainly unevaluated.[10] These publications were assigned among the authors, and a review template used which allowed for the input of findings across all research questions, recognising the interconnectedness of the themes. The first author then double-checked the review and the most salient points and synthesized the key findings to develop initial insights, which all authors reviewed and is presented below.RQ3 and RQ4 had the least literature directly related to them due to the student focus in publications.

RQ1: What pedagogies and teaching methods facilitate the successful integration of sustainable design in architectural education?				
Level 1		Level 2		Level 3
Sustain (-able, -ability)	AND	Architect (-ure)	AND	Pedagog (-y, -ies, -ical)
				Design Education
				Design Teaching
				Studio
				Education
				Learning
				Teaching and learning Methods
				Teaching
				Pedagog (-y, -ies, -ical)
				Design Education

Table 2: Keywords for RQ1

RQ2: What skills and competencies are needed by educators to integrate [these] sustainable design pedagogies and teaching methods?				
Level 1		Level 2		Level 3
Sustain(-able,-ability)	AND	Skill(-s)	AND	Design Studio
		Knowledge		Design Education
		Competenc(-y, -ies)		Design Teaching
				Design Learning
Sustain(-able, -ability)	AND	Skill(-s)	AND	Architect (-ure) Studio
		Knowledge		Architect (-ure) Education
		Competenc(-y, -ies)		Architect (-ure)Teaching
				Architect (-ure) Learning

Table 3: Keywords for RQ2

RQ3: What are the barriers and challenges for upskilling educators to attain these skills and competencies?				
Level 1		Level 2		Level 3
Sustain(-able, -ability)	AND	Architect (-ure)	AND	Teaching Experience (-s)
				Teaching Strateg (-y, -ies)
				Teaching Solution (-s)
				Teaching Case Stud (-y, -ies)
				Teaching Approach (-es)
				Teaching Tool (-s)
				Teaching Model (-s)
Sustain(-able, -ability)	AND	Architect (-ure) Integration	AND	Barriers
		Architect (-ure) Teaching		Challenge (-s)
		Architect (-ure) Design		Gap (-s)
		Design Education		Limitation (-s)
		Design Studio		Upskill (-ing)
		Design Learning		Improv (-e,-ing)
		Design Teaching		Didactic (-s)
				Appraisal (-s)
				Incorporat (-e, -ing)
				Practic (-e, -ioner) led

Table 4: Keywords for RQ3

RQ4: How can these barriers be overcome; as related to teacher competencies, skills and knowledge?				
Level 1		Level 2		Level 3
Sustain(-able, -ability)	AND	Architect (-ure) Teach (-er, -ing)	AND	Experience (-s)
				Strateg (-y, -ies)
				Solution (-s)
				Case Stud (-y, -ies)
				Approach (-es)
				Tool (-s)
				Model (-s)
				Virtual practice
				Digital practice
				Opportunity (-y, -ies)
				Experiment (-s)
				Exploration (-s)
				Blended
				New Delivery mode (-s)
				New Tool (-s)
Sustain(-able, -ability)	AND	Design Education Design Studio Design Learning Design Teaching	AND	Experience (-s)
				Strateg (-y, -ies)
				Solution (-s)
				Case Stud (-y, -ies)
				Approach (-es)
				Tool (-s)
				Model (-s)
				Virtual practice
				Digital practice
				Opportunity (-y, -ies)
				Experiment (-s)
				Exploration (-s)
				Blended
				New Delivery mode (-s)
				New Tool (-s)
				Experiment (-s)

Table 5: Keywords for RQ4

RESULTS

Fi
rstly, analysis across all papers was undertaken to define 1) the geographic location of the studies (Figure 1).

2) the year of the study (Figure 2); 3) the types of methodologies most typically being used (Figure 3) and 4) whether the document's focus was on students, educators, or both (Figure 4).
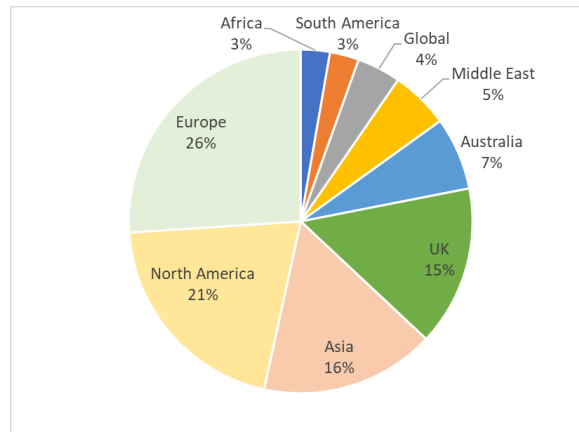
Figure 1. Geographic location of publications: majority in line with Boarin's recent study.
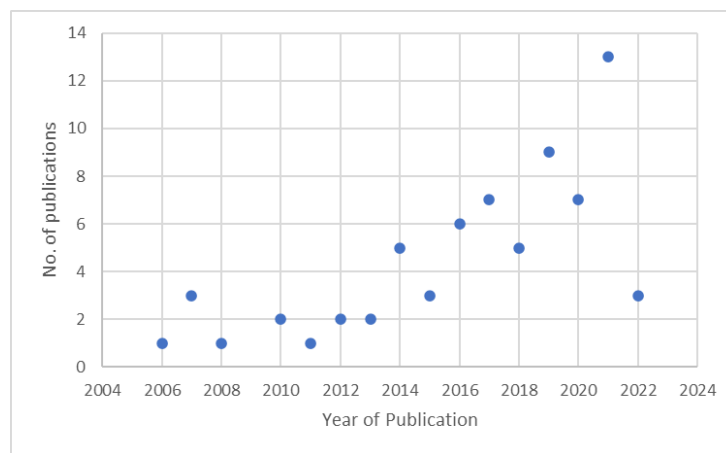
Figure 2. Publishing year of publications for the included publications: number of publications increasing year on year, reflecting the growing urgency of the topic the keywords identified. (Note only the first quarter of 2022 was included at the time of writing).
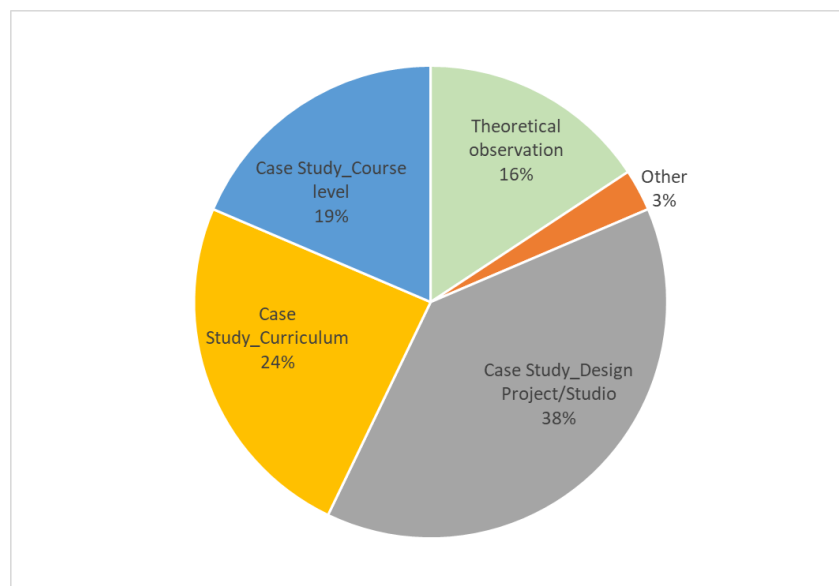
Figure 3. Research methods found in the publications
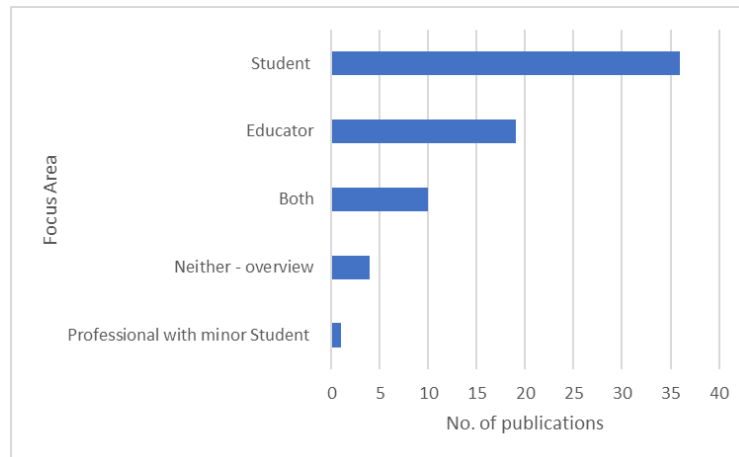
Figure 4. Focus area in the number of publications

The most prevalent research method is case studies, particularly around the 'design studio'. These were formulated around design studio briefs/ projects, typically isolated from the rest of the courses and the broader curriculum, which may signal a wider lack of curriculum integration beyond project/course level. It is also evident that the main focus of the publications is on *student* skills/knowledge/attributes concerning climate change, rather than on the educators.

The publication analysis is presented below in response to each research question.

RQ1: What pedagogies and teaching methods facilitate the successful integration of sustainable design in architectural education?

Boarin et al.'s paper (2022) provided a good summary of previous studies in this regard, though, it focused on improving student engagement, rather than focusing on educator competencies. In addition to the need for general, holistic integration of sustainability on the course level, a range of other potential **integration strategies**[11] were noted (see Figure 5). For example, 1) adding sustainability content to the existing pedagogical framework, 2) selective integration through, e.g., a sustainable design studio and 3) full revision of curricula. Little evidence was offered on the benefits of any one integration strategy over another.

CCD integration needs to occur both across years and within each year[12] and such integration solutions were mainly in problem-solving centred teaching methods such as living labs and live studio projects, where theory is applied in practice.[e.g., 13] Though these are not generally new ideas in the teaching of architecture, the use of **real-life, collaborative, and interdisciplinary design projects,**[e.g. 14] together with **digital tools and simulation software,**[e.g. 15] as well as distance learning, was a novel approach.
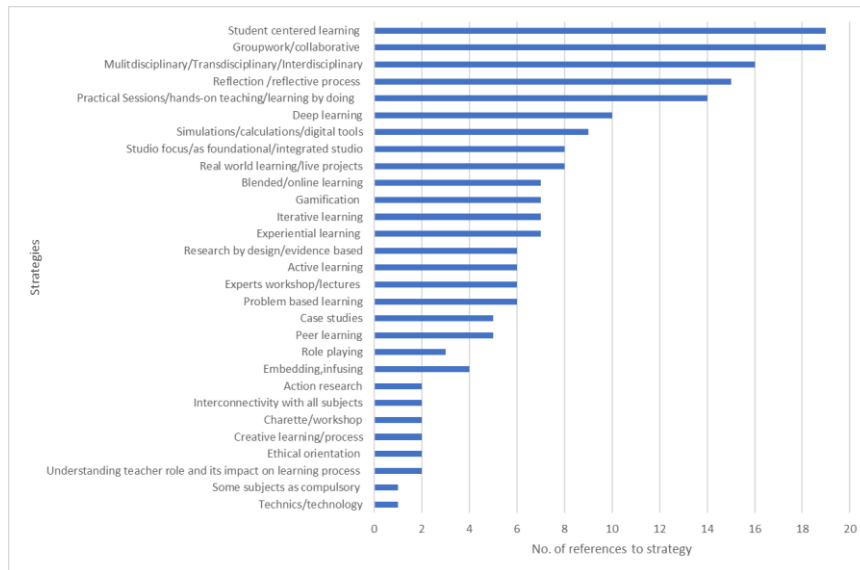
Figure 5. Most advocated teaching strategies and pedagogies for sustainability integration as found in the number of investigated publications

Student-centred learning was seen as the preferable pedagogical approach for successfully integrating sustainability, opposite to transmissive modes of learning. (See Figure 5).[e.g. 16] In a student-centred approach, the emphasis is on students' self-awareness, self-evaluation and self-direction, where learning becomes an iterative, reflective conversation rather than a one-way transmission of information from teacher to student.[17] The complexities of sustainability require the ability to discuss and debate, construct and deconstruct ideas, and suggest that focusing on 'soft skills' like values, judgement, and critical thinking are as valuable as other 'hard' design skills (see also Nisonen, 2022).

Student centeredness often involves using other pedagogical strategies that highlight the need for wide-ranging, multidisciplinary conversations, such as **collaborative learning** through group work, interdisciplinary learning, reflective processes, and deep learning, and learning by doing (supported by digital tools).[e.g., 18]

While the focus of many of the publications on design studio case studies, with an implication it is an ideal environment for teaching and learning sustainability,[e.g.19] some made the link explicit, with design studio as the foundational focus of any integrated sustainability curriculum.[e.g.,20] Additionally, the ability of design studio briefs to use real-world problems, with real-life stakeholders or clients was also noted. Such live projects were seen as a valuable framework for translating theory into practice and providing a tangible platform for understanding projects' challenges and opportunities.[e.g.21] The remaining pedagogical approaches ranged from blended learning to technology integration and can be seen in Figure 5.[e.g. 22]

Pedagogical approaches were also synthesised and categorised into two broad categories, and three sub-categories - under the overarching student-centred learning pedagogy, aligning common approaches or learning outcome aims (see Figure 6). These categories relate to 1) Theory Strategies which feed into the overall curriculum structure, 2) Reflective learning pedagogies, which use collaborative (2a) or Industry integration methods (2b), with Delivery and Implementation methods (2c) to solidify the theory. From this, it is clear that reflective learning pedagogies are critical to successful sustainability integration.
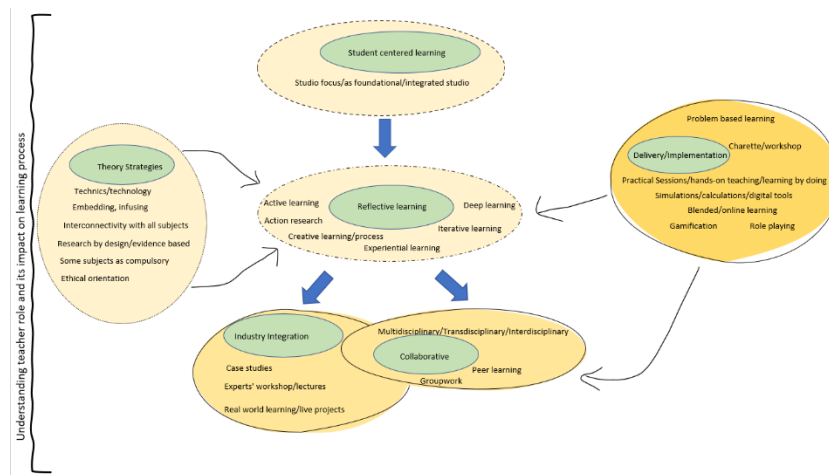
Figure 6. Most advocated teaching approaches and pedagogies for sustainability integration, based on reviewed publications (categorisation by authors)
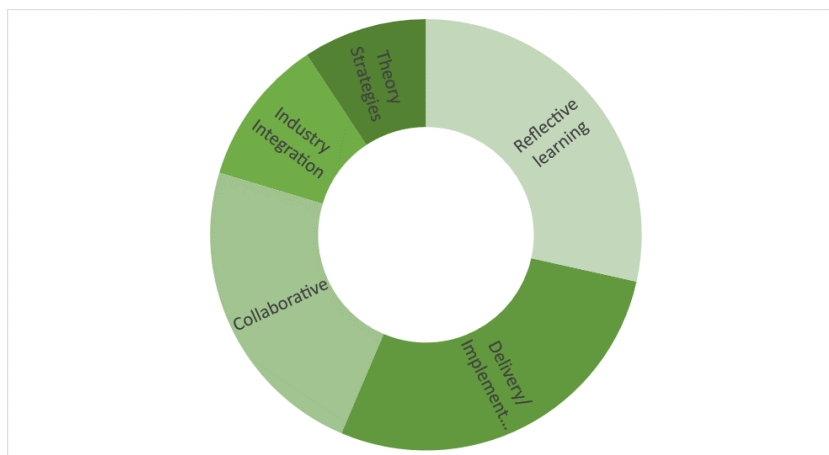
Figure 7.Synthesised Strategies by authors, based on their prevalence in reviewed publications

Very few publications explicitly discussed the required deeper understanding of the teachers' role and its impact on the learning process,[23] highlighting a research gap where teachers skills to deliver CCD are presently assumed.

RQ2: What are skills and competencies needed by educators to integrate [these] sustainable design pedagogies and teaching methods?

There was a general recognition that changing curricula alone will not be sufficient for successful CCD integration. Instead, educator competencies,[e.g.24] school culture[e.g.25] and underlying values/goals also need to be addressed.[e.g.26] Other insights are discussed below; these were typically extracted as side notes and reflections in the publications, as reference to educator skills/competencies was not the focus of most publications reviewed. The same is true of RQ3 and RQ4.
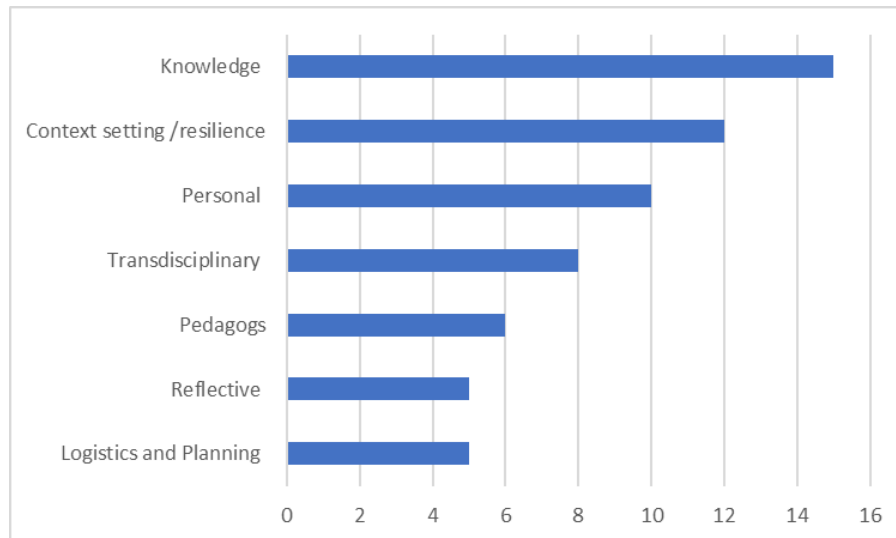
Figure 8. Educator skills and attributes

When synthesised (Figure 8), the required skills/ competencies were seen as, firstly, knowledge around ecological literacy and technical and digital skills in sustainability. Some noted that the application of knowledge depended on individual educators,[e.g.,27] highlighting a potential inequity and inconsistency in approach of teaching. Next, to teach and learn sustainability through student-centred approaches, educators must be flexible and innovative and able to facilitate the learner's personal development and skills instead of just transmitting professional know-how. Educators also need to create the correct setting and context for learning by framing design problems using sustainability as the starting point.[28] Teachers' personal 'soft' skills, a shift in values or ethics and a motivation to pursue a sustainability agenda, and were also noted as important,[29] as was the use of part-time architects as design studio teachers without the necessary pedagogical understanding.[e.g.30]

Similar to teaching methods, the need for transdisciplinary teaching teams to facilitate stepping out of silos was noted,[e.g. 31] as well as he need for educators to have academic knowledge of effective current teaching methods. The need for educators to be reflective, building and learning on past teaching practices was also emphasised in the publications. Lastly, logistical issues related to having sufficient time, resources, and appropriate student numbers to run the particular student-centred strategies were highlighted.

RQ3: What are the barriers and challenges for upskilling educators to attain these skills and competencies?

The most repeated barriers related **to the lack of knowledge and skills of educators,** with insufficient training in sustainability[32] and a lack of experts[33] a particular software skill[34] or a lack of pedagogical training and awareness of the role of an educator in terms of didactics, teaching and learning.[35] This barrier is connected to the previously mentioned external tutors, who either may not have the same understanding of sustainability or do not prioritise it.[36] This affects the overall influence on the teaching and learning outcomes[37] when course briefs and studio themes are tempered by the studio tutors' interests.[38] Other reasons given for the perceived lack of knowledge included the demands of higher education institutions, leaving educators with little time or energy to invest in expanding their knowledge or teaching practice[39] and educators not addressing it early enough in their teaching career.[40]

The second barrier related to **issues with defining and scoping sustainability**, with sustainability seen as a contested concept, with fragmented and vague definitions,[41] and the breadth and depth of topics which are included in the concept, which can be overwhelming.[42] The resulting reduction or separation

of sustainability into technical aspects was noted,[43] causing an **"othering" of sustainability** to more traditional architecture concerns, with a "perceived incompatibility between good design and sustainability" A disconnect between 'green buildings' that are only discussed in terms of their environmental credentials, rather than their broader architectural merit[44] and a more traditional design development process[45] were also noted concerning 'othering'. A **division between teaching for sustainability and teaching for design** was noted[46] with the teaching of sustainability still centred on quantitative analysis aspects, which may further exacerbate the complexity and 'othering' of sustainability.[47]

Another barrier was the **continued use of traditional transmissive teaching methods,**[48] where teaching is passive and teacher-centred rather than student-centred.[49]

Difficulties in implementing larger scale curriculum change were another barrier, where sustainability integration was made at the individual studio or educator level rather than integrated into a wider school curriculum.[50] Some also noted wider cultural issues with a resistance to change[51] and a need to embrace sustainability at a school level[52] to provide strong leadership[53] and a general framework for sustainability[54] that moves beyond the traditionally siloed disciplines.[55]

Practical, logistical barriers were also noted to do with limited teaching timeframes[56] lack of financial support,[57] paucity of facilities,[58] and the modularisation of the curriculum,[59] meaning fluidity and spontaneity are challenging, with teaching "tending towards the default".[40]

Less common barriers referred to general uncertainty within the **architecture profession**[61] and **lack of long term thinking.**[62]

RQ4: How can these barriers be overcome; as related to teacher competencies, skills, and knowledge?

Firstly, **teaching methods need to be reviewed and diversified** to include innovative and student-centred techniques,[63] such as blended learning that support collaboration and reflection.[64] Moreover, an extensive review of whole schools, courses, and curricula is required to integrate sustainability in the design process and the whole learning culture.[65] This requires an extensive, flexible framework and staff buy-in.[66]

Secondly, **educators require teacher training early in their careers**[67] to upskill[68] but also to create communities of practice to pool knowledge and share best practices.[69] This was noted as especially important when practitioners make up a high proportion of educators within a school[70] to enable them to improve their pedagogic skills.[71]

DISCUSSION

The publications reviewed for this study demonstrated the student focus of research into methods for integrating sustainability. This might be explained by the publications being authored by sustainability experts with more advanced competencies and knowledge to educate students in this area. However, research and educational development projects are clearly needed to enable upskilling of all educators. Many publications focused on specific aspects of sustainability integration within specific design studios and were solution-focused rather than pedagogically reflective (e.g., focusing on final student outcomes rather than the learning process). While this approach was common in the reviewed publications, there was also a general recognition that having an isolated, content-specific approach will not be sufficient for successful sustainability integration; educator competencies, school culture change, and leadership must also be addressed; as well as wider curriculum changes are also necessary to truly integrate sustainability into the architecture curriculum.

The need to shift from educator-centred teaching methods to student-centred learning methods was made evident with collaborative, reflective, deep learning strategies as key approaches. However, few

practical examples of this deeper, more holistic sustainability integration in actual design projects or processes were given. The lack of literature focused explicitly on teacher skills signals the need for further work in this area to ensure this can be materialised with urgency.

Finally, digital tools can support a more advanced CCD literacy[72] and foster flexible, independent learning, increased motivation and engagement, contextualisation of knowledge and increased peer-learning opportunities,[73] Digital platforms can facilitate student-student learning,[74] and can be used for blended learning strategies incorporating both online and face to face teaching methods.

Further research and development

The need for a wider framework for sustainability integration is evident in terms of structure and curricula. Any framework for sustainability/CCD integration will have to address practical and logistical differences between courses in different institutions and facilitate a wider curriculum review with organised content around topics, years, and complexity levels.

The successful integration of sustainability calls for upskilling educators beyond subject-based knowledge; as the notable research gap revealed. The facilitation of reflective learning for sustainability is highly dependent on educators' soft skills and personal values, as holistic learning is about developing the whole person, not solely their knowledge base. Educators need to have the means to explore and challenge students' perceptions and to help them discover the complex interdependence of sustainability issues. Without a personal commitment to CCD, a teacher cannot truly teach holistically and critically. Consequently, transitioning from transmissive educator-centred pedagogies to collaborative student-centred ones requires actively tackling educators' teaching methods, values, and behaviour.[75]

Finally, the absence of 'how to' case study examples on new pedagogies, and evidence-based research of successful and (un)successful case studies is necessary.

CONCLUSION

This paper systematically reviewed 71 recent publications on the integration of sustainability in architecture education. Findings included 1) a research gap related to educator skills/competencies; 2) the need for student-centred learning approaches instead of traditional educator-centred architecture design pedagogies; 3) the need for deep, wide structural and curricula change and frameworks to embed sustainability principles and 4) the need for upskilling of educators in sustainability and CCD literacy and didactics, particularly for practitioner educators who are least familiar with pedagogical themes and requirements.

LIMITATIONS

The publications yielded by the systematic review provided a narrower band of publications than a more explorative traditional literature review may provide. However, the latter can be expanded, e.g., by expanding search terms or following references in the publications to ensure a broad, comprehensive overview of the field.

ACKNOWLEDGEMENTS

NOTES

[1] New rules for greener and smarter buildings will increase quality of life for all Europeans, EC, accessed Dec 2021. https://ec.europa.eu/info/news/new-rules-greener-and-smarter-buildings-will-increase-quality-life-alleuropeans-2019-apr-15_en (2019)

[2] Committing to climate-neutrality by 2050: Commission proposes European Climate Law and consults on the European Climate Pact, EC, accessed Dec 2021.
 https://ec.europa.eu/commission/presscorner/detail/en/ip_20_335 (2020)

[3] Tim Jackson, 2050 is too late – we must drastically cut emissions much sooner, The Conversation, accessed Dec 2021.
https://theconversation.com/2050-is-too-late-we-must-drastically-cut-emissions-much-sooner-121512 (2019)

[4] Architecture "lagging behind all other sectors" in climate change fight says IPCC report author, Dezeen, accessed 12th April 2022. https://www.dezeen.com/2022/04/06/ipcc-climate-change-mitigation-report/

[5] Peter Clegg, Beyond the Declaration: Delivery of GHG Reductions, accessed Dec 2021 https://www.buildingsandcities.org/insights/commentaries/architects-declaration-emissions-reductions.html (2020)

[6] Architecture Education Declares, accessed May 2022. https://www.architectureeducationdeclares.com/

[7] Paola Boarin, Antonio Martinez-Molina, and Ignacio Juan-Ferruses. "Understanding students' perception of sustainability in architecture education: A comparison among universities in three different continents." Journal of Cleaner Production 248 (2020): 119237

[8] Paola Boarin, and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022): 130989.

[9] The United Nations Decade of Education for Sustainable Development (2005-2014), UN, accessed 24thhttps://en.unesco.org/themes/education-sustainable-development/what-is-esd/un-decade-of-esd

[10] Paola Boarin, and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022)

[11] Jonathan Natanian and Or Aleksandrowicz. "Environmental education of an architect: The case of final-year design studio at the technion, Israel." International Journal of Architectural Research: ArchNet-IJAR 12, no. 1 (2018): 356; Sergio Altomonte, Peter Rutherford, and Robin Wilson. "Mapping the way forward: Education for sustainability in architecture and urban design." Corporate Social Responsibility and Environmental Management 21, no. 3 (2014): 143-154.

[12] Doris CCK Kowaltowski, Vanessa Gomes da Silva, Leticia de O Neves, Marcella S. Deliberador, Olívia O. de C. Zara, Giseli M. Colleto, and Evandra Ramos Victorio. "Action research and architectural sustainable design education: a case study in Brazil." International Journal of Technology and Design Education 30, no. 4 (2020): 815-836; Kamal Eldin Mohamed, "An instructive model of integrating sustainability into the undergraduate design studio." Journal of Cleaner Production (2022): 130591; Paola Boarin, Antonio Martinez-Molina, and Ignacio Juan-Ferruses. "Understanding students' perception of sustainability in architecture education: A comparison among universities in three different continents." Journal of Cleaner Production 248 (2020): 119237

[13] Sonja Oliveira, Elena Marco, and Bill Gething. "What do we say we teach about energy? Viewed through the lens of UK architecture undergraduate education." (2015); Galen Cranz, Georgia Lindsay, and Lusi Morhayim. "Teaching Through Doing: Post-Occupancy Evaluation Of Berkeley's David Brower Center." *Journal of Architectural and Planning Research* (2016): 1-17; Maria Kalamas Hedden, Roneisha Worthy, Edwin Akins, Vanessa Slinger-Friedman, and R. C. Paul. "Teaching sustainability using an active learning constructivist approach: Discipline-specific case studies in higher education." *Sustainability* 9, no. 8 (2017): 1320.

[14] Jason B. Walker, and Michael W. Seymour. "Utilizing the design charrette for teaching sustainability." *International Journal of Sustainability in Higher Education* (2008); M. Amparo Núñez-Andrés, Antonio Martinez-Molina, Núria Casquero-Modrego, and Jae Yong Suk. "The impact of peer learning on student performance in an architectural sustainability course." *International Journal of Sustainability in Higher Education* (2021); Marcin Brzezicki, and Agata Jasiolek. "A Survey-Based Study of Students' Expectations vs. Experience of Sustainability Issues in Architectural Education at Wroclaw University of Science and Technology, Poland." *Sustainability* 13, no. 19 (2021): 10960; D., Hlaváček, and M. Čeněk. "Hands-On: Sustainable Approach in Architectural Education." In *IOP Conference Series: Earth and Environmental Science*, vol. 290, no. 1, p. 012047. IOP Publishing, 2019.

[15] Eleni Alexandrou, Flora Bougiatioti, Miltiadis Katsaros, Athanasios Kotsenos, and Elias Zacharopoulos. "Sustainability challenges in architectural education: assessment of an architectural technology course on the

bioclimatic redesign of existing buildings in Greece." *International Journal of Sustainable Energy* (2021): 1-20; Marwa Dabaieh,, Menna Lashin, and Ahmed Elbably. "Going green in architectural education: An urban living lab experiment for a graduation green design studio in Saint Catherine, Egypt." *Solar Energy* 144 (2017): 356-366; Camille De Gaulmyn and Karine Dupre. "Teaching sustainable design in architecture education: Critical review of Easy Approach for Sustainable and Environmental Design (EASED)." *Frontiers of Architectural Research* 8, no. 2 (2019): 238-260.

[16] Kristyna Schulzova and Daniela Bosova. "Building Physics Requirements And Architecture Students." International Multidisciplinary Scientific GeoConference: SGEM 18, no. 6.1 (2018): 537-544; M. Amparo Núñez-Andrés, Antonio Martinez-Molina, Núria Casquero-Modrego, and Jae Yong Suk. "The impact of peer learning on student performance in an architectural sustainability course." *International Journal of Sustainability in Higher Education* (2021); Maria Kalamas Hedden, Roneisha Worthy, Edwin Akins, Vanessa Slinger-Friedman, and R. C. Paul. "Teaching sustainability using an active learning constructivist approach: Discipline-specific case studies in higher education." *Sustainability* 9, no. 8 (2017): 1320; M. Carolina Sepúlveda,, and H. Natalia Gajardo. "Innovation in teaching and learning methods: Integrating sustainability subjects in the architectural design process." In *SHS Web of Conferences*, vol. 26, p. 01024. EDP Sciences, 2016; Kamal Eldin Mohamed, "An instructive model of integrating sustainability into the undergraduate design studio." Journal of Cleaner Production (2022): 130591; Kajetan Sadowski. "Implementation of the New European Bauhaus Principles as a Context for Teaching Sustainable Architecture." *Sustainability* 13, no. 19 (2021): 10715; Robert Grover, Stephen Emmitt, and Alex Copping. "Critical learning for sustainable architecture: Opportunities for design studio pedagogy." *Sustainable Cities and Society* 53 (2020): 101876.

[17] Robert Grover, Stephen Emmitt, and Alex Copping. "Reflecting on sustainability: Coproducing a critical framework for sustainable design in the architectural studio." *Higher Education Pedagogies* 4, no. 1 (2019): 41-63; Robert Grover, Stephen Emmitt, and Alexander Copping. "Fit for purpose?: Sustainability and the design studio." In *International conference for the sustainable design of the built environment 2018.* 2018

[18] Elizabeth Donovan and Anna Holder. "How architecture students gain and apply knowledge of sustainable architecture." *Innovation for Sustainable Future. Presented at the Central Europe Towards Sustainable Building (CESB16), Grada Publishing, Prague* (2016); Fatma Kolsal and Ozlem Kandemir. "A Research on Learning Styles-An Introduction to Architectural Design Studio." (2021); Elif Tatar and Ruşen Yamaçlı. "A sustainable model proposal for architectural education." *International Journal of Design Education* (2021).

[19] Kamal Eldin Mohamed, "Sustainable Architectural Design Education: An Improved Experimental Method in a 3rd Year Design Studio." *The Academic Research Community publication* 4, no. 1 (2020): 64-74; Glen Andrew Hill,. "The 'tutorless' design studio: A radical experiment in blended learning." *Journal of Problem Based Learning in Higher Education* 5, no. 1 (2017); Jonathan Natanian,, and Or Aleksandrowicz. "Environmental education of an architect: The case of final-year design studio at the technion, Israel." *International Journal of Architectural Research: ArchNet-IJAR* 12, no. 1 (2018): 356.

[20] Robert Grover, Stephen Emmitt, and Dr Alex Copping. "Critical sustainability in the design studio. Pedagogic change through student engagement and collaboration." In *Architecture Connects AAE 2017 Conference Proceedings, 96*, vol. 105. 2017; Robert Grover, Stephen Emmitt, and Alex Copping. "Critical learning for sustainable architecture: Opportunities for design studio pedagogy." *Sustainable Cities and Society* 53 (2020): 101876; Robert Grover, Stephen Emmitt, and Alex Copping. "Reflecting on sustainability: Coproducing a critical framework for sustainable design in the architectural studio." *Higher Education Pedagogies* 4, no. 1 (2019): 41-63

[21] Fay Al Khalifa. "Achieving Sustainable Urbanism through Architectural Education: A Move Back to a Learning-by-Doing Pedagogy".T*he International Journal of Architectonic Spatial and Environmental Design*(2019)13(4):1-16; Pernille Christensen and Elaine Worzala. "Teaching Sustainability: Applying studio pedagogy to develop an alternative post-hurricane housing solution using surplus shipping containers." *Journal of Sustainable Real Estate* 2, no. 1 (2010): 335-360; Matthias Barth, Jasmin Godemann, Marco Rieckmann, and Ute Stoltenberg. "Developing key competencies for sustainable development in higher education." *International Journal of sustainability in higher education* (2007).

[22] Kiel Moe. "Compelling yet unreliable theories of sustainability." *Journal of Architectural Education* 60, no. 4 (2007): 24-30; Bender, Diane M., and Jon D. Vredevoogd. "Using online education technologies to support studio instruction." *Journal of Educational Technology & Society* 9, no. 4 (2006): 114-122; Regueiro, Araceli, Bárbara Crespo, Carla Míguez-Álvarez, and Miguel Cuevas. "Designing a holistic process of learning for implementing sustainability: An experience in an engineering doctoral program." *Computer Applications in Engineering Education* 27, no. 4 (2019): 765-776.

[23] McLaughlan, Rebecca, and Ishita Chatterjee. "What works in the architecture studio? Five strategies for optimising student learning." *International Journal of Art & Design Education* 39, no. 3 (2020): 550-564; Pelin Efilti

and Koray Gelmez. "Celebrating the variety, fighting the confusion: An integrative review of the design teacher's pedagogical roles." *art, design & communication in higher Education* 20, no. 2 (2021): 243-287.

24 Margarida Feria and Miguel Amado. "Architectural design: Sustainability in the decision-making process." *Buildings* 9, no. 5 (2019): 135;Paul Micklethwaite and Robert Knifton. "Climate Change. Design Teaching for a New Reality." *The Design Journal* 20, no. sup1 (2017): S1636-S1650;Sergio Altomonte, Brian Logan, Markus Feisst, Peter Rutherford, and Robin Wilson (2016) "Interactive and situated learning in education for sustainability." *International Journal of Sustainability in Higher Education.*

25O'Dwyer, Sarah, and Julie Gwilliam. "Ways of Choosing: The Role of School Design Culture in Promoting Particular Design Paradigms in Irish Architectural Education." In *EAAE Annual Conference Proceedings*, pp. 44-65. 2020;Maja Terlević, Andreja Istenič Starčič, and Maruška Šubic Kovač. "Sustainable spatial development in higher education." *Urbani izziv* 26, no. 1 (2015): 105-120.

26Sandra Lee Pinel and Ryan Urie. "Learning reflective planning: The application of participatory action research principles to planning studio design and assessment." *Journal of Architectural and Planning Research* (2017): 32-48; Ahmed Zaib Khan, Han Vandevyvere, and Karen Allacker. "Design for the ecological age: Rethinking the role of sustainability in architectural education." *Journal of Architectural Education* 67, no. 2 (2013): 175-185

27Robert Grover, Stephen Emmitt, and Alex Copping. "Critical learning for sustainable architecture: Opportunities for design studio pedagogy." *Sustainable Cities and Society* 53 (2020)

28Maria Kalamas Hedden, Roneisha Worthy, Edwin Akins, Vanessa Slinger-Friedman, and R. C. Paul. "Teaching sustainability using an active learning constructivist approach: Discipline-specific case studies in higher education." *Sustainability* 9, no. 8 (2017): 1320.

29Barth, Matthias, Jasmin Godemann, Marco Rieckmann, and Ute Stoltenberg. "Developing key competencies for sustainable development in higher education." *International Journal of sustainability in higher education* (2007).

30Paola Boarin and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022);Robert Grover, Stephen Emmitt, and Alex Copping. "Critical learning for sustainable architecture: Opportunities for design studio pedagogy." *Sustainable Cities and Society* 53 (2020);Pelin Efilti and Koray Gelmez. "Celebrating the variety, fighting the confusion: An integrative review of the design teacher's pedagogical roles." *art, design & communication in higher Education* 20, no. 2 (2021): 243-287.

31Y Luckan. "Analysis and perception: architectural pedagogy for environmental sustainability." *WIT Transactions on The Built Environment* 142 (2014): 577-588;Altomonte, Sergio, Peter Rutherford, and Robin Wilson. "Mapping the way forward: Education for sustainability in architecture and urban design." *Corporate Social Responsibility and Environmental Management* 21, no. 3 (2014): 143-154;Shi, Xinyu, Xue Fang, Zhoufan Chen, Tyson Keen Phillips, and Hiroatsu Fukuda. "A didactic pedagogical approach toward sustainable architectural education through robotic tectonics." *Sustainability* 12, no. 5 (2020): 1757.

32Ahmed Sarhan and Peter Rutherford. "Integrating sustainability in the architectural design education process-taxonomy of challenges and guidelines." (2014);Maja Terlević, Andreja Istenič Starčič, and Maruška Šubic Kovač. "Sustainable spatial development in higher education." *Urbani izziv* 26, no. 1 (2015): 105-120;Matthias Barth, Jasmin Godemann, Marco Rieckmann, and Ute Stoltenberg. "Developing key competencies for sustainable development in higher education." *International Journal of sustainability in higher education* (2007);Rebecca McLaughlan and Ishita Chatterjee. "What works in the architecture studio? Five strategies for optimising student learning." *International Journal of Art & Design Education* 39, no. 3 (2020): 550-564;Kamal Eldin Mohamed. "An instructive model of integrating sustainability into the undergraduate design studio." Journal of Cleaner Production (2022): 130591;Marcin Brzezicki and Agata Jasiolek. "A Survey-Based Study of Students' Expectations vs. Experience of Sustainability Issues in Architectural Education at Wroclaw University of Science and Technology, Poland." *Sustainability* 13, no. 19 (2021): 10960;Altomonte, Sergio, Peter Rutherford, and Robin Wilson. "Mapping the way forward: Education for sustainability in architecture and urban design." *Corporate Social Responsibility and Environmental Management* 21, no. 3 (2014): 143-154; Araceli Regueiro, Bárbara Crespo, Carla Míguez-Álvarez, and Miguel Cuevas. "Designing a holistic process of learning for implementing sustainability: An experience in an engineering doctoral program." *Computer Applications in Engineering Education* 27, no. 4 (2019): 765-776;Mark Kelly. "Embedding sustainability across the built environment curriculum and beyond." In *EESD2021: Proceedings of the 10th Engineering Education for Sustainable Development Conference*, pp. 1-15. University College Cork, 2021.

33Paola Boarin and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022): 130989;Paola Boarin, Antonio Martinez-Molina, and Ignacio Juan-Ferruses. "Understanding students' perception of sustainability in architecture education: A comparison among universities in three different continents." *Journal of Cleaner Production* 248 (2020)

[34]Grover, Robert, Stephen Emmitt, and Alex Copping. "Reflecting on sustainability: Coproducing a critical framework for sustainable design in the architectural studio." *Higher Education Pedagogies* 4, no. 1 (2019): 41-63;"A didactic pedagogical approach toward sustainable architectural education through robotic tectonics." *Sustainability* 12, no. 5 (2020): 1757

[35]Altomonte, Sergio, Peter Rutherford, and Robin Wilson. "Mapping the way forward: Education for sustainability in architecture and urban design." *Corporate Social Responsibility and Environmental Management* 21, no. 3 (2014): 143-154;Pelin Efilti and Koray Gelmez. "Celebrating the variety, fighting the confusion: An integrative review of the design teacher's pedagogical roles." *art, design & communication in higher Education* 20, no. 2 (2021): 243-287;Daniela Elena Dumitru. "Reorienting higher education pedagogical and professional development curricula toward sustainability–a Romanian perspective." *International Journal of Sustainability in Higher Education* (2017);Doris CCK Kowaltowski, Vanessa Gomes da Silva, Leticia de O Neves, Marcella S. Deliberador, Olívia O. de C. Zara, Giseli M. Colleto, and Evandra Ramos Victorio. "Action research and architectural sustainable design education: a case study in Brazil." International Journal of Technology and Design Education 30, no. 4 (2020): 815-836.

[36]Paola Boarin, Antonio Martinez-Molina, and Ignacio Juan-Ferruses. "Understanding students' perception of sustainability in architecture education: A comparison among universities in three different continents." *Journal of Cleaner Production* 248 (2020)

[37]Paul Micklethwaite and Robert Knifton. "Climate Change. Design Teaching for a New Reality." *The Design Journal* 20, no. sup1 (2017): S1636-S1650.

[38]Sarah O'Dwyer and Julie Gwilliam. "Ways of Choosing: The Role of School Design Culture in Promoting Particular Design Paradigms in Irish Architectural Education." In *EAAE Annual Conference Proceedings*, pp. 44-65. (2020)

[39]Maja Terlević, Andreja Istenič Starčič, and Maruška Šubic Kovač. "Sustainable spatial development in higher education." *Urbani izziv* 26, no. 1 (2015): 105-120;Ciskek and Anna Jaglarz. "Architectural Education in the Current of Deep Ecology and Sustainability." *Buildings* 11, no. 8 (2021): 358;Robert Grover, Stephen Emmitt, and Alex Copping. "Critical learning for sustainable architecture: Opportunities for design studio pedagogy." *Sustainable Cities and Society* 53 (2020)

[40]Daniela Elena Dumitru. "Reorienting higher education pedagogical and professional development curricula toward sustainability–a Romanian perspective." *International Journal of Sustainability in Higher Education* (2017).

[41]Robert Grover, Stephen Emmitt, and Alex Copping. "Reflecting on sustainability: Coproducing a critical framework for sustainable design in the architectural studio." *Higher Education Pedagogies* 4, no. 1 (2019): 41-63; Ahmed Zaib Khan, Han Vandevyvere, and Karen Allacker. "Design for the ecological age: Rethinking the role of sustainability in architectural education." *Journal of Architectural Education* 67, no. 2 (2013): 175-185; Ewa Ciskek and Anna Jaglarz. "Architectural Education in the Current of Deep Ecology and Sustainability." *Buildings* 11, no. 8 (2021): 358; Mohamed, Kamal Eldin. "An instructive model of integrating sustainability into the undergraduate design studio." Journal of Cleaner Production (2022): 130591; Altomonte, Sergio, Peter Rutherford, and Robin Wilson. "Mapping the way forward: Education for sustainability in architecture and urban design." *Corporate Social Responsibility and Environmental Management* 21, no. 3 (2014): 143-154.; Paola Boarin and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022): 130989; Paola Boarin, Antonio Martinez-Molina, and Ignacio Juan-Ferruses. "Understanding students' perception of sustainability in architecture education: A comparison among universities in three different continents." *Journal of Cleaner Production* 248 (2020); Kajetan Sadowski. "Implementation of the New European Bauhaus Principles as a Context for Teaching Sustainable Architecture." *Sustainability* 13, no. 19 (2021): 10715.

[42]D. Hlaváček and M. Čeněk. "Hands-On: Sustainable Approach in Architectural Education." In *IOP Conference Series: Earth and Environmental Science*, vol. 290, no. 1, p. 012047. IOP Publishing, 2019;Elizabeth Donovan and Anna Holder. "How architecture students gain and apply knowledge of sustainable architecture." *Innovation for Sustainable Future. Presented at the Central Europe Towards Sustainable Building (CESB16), Grada Publishing, Prague* (2016);Doris CCK Kowaltowski,, Vanessa Gomes da Silva, Leticia de O Neves, Marcella S. Deliberador, Olívia O. de C. Zara, Giseli M. Colleto, and Evandra Ramos Victorio. "Action research and architectural sustainable design education: a case study in Brazil." International Journal of Technology and Design Education 30, no. 4 (2020): 815-836

[43]Jonathan Natanian and Or Aleksandrowicz. "Environmental education of an architect: The case of final-year design studio at the technion, Israel." *International Journal of Architectural Research: ArchNet-IJAR* 12, no. 1 (2018): 356;Robert Grover, Stephen Emmitt, and Alex Copping. "Reflecting on sustainability: Coproducing a critical framework for sustainable design in the architectural studio." *Higher Education Pedagogies* 4, no. 1 (2019): 41-63; Kiel Moe. "Compelling yet unreliable theories of sustainability." *Journal of Architectural Education* 60, no. 4 (2007):

24-30; Robert Grover, Stephen Emmitt, and Alex Copping. "Reflecting on sustainability: Coproducing a critical framework for sustainable design in the architectural studio." *Higher Education Pedagogies* 4, no. 1 (2019): 41-63.

[44] Robert Grover, Stephen Emmitt, and Alex Copping. "Reflecting on sustainability: Coproducing a critical framework for sustainable design in the architectural studio." *Higher Education Pedagogies* 4, no. 1 (2019): 41-63.

[45] Ahmed Sarhan and Peter Rutherford. "Integrating sustainability in the architectural design education process-taxonomy of challenges and guidelines." (2014).

[46] Ahmed Zaib Khan, Han Vandevyvere, and Karen Allacker. "Design for the ecological age: Rethinking the role of sustainability in architectural education." *Journal of Architectural Education* 67, no. 2 (2013): 175-185; Robert Grover, Stephen Emmitt, and Alex Copping. "Reflecting on sustainability: Coproducing a critical framework for sustainable design in the architectural studio." *Higher Education Pedagogies* 4, no. 1 (2019): 41-63.

[47] Lisa Domenica Iulo, Christine Gorby, Ute Poerschke, Loukas Nickolas Kalisperis, and Malcolm Woollen. "Environmentally conscious design–educating future architects." *International Journal of Sustainability in Higher Education* (2013); Ahmed Zaib Khan, Han Vandevyvere, and Karen Allacker. "Design for the ecological age: Rethinking the role of sustainability in architectural education." *Journal of Architectural Education* 67, no. 2 (2013): 175-185; Sergio Altomonte, Peter Rutherford, and Robin Wilson. "Mapping the way forward: Education for sustainability in architecture and urban design." *Corporate Social Responsibility and Environmental Management* 21, no. 3 (2014): 143-154; Doris CCK Kowaltowski, Vanessa Gomes da Silva, Leticia de O Neves, Marcella S. Deliberador, Olívia O. de C. Zara, Giseli M. Colleto, and Evandra Ramos Victorio. "Action research and architectural sustainable design education: a case study in Brazil." International Journal of Technology and Design Education 30, no. 4 (2020): 815-836.

[48] Mohamed, Kamal Eldin. "An instructive model of integrating sustainability into the undergraduate design studio." Journal of Cleaner Production (2022): 130591

[49] Mark Olweny. "Introducing sustainability into an architectural curriculum in East Africa." *International Journal of Sustainability in Higher Education* (2018); Paola Boarin and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022); M. Amparo Núñez-Andrés, Antonio Martinez-Molina, Núria Casquero-Modrego, and Jae Yong Suk. "The impact of peer learning on student performance in an architectural sustainability course." *International Journal of Sustainability in Higher Education* (2021); Fay Al Khalifa. "Achieving Sustainable Urbanism through Architectural Education: A Move Back to a Learning-by-Doing Pedagogy". *The International Journal of Architectonic Spatial and Environmental Design* (2019) 13(4):1; Sergio Altomonte, Brian Logan, Markus Feisst, Peter Rutherford, and Robin Wilson. "Interactive and situated learning in education for sustainability."(2016) *International Journal of Sustainability in Higher Education*

[50] Robert Grover, Stephen Emmitt, and Alex Copping. "Critical learning for sustainable architecture: Opportunities for design studio pedagogy." *Sustainable Cities and Society* 53 (2020); Robert Grover, Stephen Emmitt, and Dr Alex Copping. "Critical sustainability in the design studio. Pedagogic change through student engagement and collaboration." In *Architecture Connects AAE 2017 Conference Proceedings, 96*, vol. 105. 2017; Paola Boarin and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022); Ceylan, Salih Ceylan. "Redesigning architectural education: an exploration about the impact of worldwide energy problems on architectural education based on the changes in the education program contents of architecture schools." *International Journal of Sustainable Human Development* 2, no. 3 (2014): 87-93; Margarida Feria and Miguel Amado. "Architectural design: Sustainability in the decision-making process." *Buildings* 9, no. 5 (2019): 135; Kajetan Sadowski. "Implementation of the New European Bauhaus Principles as a Context for Teaching Sustainable Architecture." *Sustainability* 13, no. 19 (2021): 10715.

[51] Araceli Regueiro,, Bárbara Crespo, Carla Míguez-Álvarez, and Miguel Cuevas. "Designing a holistic process of learning for implementing sustainability: An experience in an engineering doctoral program." *Computer Applications in Engineering Education* 27, no. 4 (2019): 765-776

[52] Sergio Altomonte, Peter Rutherford, and Robin Wilson. "Mapping the way forward: Education for sustainability in architecture and urban design." *Corporate Social Responsibility and Environmental Management* 21, no. 3 (2014): 143-154; Sarah O'Dwyer and Julie Gwilliam. "Ways of Choosing: The Role of School Design Culture in Promoting Particular Design Paradigms in Irish Architectural Education." In *EAAE Annual Conference Proceedings*, pp. 44-65. (2020); Hedden Kalamas, Maria, Roneisha Worthy, Edwin Akins, Vanessa Slinger-Friedman, and R. C. Paul. "Teaching sustainability using an active learning constructivist approach: Discipline-specific case studies in higher education." *Sustainability* 9, no. 8 (2017): 1320.

[53]Sergio Altomonte, Peter Rutherford, and Robin Wilson. "Mapping the way forward: Education for sustainability in architecture and urban design." *Corporate Social Responsibility and Environmental Management* 21, no. 3 (2014): 143-154; Cisek, Ewa, and Anna Jaglarz. "Architectural Education in the Current of Deep Ecology and Sustainability." *Buildings* 11, no. 8 (2021): 358.

[54]Robert Grover, Stephen Emmitt, and Alex Copping. "Critical learning for sustainable architecture: Opportunities for design studio pedagogy." *Sustainable Cities and Society* 53 (2020)

[55]Pernille Christensen and Elaine Worzala. "Teaching Sustainability: Applying studio pedagogy to develop an alternative post-hurricane housing solution using surplus shipping containers." *Journal of Sustainable Real Estate* 2, no. 1 (2010): 335-360.

[56]Hedden Kalamas, Maria, Roneisha Worthy, Edwin Akins, Vanessa Slinger-Friedman, and R. C. Paul. "Teaching sustainability using an active learning constructivist; Michael Hensel, Daniele Santucci, Defne Sunguroğlu Hensel, and Thomas Auer. "The Lampedusa Studio: A Multimethod Pedagogy for Tackling Compound Sustainability Problems in Architecture, Landscape Architecture, and Urban Design." *Sustainability* 12, no. 11 (2020): 4369; Jonathan Natanian and Or Aleksandrowicz. "Environmental education of an architect: The case of final-year design studio at the technion, Israel." *International Journal of Architectural Research: ArchNet-IJAR* 12, no. 1 (2018): 356; Rebecca McLaughlan and Ishita Chatterjee. "What works in the architecture studio? Five strategies for optimising student learning." *International Journal of Art & Design Education* 39, no. 3 (2020): 550-564; Doris CCK Kowaltowski, Vanessa Gomes da Silva, Leticia de O Neves, Marcella S. Deliberador, Olívia O. de C. Zara, Giseli M. Colleto, and Evandra Ramos Victorio. "Action research and architectural sustainable design education: a case study in Brazil." International Journal of Technology and Design Education 30, no. 4 (2020): 815-836; Marcin Brzezicki and Agata Jasiolek. "A Survey-Based Study of Students' Expectations vs. Experience of Sustainability Issues in Architectural Education at Wroclaw University of Science and Technology, Poland." *Sustainability* 13, no. 19 (2021): 10960.

[57]Araceli Regueiro, Bárbara Crespo, Carla Míguez-Álvarez, and Miguel Cuevas. "Designing a holistic process of learning for implementing sustainability: An experience in an engineering doctoral program." *Computer Applications in Engineering Education* 27, no. 4 (2019): 765-776.

[58]Paola Boarin and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022)

[59]Michael Hensel, Daniele Santucci, Defne Sunguroğlu Hensel, and Thomas Auer. "The Lampedusa Studio: A Multimethod Pedagogy for Tackling Compound Sustainability Problems in Architecture, Landscape Architecture, and Urban Design." *Sustainability* 12, no. 11 (2020): 4369; Doris CCK Kowaltowski, Vanessa Gomes da Silva, Leticia de O Neves, Marcella S. Deliberador, Olívia O. de C. Zara, Giseli M. Colleto, and Evandra Ramos Victorio. "Action research and architectural sustainable design education: a case study in Brazil." International Journal of Technology and Design Education 30, no. 4 (2020): 815-836.

[60]Sarah O'Dwyer and Julie Gwilliam. "Ways of Choosing: The Role of School Design Culture in Promoting Particular Design Paradigms in Irish Architectural Education." In *EAAE Annual Conference Proceedings*, pp. 44-65. (2020)

[61]Rebecca McLaughlan and Ishita Chatterjee. "What works in the architecture studio? Five strategies for optimising student learning." *International Journal of Art & Design Education* 39, no. 3 (2020): 550-564

[62]Sergio Altomonte, Peter Rutherford, and Robin Wilson. "Mapping the way forward: Education for sustainability in architecture and urban design." *Corporate Social Responsibility and Environmental Management* 21, no. 3 (2014): 143-154.

[63]Paola Boarin and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022); Doris CCK Kowaltowski, Vanessa Gomes da Silva, Leticia de O Neves, Marcella S. Deliberador, Olívia O. de C. Zara, Giseli M. Colleto, and Evandra Ramos Victorio. "Action research and architectural sustainable design education: a case study in Brazil." International Journal of Technology and Design Education 30, no. 4 (2020): 815-836; Margarida Feria and Miguel Amado. "Architectural design: Sustainability in the decision-making process." *Buildings* 9, no. 5 (2019): 135; Sandra Lee Pinel and Ryan Urie. "Learning reflective planning: The application of participatory action research principles to planning studio design and assessment." *Journal of Architectural and Planning Research* (2017): 32-48; Kamal Eldin Mohamed. "An instructive model of integrating sustainability into the undergraduate design studio." Journal of Cleaner Production (2022): 130591

[64]Elizabeth Donovan and Anna Holder. "How architecture students gain and apply knowledge of sustainable architecture." *Innovation for Sustainable Future. Presented at the Central Europe Towards Sustainable Building (CESB16), Grada Publishing, Prague* (2016); Diane M. Bender and Jon D. Vredevoogd. "Using online education technologies to support studio instruction." *Journal of Educational Technology & Society* 9, no. 4 (2006): 114-

122; Glen Andrew Hill,. "The 'tutorless' design studio: A radical experiment in blended learning." *Journal of Problem Based Learning ihedn Higher Education* 5, no. 1 (2017); Xinyu Shi,, Xue Fang, Zhoufan Chen, Tyson Keen Phillips, and Hiroatsu Fukuda. "A didactic pedagogical approach toward sustainable architectural education through robotic tectonics." *Sustainability* 12, no. 5 (2020): 1757.

[65]Sarah O'Dwyer and Julie Gwilliam. "Ways of Choosing: The Role of School Design Culture in Promoting Particular Design Paradigms in Irish Architectural Education." In *EAAE Annual Conference Proceedings*, pp. 44-65. (2020); Paola Boarin and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022); D. Hlaváček and M. Čeněk. "Hands-On: Sustainable Approach in Architectural Education." In *IOP Conference Series: Earth and Environmental Science*, vol. 290, no. 1, p. 012047. IOP Publishing, 2019; Maja Terlević, Andreja Istenič Starčič, and Maruška Šubic Kovač. "Sustainable spatial development in higher education." *Urbani izziv* 26, no. 1 (2015): 105-120.

[66]Sarah O'Dwyer and Julie Gwilliam. "Ways of Choosing: The Role of School Design Culture in Promoting Particular Design Paradigms in Irish Architectural Education." In *EAAE Annual Conference Proceedings*, pp. 44-65. (2020); Sergio Altomonte, Peter Rutherford, and Robin Wilson. "Mapping the way forward: Education for sustainability in architecture and urban design." *Corporate Social Responsibility and Environmental Management* 21, no. 3 (2014): 143-154; Jonathan Natanian and Or Aleksandrowicz. "Environmental education of an architect: The case of final-year design studio at the technion, Israel." *International Journal of Architectural Research: ArchNet-IJAR* 12, no. 1 (2018): 356; Hedden Kalamas, Maria, Roneisha Worthy, Edwin Akins, Vanessa Slinger-Friedman, and R. C. Paul. "Teaching sustainability using an active learning constructivist approach: Discipline-specific case studies in higher education." *Sustainability* 9, no. 8 (2017): 1320; Simon O'Rafferty, Hannah Curtis, and Frank O'Connor. "Mainstreaming sustainability in design education–a capacity building framework." *International Journal of Sustainability in Higher Education* (2014).

[67]Daniela Elena Dumitru. "Reorienting higher education pedagogical and professional development curricula toward sustainability–a Romanian perspective." *International Journal of Sustainability in Higher Education* (2017).

[68]Ahmed Zaib Khan, Han Vandevyvere, and Karen Allacker. "Design for the ecological age: Rethinking the role of sustainability in architectural education." *Journal of Architectural Education* 67, no. 2 (2013): 175-185; Kiel Moe. "Compelling yet unreliable theories of sustainability." *Journal of Architectural Education* 60, no. 4 (2007): 24-30.

[69]Doris CCK Kowaltowski, Vanessa Gomes da Silva, Leticia de O Neves, Marcella S. Deliberador, Olívia O. de C. Zara, Giseli M. Colleto, and Evandra Ramos Victorio. "Action research and architectural sustainable design education: a case study in Brazil." International Journal of Technology and Design Education 30, no. 4 (2020): 815-836; Matthias Barth, Jasmin Godemann, Marco Rieckmann, and Ute Stoltenberg. "Developing key competencies for sustainable development in higher education." *International Journal of sustainability in higher education* (2007); Mark Kelly. "Embedding sustainability across the built environment curriculum and beyond." In *EESD2021: Proceedings of the 10th Engineering Education for Sustainable Development Conference*, pp. 1-15. University College Cork, 2021; Remon Rooij, Renate Klaassen, Roberto Cavallo, and Jos A. Arts. "Architecture and built environment design education: disciplinary and pedagogical developments." *International Journal of Technology and Design Education* 30, no. 5 (2020): 837-848; Paul Micklethwaite and Robert Knifton. "Climate Change. Design Teaching for a New Reality." *The Design Journal* 20, no. sup1 (2017): S1636-S1650.

[70]Paola Boarin and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022)

[71]Pelin Efilti and Koray Gelmez. "Celebrating the variety, fighting the confusion: An integrative review of the design teacher's pedagogical roles." *art, design & communication in higher Education* 20, no. 2 (2021): 243-287; Araceli Regueiro, Bárbara Crespo, Carla Míguez-Álvarez, and Miguel Cuevas. "Designing a holistic process of learning for implementing sustainability: An experience in an engineering doctoral program." *Computer Applications in Engineering Education* 27, no. 4 (2019): 765-776.

[72]Paola Boarin and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022)

[73]Sergio Altomonte, Brian Logan, Markus Feisst, Peter Rutherford, and Robin Wilson. "Interactive and situated learning in education for sustainability."(2016) *International Journal of Sustainability in Higher Education*

[74]Sergio Altomonte, Brian Logan, Markus Feisst, Peter Rutherford, and Robin Wilson. "Interactive and situated learning in education for sustainability."(2016) *International Journal of Sustainability in Higher Education*

[75]Treechada Chotiratanapinun. "First practical step to achieve education for sustainable development (ESD) in the context of Thailand's design education: exploring a transformative pedagogical approach."

BIBLIOGRAPHY

Alexandrou, Eleni, Flora Bougiatioti, Miltiadis Katsaros, Athanasios Kotsenos, and Elias Zacharopoulos. "Sustainability challenges in architectural education: assessment of an architectural technology course on the bioclimatic redesign of existing buildings in Greece." *International Journal of Sustainable Energy* (2021): 1-20.

Al Khalifa, Fay. "Achieving Sustainable Urbanism through Architectural Education: A Move Back to a Learning-by-Doing Pedagogy". *The International Journal of Architectonic Spatial and Environmental Design* (2019) 13(4):1

Altomonte, Sergio, Brian Logan, Markus Feisst, Peter Rutherford, and Robin Wilson. "Interactive and situated learning in education for sustainability."(2016) *International Journal of Sustainability in Higher Education*

Altomonte, Sergio, Peter Rutherford, and Robin Wilson. "Mapping the way forward: Education for sustainability in architecture and urban design." *Corporate Social Responsibility and Environmental Management* 21, no. 3 (2014): 143-154.

Architecture Education Declares. Accessed Dec 2021. https://www.architectureeducationdeclares.com/

Barry, S. "Hive minds: distributed intelligence within the iomimetic studio." *WIT Transactions on Ecology and the Environment* 173 (2013): 335-343.

Barth, Matthias, Jasmin Godemann, Marco Rieckmann, and Ute Stoltenberg. "Developing key competencies for sustainable development in higher education." *International Journal of sustainability in higher education* (2007).

Bender, Diane M., and Jon D. Vredevoogd. "Using online education technologies to support studio instruction." *Journal of Educational Technology & Society* 9, no. 4 (2006): 114-122.

Boarin, Paola and Antonio Martinez-Molina. "Integration of environmental sustainability considerations within architectural programmes in higher education: A review of teaching and implementation approaches." *Journal of Cleaner Production* (2022)

Boarin, Paola, Antonio Martinez-Molina, and Ignacio Juan-Ferruses. "Understanding students' perception of sustainability in architecture education: A comparison among universities in three different continents." *Journal of Cleaner Production* 248 (2020)

Brzezicki, Marcin, and Agata Jasiolek. "A Survey-Based Study of Students' Expectations vs. Experience of Sustainability Issues in Architectural Education at Wroclaw University of Science and Technology, Poland." *Sustainability* 13, no. 19 (2021): 10960.

Cerra, Joshua Frank. "Inland adaptation: Developing a studio model for climate-adaptive design as a framework for design practice." *Landscape Journal* 35, no. 1 (2016): 37-56.

Ceylan, Salih. "Redesigning architectural education: an exploration about the impact of worldwide energy problems on architectural education based on the changes in the education program contents of architecture schools." *International Journal of Sustainable Human Development* 2, no. 3 (2014): 87-93.

Chotiratanapinun, Treechada. "First practical step to achieve education for sustainable development (ESD) in the context of Thailand's design education: exploring a transformative pedagogical approach."

Christensen, Pernille, and Elaine Worzala. "Teaching Sustainability: Applying studio pedagogy to develop an alternative post-hurricane housing solution using surplus shipping containers." *Journal of Sustainable Real Estate* 2, no. 1 (2010): 335-360.

Chupin, Jean-Pierre, Morteza Hazbei, and Karl-Antoine Pelchat. "Three Types of Architectural Educational Strategies (AES) in Sustainable Buildings for Learning Environments in Canada." *Sustainability* 13, no. 15 (2021): 8166.

Cisek, Ewa, and Anna Jaglarz. "Architectural Education in the Current of Deep Ecology and Sustainability." *Buildings* 11, no. 8 (2021): 358.

Clegg, Peter. "Beyond the Declaration: Delivery of GHG Reductions".Accessed Dec 2021.

https://www.buildingsandcities.org/insights/commentaries/architects-declaration-emissions-reductions.html. (2020).

Cranz, Galen, Georgia Lindsay, and Lusi Morhayim. "TEACHING THROUGH DOING: POST-OCCUPANCY EVALUATION OF BERKELEY'S DAVID BROWER CENTER." *Journal of Architectural and Planning Research* (2016): 1-17

Dabaieh, Marwa, Menna Lashin, and Ahmed Elbably. "Going green in architectural education: An urban living lab experiment for a graduation green design studio in Saint Catherine, Egypt." *Solar Energy* 144 (2017): 356-366.

De Gaulmyn, Camille, and Karine Dupre. "Teaching sustainable design in architecture education: Critical review of Easy Approach for Sustainable and Environmental Design (EASED)." *Frontiers of Architectural Research* 8, no. 2 (2019): 238-260.

Dezeen, "Architecture "lagging behind all other sectors" in climate change fight says IPCC report author", Accessed 12th April 2022. https://www.dezeen.com/2022/04/06/ipcc-climate-change-mitigation-report/

Donovan, Elizabeth, and Anna Holder. "How architecture students gain and apply knowledge of sustainable architecture." *Innovation for Sustainable Future. Presented at the Central Europe Towards Sustainable Building (CESB16), Grada Publishing, Prague* (2016).

Dumitru, Daniela Elena. "Reorienting higher education pedagogical and professional development curricula toward sustainability–a Romanian perspective." *International Journal of Sustainability in Higher Education* (2017).

EC, "New rules for greener and smarter buildings will increase quality of life for all

Europeans", Accessed Dec 2021. https://ec.europa.eu/info/news/new-rules-greener-and-smarter-buildings-will-increase-quality-life-alleuropeans-2019-apr-15_en . (2019).

EC, "Committing to climate-neutrality by 2050: Commission proposes European Climate Law and consults on the European Climate Pact", Accessed Dec 2021.
 https://ec.europa.eu/commission/presscorner/detail/en/ip_20_335 (2020)

Efilti, Pelin, and Koray Gelmez. "Celebrating the variety, fighting the confusion: An integrative review of the design teacher's pedagogical roles." *art, design & communication in higher Education* 20, no. 2 (2021): 243-287.

EPBD, "DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the energy performance of buildings" Accessed Dec 2021.
 https://eur-lex.europa.eu/legal content/EN/TXT/PDF/?uri=CELEX:02010L0031-20181224&from=EN. (2018).

Feria, Margarida, and Miguel Amado. "Architectural design: Sustainability in the decision-making process." *Buildings* 9, no. 5 (2019): 135.

Gough, David, Sandy Oliver, and James Thomas, eds. "An introduction to systematic reviews" Sage, (2017).

Grover, Robert, Stephen Emmitt, and Alex Copping. "Critical learning for sustainable architecture: Opportunities for design studio pedagogy." *Sustainable Cities and Society* 53 (2020)

Grover, Robert, Stephen Emmitt, and Alex Copping. "Reflecting on sustainability: Coproducing a critical framework for sustainable design in the architectural studio." *Higher Education Pedagogies* 4, no. 1 (2019): 41-63.

Grover, Robert, Stephen Emmitt, and Alexander Copping. "Fit for purpose?: Sustainability and the design studio." In *International conference for the sustainable design of the built environment 2018*. 2018.

Grover, Robert, Stephen Emmitt, and Dr Alex Copping. "Critical sustainability in the design studio. Pedagogic change through student engagement and collaboration." In *Architecture Connects AAE 2017 Conference Proceedings, 96*, vol. 105. 2017.

Grover, Robert, Stephen Emmitt, and Alexander Copping. "Fit for purpose?: Sustainability and the design studio." In *International conference for the sustainable design of the built environment 2018*. 2018.

Hensel, Michael, Daniele Santucci, Defne Sunguroğlu Hensel, and Thomas Auer. "The Lampedusa Studio: A Multimethod Pedagogy for Tackling Compound Sustainability Problems in Architecture, Landscape Architecture, and Urban Design." *Sustainability* 12, no. 11 (2020): 4369.

Hill, Glen Andrew. "The 'tutorless' design studio: A radical experiment in blended learning." *Journal of Problem Based Learning ihedn Higher Education* 5, no. 1 (2017).

Hlaváček, D., and M. Čeněk. "Hands-On: Sustainable Approach in Architectural Education." In *IOP Conference Series: Earth and Environmental Science*, vol. 290, no. 1, p. 012047. IOP Publishing (2019).

Ismail, Muhammad Azzam, Nila Keumala, and Rawia Marwan Dabdoob. "Review on integrating sustainability knowledge into architectural education: Practice in the UK and the USA." *Journal of Cleaner Production* 140 (2017): 1542-1552.

Iulo, Lisa Domenica, Christine Gorby, Ute Poerschke, Loukas Nickolas Kalisperis, and Malcolm Woollen. "Environmentally conscious design–educating future architects." *International Journal of Sustainability in Higher Education* (2013).

Jackson, Tim. "2050 is too late – we must drastically cut emissions much sooner2. The Conversation. Accessed Dec 2021. https://theconversation.com/2050-is-too-late-we-must-drastically-cut-emissions-much-sooner-121512 . (2019).

Kalamas Hedden, Maria, Roneisha Worthy, Edwin Akins, Vanessa Slinger-Friedman, and R. C. Paul. "Teaching sustainability using an active learning constructivist approach: Discipline-specific case studies in higher education." *Sustainability* 9, no. 8 (2017): 1320.

Kelly, Mark. "Embedding sustainability across the built environment curriculum and beyond." In *EESD2021: Proceedings of the 10th Engineering Education for Sustainable Development Conference*, pp. 1-15. University College Cork, 2021.

Khan, Ahmed Zaib, Han Vandevyvere, and Karen Allacker. "Design for the ecological age: Rethinking the role of sustainability in architectural education." *Journal of Architectural Education* 67, no. 2 (2013): 175-185.

Klein, David, and Ken Phillips. "Sustainable design: An educational imperative." (2011).

Kolsal, Fatma, and Ozlem Kandamir. "A Research on Learning Styles-An Introduction to Architectural Design Studio." (2021).

Kowaltowski, Doris CCK, Vanessa Gomes da Silva, Leticia de O Neves, Marcella S. Deliberador, Olívia O. de C. Zara, Giseli M. Colleto, and Evandra Ramos Victorio. "Action research and architectural sustainable design education: a case study in Brazil." International Journal of Technology and Design Education 30, no. 4 (2020): 815-836.

Luckan, Y. "Analysis and perception: architectural pedagogy for environmental sustainability." *WIT Transactions on The Built Environment* 142 (2014): 577-588.

Martínez-Ventura, Jordi, Eduardo de-Miguel-Arbonés, Carla Sentieri-Omarrementería, Juanjo Galan, and María Calero-Llinares. "A tool to assess architectural education from the sustainable development perspective and the students' viewpoint." *Sustainability* 13, no. 17 (2021): 9596.

Massaro, Maurizio John Dumay, and James Guthrie. "On the shoulders of giants: undertaking a structured literature review in accounting." Accounting, Auditing & Accountability Journal (2016).

McLaughlan, Rebecca, and Ishita Chatterjee. "What works in the architecture studio? Five strategies for optimising student learning." *International Journal of Art & Design Education* 39, no. 3 (2020): 550-564.

Micklethwaite, Paul, and Robert Knifton. "Climate Change. Design Teaching for a New Reality." *The Design Journal* 20, no. sup1 (2017): S1636-S1650.

Moe, Kiel. "Compelling yet unreliable theories of sustainability." *Journal of Architectural Education* 60, no. 4 (2007): 24-30.

Mohamed, Kamal Eldin. "An instructive model of integrating sustainability into the undergraduate design studio." Journal of Cleaner Production (2022): 130591

Mohamed, Kamal Eldin. "Sustainable Architectural Design Education: An Improved Experimental Method in a 3rd Year Design Studio." *The Academic Research Community publication* 4, no. 1 (2020): 64-74.

Moosavi, Sareh, and Judy Bush. "Embedding Sustainability in Interdisciplinary Pedagogy for Planning and Design Studios." *Journal of Planning Education and Research* (2021): 0739456X211003639.

Natanian, Jonathan, and Or Aleksandrowicz. "Environmental education of an architect: The case of final-year design studio at the technion, Israel." *International Journal of Architectural Research: ArchNet-IJAR* 12, no. 1 (2018): 356.

Nisonen, Essi. "Architecture as sustainability – educating the transformative practitioner". Master's Thesis, Tampere University (2022).

Núñez-Andrés, M. Amparo, Antonio Martinez-Molina, Núria Casquero-Modrego, and Jae Yong Suk. "The impact of peer learning on student performance in an architectural sustainability course." *International Journal of Sustainability in Higher Education* (2021).

O'Dwyer, Sarah, and Julie Gwilliam. "Ways of Choosing: The Role of School Design Culture in Promoting Particular Design Paradigms in Irish Architectural Education." In *EAAE Annual Conference Proceedings*, pp. 44-65. 2020.

Oliveira, Sonja, Elena Marco, and Bill Gething. "What do we say we teach about energy? Viewed through the lens of UK architecture undergraduate education." (2015)

Olweny, Mark. "Introducing sustainability into an architectural curriculum in East Africa." *International Journal of Sustainability in Higher Education* (2018).

Pinel, Sandra Lee, and Ryan Urie. "Learning reflective planning: The application of participatory action research principles to planning studio design and assessment." *Journal of Architectural and Planning Research* (2017): 32-48.

Palabiyik, Serkan, and Elif Alkilinc. "Developing a web based software for the evaluation of architectural designs."

Regueiro, Araceli, Bárbara Crespo, Carla Míguez-Álvarez, and Miguel Cuevas. "Designing a holistic process of learning for implementing sustainability: An experience in an engineering doctoral program." *Computer Applications in Engineering Education* 27, no. 4 (2019): 765-776.

Rieh, Sun-Young, Byung-Yun Lee, Joon-Gul Oh, Thorsten Schuetze, Santiago Porras Álvarez, Kyungsun Lee, and Jiyoung Park. "Integration of sustainability into architectural education at accredited Korean universities." *Sustainability* 9, no. 7 (2017): 1121.

Sadowski, Kajetan. "Implementation of the New European Bauhaus Principles as a Context for Teaching Sustainable Architecture." *Sustainability* 13, no. 19 (2021): 10715.

Sarhan, Ahmed, and Peter Rutherford. "Integrating sustainability in the architectural design education process-taxonomy of challenges and guidelines." (2014).

Sepúlveda, M. Carolina, and H. Natalia Gajardo. "Innovation in teaching and learning methods: Integrating sustainability subjects in the architectural design process." In *SHS Web of Conferences*, vol. 26, p. 01024. EDP Sciences, 2016.

Schulzova, Kristyna, and Daniela Bosova. "BUILDING PHYSICS REQUIREMENTS AND ARCHITECTURE STUDENTS." *International Multidisciplinary Scientific GeoConference: SGEM* 18, no. 6.1 (2018): 537-544.

Shi, Xinyu, Xue Fang, Zhoufan Chen, Tyson Keen Phillips, and Hiroatsu Fukuda. "A didactic pedagogical approach toward sustainable architectural education through robotic tectonics." *Sustainability* 12, no. 5 (2020): 1757.

Tatar, Elif, and Ruşen Yamaçlı. "A sustainable model proposal for architectural education." *International Journal of Design Education* (2021).

Taleghani, Mohammad, Hamid Reza Ansari, and Philip Jennings. "Sustainability in architectural education: A comparison of Iran and Australia." *Renewable energy* 36, no. 7 (2011): 2021-2025.

Terlević, Maja, Andreja Istenič Starčič, and Maruška Šubic Kovač. "Sustainable spatial development in higher education." *Urbani izziv* 26, no. 1 (2015): 105-120.

UN, "The United Nations Decade of Education for Sustainable Development (2005-2014)", Accessed 24th Feb 2022. https://en.unesco.org/themes/education-sustainable-development/what-is-esd/un-decade-of-esd

Vassigh, Shahin. "Digital gaming and sustainable design." *Enquiry The ARCC Journal for Architectural Research* 5, no. 2 (2008).

Walker, Jason B., and Michael W. Seymour. "Utilizing the design charrette for teaching sustainability." *International Journal of Sustainability in Higher Education* (2008).

Xiang, Xingwei, Xiaolong Yang, Jixi Chen, Renzhong Tang, and Luoke Hu. "A Comprehensive Model of Teaching Digital Design in Architecture that Incorporates Sustainability." *Sustainability* 12, no. 20 (2020): 8368.

Xiang, Xingwei, Qian Wu, Ye Zhang, Bifeng Zhu, Xiaoji Wang, Anping Wan, Tongle Huang, and Luoke Hu. "A Pedagogical Approach to Incorporating the Concept of Sustainability into Design-to-Physical-Construction Teaching in Introductory Architectural Design Courses: A Case Study on a Bamboo Construction Project." *Sustainability* 13, no. 14 (2021): 7692.

Yavuz, Arzu Özen, and Tuğçe Çelik. "Proposing A Generative Model Developed By Ecologic Approaches In Architectural Design Education." *Procedia-Social and Behavioral Sciences* 143 (2014): 330-333.

CONCEPTION OF TEACHING: ARCHITECTURE LECTURERS IN NIGERIA

Author:
FOLU AJIBOYE

Affiliation:
ANGLIA RUSKIN UNIVERSITY, UK

INTRODUCTION

Conceptions of teaching are inherent in an individual's beliefs of what teaching should be and its influence on teaching approaches, learning approaches and outcomes of students has been established in literature.[1] Thus, to improve teaching quality and effectiveness among lecturers, Higher education institutions (HEI) have created measures to alter teaching conceptions. Employing varying methodologies, a few studies have tried to categorize teaching conceptions into two broad orientations of teacher/content centered and student/learner centered.[2] Thus, this study suggests that Nigerian architecture lecturers need to become aware of their teaching conceptions to enhance their teaching practices. This study draws on a qualitative approach, with interviews as the main tool for data collection and a total of fourteen lecturers as participants. Thematic data analysis was employed with both concept and data driven coding approaches. Drawing on findings of the teacher-centered teaching conceptions that circulate among architectural lecturers in Nigeria and existing teaching conceptions in literature, this study seeks to highlight and discuss some of the nuances of the teacher-centered conception of teaching.

Terminology

Several studies have used various terminologies such as orientations, theories, beliefs, approaches, and intentions to mean conception.[3] The term belief is sometimes used synonymously to mean conceptions while the term orientation usually takes more than one conception into account. Although there have not been clear definitions of this terms, hence, it is suggested that researchers in the field of teachers' beliefs should reach a consensus upon common terminology and definitions to be used to aid further study.[4] However, it is assumed that different perspectives employed in examining teaching conceptions of tertiary teachers may have formed the basis for such varying theories and terminologies that have emerged.

Justification of the study

In Nigeria, teachers in secondary and primary levels are mostly trained to teach. Thus, they are assumed to be equipped and well prepared to carry out teaching practices. On the contrary, many university academics rarely engage in teacher education thus, most university lecturers do not possess a teacher training certificate because it is not a major prerequisite in securing a lecturing job.[5] However, if as some have contended that teaching conception influences teaching approach and learning outcomes,[6]

lecturers need to be able to become aware of their teaching conceptions so that they can understand why they teach the way they do. This should consequently enable them to make an informed decision on the best teaching approach to employ at a given time to improve teaching and learning quality.

Conception of teachings is an essential element in the complex relationship between learning and teaching. However, despite studies showing a correlation between conceptions of teaching and teaching approaches[7] architecture as a field has only been studied alongside other related courses in few studies and not on its own terms.[8] Therefore, this study presents a perspective which examines existing teaching conceptions in Nigerian higher education with architecture lecturers as the focus. This should contribute to the growing discourse on architectural education and establish similarity or variation in teaching conceptions between the Nigerian context and other locations explored in literature. To sum up, this study presents varying expressions of the teacher-centred conceptions of teaching existing within the field of architectural education in Nigerian with the aim of highlighting benefits and draw backs. This is to improve students' outcomes and strengthen architectural education.

LITERATURE REVIEW
Categories and Dynamics of Teaching conceptions

Dall' Alba qualitatively described seven separate ways in which teachers perceive their roles as teachers[9] but the conceptions were not distinctly categorized as either a teacher centred or student-centred conception. However, the hierarchical presentation of the conception suggest that the student-centred perspectives are higher in hierarchy than the teacher centred ones. Another study[10] argue that teaching conceptions are better arranged in order and not in hierarchy.[11] Their submission was that teaching conceptions and approaches could be context based for some academics, which was also confirmed by some other studies.[12] However, the preliminary nature of the study and the total number of participants (thirteen) may not provide enough validity to the categories that emerged. Kember also argues that teachers can possess different conception per time and so can move from one pole to another, thus conceptions are better placed in a continuum that in hierarchy.[13] In view of this, studies on teaching conception should simply explore and highlight the existing conceptions rather than attempt to attach hierarchy or order to the teaching conceptions identified. Fox metaphorically presented his transfer and shaping theory with characteristics related to a teacher centered conception.[14] Although, the number of participants from which these theories emerged were unspecified, Fox, concluded that teaching theories held by a teacher will affect the teaching strategies they employ, their attitude towards the students and the training programs they will commit themselves to. Another study[15] interviewing 39 lecturers presented varied teaching conceptions under two main orientations.[16] Although, the study involved a wide range of disciplines, architecture was excluded. However, it was concluded that there is a relationship between lecturers' orientation to teaching and the quality of students learning. Teachers professing conceptions that they sometimes do not exhibit in practice was also highlighted by Ross.[17] Therefore, it is imperative to investigate conceptions of teaching held by certain discipline within certain social or cultural context as universal theory or model may not be suffice.

Influences on teaching conception

Revisiting research into teaching conceptions with architecture among the disciplines studied, [18]seven teaching conception categories emerged. Findings suggested that lecturers from architecture expressed a learner centred conception of teaching. Thus, they proposed that teaching conception could be influenced by difference in discipline and the institutions involved. Another study [19] also suggested that discipline is a major factor that influences the conceptions of effective teaching among the teachers. However, it can be argued that teaching conceptions are not entirely subject or discipline oriented.[20]

In addition, some studies[21] investigated the conception of excellent teaching of Chinese middle school teachers and Iranian high school English teachers. Both studies posit that teaching conceptions could be dependent on factors such as culture and polices. Although, these two studies were carried out on high school teachers, research into university teaching may be able to benefit from paying close attention to studies of such.[22] In conclusion, if factors such as context, discipline and policies influence teaching conception, placing higher importance on a particular conception may not suffice. This was supported by Fox stating that a reflective and perceptive teachers stand in a better position to decide which is the most appropriate view of teaching for each context.[23]

METHODOLOGY

This study takes on the interpretivist paradigm, based on a relativist ontology and subjective epistemology. The interpretive methodology is aimed at understanding reality from the individual's perspective. The interpretive perspective will provide fundamental support to the in-depth understanding of the experiences expressed by the participants which has been drawn through the interaction between the researchers and the participant. Considering the philosophical stance of this study, that people cannot be separated from what they know and experienced a qualitative approach to the research has been embraced to discover the lecturers' intentions and how they have either creatively or deliberately interpreted and constructed meaning as well as made sense of the world of teaching around them.[24]

Convenience and snowballing were employed. Hence, recruitment of participants relied on easy access to sources of data,[25] or through an initial contact with a subject providing a network of reliable contacts. Fourteen lecturers were interviewed from architecture departments in two Nigerian universities irrespective of their area of specialization, academic status, professional practice, or certification. One of the universities is privately owned (university A) while the other is a government owned university (university B), however, both universities, offer architecture as both an undergraduate and a post graduate course. Also, based on recent university ranking released by Cybermetrics Lab [26] they are both best universities in their ownership categories.

Semi-structured questions were sent to the participants ahead of the interview sessions to allow participants internalize and reflect on the questions and their intended answers. The questions were broad enough to allow participants express deep reflection and construction of their teaching situations and experiences. Due to the global pandemic at the time of data collection, Interview sessions were conducted via Google meet and WhatsApp. These platforms were the only available and suitable means of conducting interview with the participants. Each interview session was either audio or video recorded based on participants choice. Interview sessions were transcribed and read literarily, interpretively, and reflexively [27] to produce meanings embedded in the data collected. This was done alongside repetitive listening to audio recordings of the interview sessions. Analysis employed manual thematic coding with descriptive and interpretive analysis. Categories emerged both from the data and the theoretical frameworks. Quotes from the participants are linked with the appropriate themes generated from both literature and emerging themes from the interview. A research proposal was submitted to Anglia Ruskin University, United Kingdom ethics committee and approval was obtained before data collection commenced. Therefore, to maintain ethical standard, responses to the interview remains anonymous and confidential to wane or completely avoid any risk to participants.

FINDINGS

Participants characteristics

A total of 6 female and 14 male participants were interviewed. Three female and five male participants from University A, one female and four male participants from university B. Twelve out of the fourteen

lecturers were already PhD holders while two of the lecturers from university B were currently running their PhD programme. The average number of years of lecturing for all the fourteen lecturers was 15.28years with 30 years as the highest and 2 years as the lowest. Many of the lecturers were silent about their private practice. So, it was not certain how many lecturers were actively practicing architecture.

Analysis of findings

Analysis of the data generated from the interview session suggest that the existing teacher centred conception of teaching among architecture lecturers in Nigeria can be subdivided into three. Each of these subdivisions describes and interpret unique but related nuances of how the lecturers view a teacher-centered conception of teaching. However, the teacher is actively prominent in each of these subdivisions. The lecturers expressed their view in terms of what the teacher (lecturer) is expected to do I.e., what action(s) or activity the teacher should carry out during teaching. Teaching is either about transmitting knowledge/information, supporting students learning and building expert knowledge.

	Female participants	Male participants
Transmitting Knowledge /Information	B4, A11, A3	B6, B5
Supporting student learning		A1, A2, A3, A12
Building expert knowledge	A3, A14, B5	A1, A2, A12, B4

Table 1. showing frequency of lecturer's expression of teacher-centred conception of teaching
Key- Figure 1-14 represents the participants however, participants B7, B8, B9, A10 did not express a teacher centred approach to teaching at all)
A-Private university
B-Government owned university

Transmitting knowledge/information

Some of the lecturers expressed the teacher centered conception in terms of passing on knowledge to students. In this category, the lecturer talks more while actively disseminating information. Teacher emphasizes being knowledgeable and well prepared, uses teaching aids to structure learning and present information to the students. More female lecturers expressed this concept of teaching while more lecturers from the government university expressed this view of teaching.
*I've seen it as a way whereby someone comes to class to **pour** out his knowledge (B5)*
*I just feel people should **disseminate knowledge** irrespective of the platform... maybe because I talk a lot.... I talk more than my slides... (A11)*

Supporting student learning

Some lecturers also expressed the teacher centered conception with respect to the kind of support they provide for the student. Although the teacher acknowledges the presence of the students within the category, they express their role as a protector who looks after little students like babies who need their help frantically to grow into maturity. The teacher is protective of the learning process. Thus, the lecturer unwittingly dominates the teaching event making the student passive while trying to help students learn. More males expressed this concept with only one female expressing this view of teaching. None of the lecturers from the public university expressed this concept of teaching.
*I see it as you are just **nurturing the next generation** to be problem solvers (A1)*

*Teaching is **guiding the students** to discover solutions using your own knowledge (A12)*

Building expert knowledge

The main characteristic that delineates this category is being futuristic in approach. Lecturers expressed their teacher centered conception with regards to helping the students move from their naïve forms and begin to think as experts in the field of architecture. The lecturers foresee students as experts, so they are actively committed to helping them become the professional architect that they desire in the future. There were more males who expressed this perspective of teaching while more of lecturers from the private university expressed this concept of teaching than lecturers from the government owned university.

*I am building them for the future.... when you go out there, they become that **competent future professional** that we want them to be (A1)*

*My view about teaching is that.... make **them stand by themselves** when they are outside the box of the university. (B5)*

DISCUSSION

This study aims to explore the various expressions of the teacher centred conception of teaching among architectural lecturers in Nigeria. Despite similar features of the teacher-centered conception of teaching that emerged within this study and that of previous studies, it was difficult placing them side by side with each other. Many of the lecturers expressed statements that were in consonance with a teacher-centered conception and then later expressed statements that could be categorized as a student-centered conception as the interview progressed. This suggests that lecturers expressed more than one conception of teaching when reviewed in terms of the teacher centered and student-centered categories. Research by Samuelowicz and Bain also noted that despite employing a broad range of dimensions in categorizing the conceptions that emerged, they discovered that the two divides share some similarities in their characteristics.[28] Kember also stated that teaching conceptions change as in a continuum, thus, teachers can possess different conception per time.[29] Hence, it can be concluded that creating a distinct or well-defined boundaries around conceptions held by individual lecturers is not practicable.

There may be factors that determine such instability with conceptions of teaching held by academics. Fox argues that there are several contexts that may justify the teacher centered approach as the teacher may need to create defined objectives to avoid chaos in the teaching/learning process.[30] Indeed, in architecture, design and construction of buildings must be done with regards to building regulations and codes, Thus, student's creativity and design will need to be placed within such boundaries. Hence, the need for the teacher to disseminate such laid down knowledge for the students to follow. Therefore, distinct features of different knowledge domains may determine key aspects of teaching and learning. Neumann, Parry & Becher supported that ignoring such features may impoverish many related policies and practices.[31] On the contrary, Dall' Alba argues that teaching conceptions are not entirely subject or discipline oriented.[32] Also, another study noted that teachers from 'hard' disciplines (physics and chemistry, engineering) were more likely to report a more teacher focused approach to teaching, whereas those teaching 'soft' disciplines (history and anthropology, education, and management studies) were more student focused.[33] However, the dynamic nature of architecture as a discipline may allow divers teaching conception and approach to be expressed. This is because architecture is a study of both the art and science of buildings. Therefore, it may be problematic to place architecture either in the hard or soft discipline domain.

The concept of building for expert knowledge in this study, implicitly indicates that students are not passive during a teaching activity, however, the lecturer still believes that expert knowledge must be poured into the student for them to be capable in future practice. Thus, the activity of the teacher is still

prominent. This explains why building expert knowledge as a conception has been placed under the teacher centered orientation within this study. A few studies suggests that this occurs sometimes because teachers are constrained by both their teaching conceptions and the epistemological characteristics of the academic domain, they find themselves.[34] Nonetheless, steaching conception studies suggest that the student-centred conception is superior. Hence, Cassidy and Ahmad advocates for teaching professional programs that are targeted at mechanisms that help change conception toward the student-centred approach to teaching.[35] Fox argued that reflective and perceptive teachers stand in a better position to decide which concept of teaching is most appropriate for each context[36]. Also, in understanding HE (Higher Education) teaching needs a careful consideration of the relationship between their beliefs about teaching and their teaching practices in situ.[37] Therefore, since more architecture lecturers within this study perceive a need to connect practice with theory (building expert knowledge), it is important that equal attention is given to both teaching approaches and the beliefs (conceptions) of teachers to achieve a sustainable change needed in improving students' outcomes and teaching quality rather than placing importance on a certain conception of teaching.

CONCLUSION

This study was conducted to highlight and discuss some of the nuances in expression of the teacher-centered conception of teaching. A series of interviews were conducted with a total of fourteen lecturers from two Nigerian universities. In conclusion, the teacher centred approach should not be perceived as less advanced, or detrimental to learning. However, there is a need to create more awareness of existing and needed teaching conceptions in architectural education so that teachers make informed decision on the best teaching conception for each context. Findings from this study may in turn have implications on how Nigerian-based architectural lecturers gain further awareness of existing and emerging teaching conceptions with the aim of improving students' outcomes and strengthening architectural education.

NOTES

[1] Trigwell and Prosser, 'Changing Approaches to Teaching'; Ross, 'Conceptions of Teaching', 2017; Kember, 'A Reconceptualisation of the Research into University Academics' Conceptions of Teaching'.
[2] Kember, 'A Reconceptualisation of the Research into University Academics' Conceptions of Teaching'; Samuelowicz and Bain, 'Revisiting Academics' Beliefs about Teaching and Learning'.
[3] Fox, 'Personal Theories of Teaching'; Kember, 'A Reconceptualisation of the Research into University Academics' Conceptions of Teaching'; Samuelowicz and Bain, 'Conceptions of Teaching Held by Academic Teachers'; Ross, 'Conceptions of Teaching', 2017.
[4] Kane, Sandretto, and Heath, 'Telling Half the Story', 2002; Ross, 'Conceptions of Teaching', 2017.
[5] Akinwale, 'Want to Become a Lecturer?'
[6] Ross, 'Conceptions of Teaching', 2017; Kember, 'A Reconceptualisation of the Research into University Academics' Conceptions of Teaching'.
[7] Trigwell and Prosser, 'Changing Approaches to Teaching'.
[8] Samuelowicz and Bain, 'Revisiting Academics' Beliefs about Teaching and Learning'.
[9] Dall'Alba, 'Foreshadowing Conceptions of Teaching'.
[10] {Citation}
[11] Samuelowicz and Bain, 'Conceptions of Teaching Held by Academic Teachers'.
[12] Ross, 'Conceptions of Teaching', 2017; Tavakoli and Baniasad-Azad, 'Teachers' Conceptions of Effective Teaching and Their Teaching Practices'.
[13] Kember, 'A Reconceptualisation of the Research into University Academics' Conceptions of Teaching'.
[14] Fox, 'Personal Theories of Teaching', 198.
[15] Kember and Gow, 'Orientations to Teaching and Their Effect on the Quality of Student Learning', 1994.
[16] Kember and Gow, 'Orientations to Teaching and Their Effect on the Quality of Student Learning', 1994.
[17] Ross, 'Conceptions of Teaching', 2017.
[18] Samuelowicz and Bain, 'Revisiting Academics' Beliefs about Teaching and Learning'.
[19] Dall'Alba, 'Foreshadowing Conceptions of Teaching'.
[20] Chen, 'East-Asian Teaching Practices through the Eyes of Western Learners'; Tavakoli and Baniasad-Azad, 'Teachers' Conceptions of Effective Teaching and Their Teaching Practices'.
[21] {Citation}
[22] Kane, Sandretto, and Heath, 'Telling Half the Story', 2002.
[23] Fox, 'Personal Theories of Teaching', 1.
[24] Cohen, Manion, and Morrison, *Research Methods in Education*.
[25] Kumar, *Research Methodology*.
[26] 'Nigeria | Ranking Web of Universities: Webometrics Ranks 30000 Institutions'.
[27] Basit, *Conducting Research in Educational Contexts*.
[28] Samuelowicz and Bain, 'Revisiting Academics' Beliefs about Teaching and Learning'.
[29] Kember, 'A Reconceptualisation of the Research into University Academics' Conceptions of Teaching'.
[30] Fox, 'Personal Theories of Teaching'.
[31] Neumann and Parry, '"S, & Becher, T. (2002)." Teaching and Learning in Their Disciplinary Contexts: A Conceptual Analysis'.
[32] Dall'Alba, 'Foreshadowing Conceptions of Teaching'.
[33] Lindblom-Ylänne et al., 'How Approaches to Teaching Are Affected by Discipline and Teaching Context'.
[34] Päuler-Kuppinger and Jucks, 'Perspectives on Teaching'.
[35] Cassidy and Ahmad, 'Evidence for Conceptual Change in Approaches to Teaching'.
[36] Fox, 'Personal Theories of Teaching'.
[37] Kane, Sandretto, and Heath, 'Telling Half the Story', 2002.

BIBLIOGRAPHY

Akinwale, YEKEEN. 'Want to Become a Lecturer? NUC Says You Don't Need a PGDE'. International Centre for Investigative Reporting, 25 September 2017. https://www.icirnigeria.org/want-to-become-a-lecturer-nuc-says-you-dont-need-a-pdge/.

Basit, Tehmina N. *Conducting Research in Educational Contexts*. Bloomsbury Publishing, 2010.

Cassidy, Robert, and Arshad Ahmad. 'Evidence for Conceptual Change in Approaches to Teaching'. *Teaching in Higher Education* 26, no. 5 (2021): 742–58.

Chen, Rainbow Tsai-Hung. 'East-Asian Teaching Practices through the Eyes of Western Learners'. *Teaching in Higher Education* 19, no. 1 (2014): 26–37.

Cohen, Louis, Lawrence Manion, and Keith Morrison. *Research Methods in Education*. Routledge, 2002.

Dall 'Alba, Gloria. 'Foreshadowing Conceptions of Teaching', 1991.

Fox, Dennis. 'Personal Theories of Teaching'. *Studies in Higher Education* 8, no. 2 (1983): 151–63.

Kane, Ruth, Susan Sandretto, and Chris Heath. 'Telling Half the Story: A Critical Review of Research on the Teaching Beliefs and Practices of University Academics'. *Review of Educational Research* 72, no. 2 (2002): 177–228.

———. 'Telling Half the Story: A Critical Review of Research on the Teaching Beliefs and Practices of University Academics'. *Review of Educational Research* 72, no. 2 (2002): 177–228.

Kember, David. 'A Reconceptualisation of the Research into University Academics' Conceptions of Teaching'. *Learning and Instruction* 7, no. 3 (1997): 255–75.

Kember, David, and Lyn Gow. 'Orientations to Teaching and Their Effect on the Quality of Student Learning'. *The Journal of Higher Education* 65, no. 1 (1994): 58–74.

———. 'Orientations to Teaching and Their Effect on the Quality of Student Learning'. *The Journal of Higher Education* 65, no. 1 (1994): 58–74.

Kumar, Ranjit. *Research Methodology: A Step-by-Step Guide for Beginners*. Sage, 2018.

Lindblom-Ylänne, Sari, Keith Trigwell, Anne Nevgi, and Paul Ashwin. 'How Approaches to Teaching Are Affected by Discipline and Teaching Context'. *Studies in Higher Education* 31, no. 03 (2006): 285–98.

Neumann, R. Parry, and Sh Parry. '"S, & Becher, T. (2002)." Teaching and Learning in Their Disciplinary Contexts: A Conceptual Analysis'. *Studies in Higher Education* 27, no. 4 (n.d.): 405–17.

'Nigeria | Ranking Web of Universities: Webometrics Ranks 30000 Institutions'. Accessed 30 May 2022. https://www.webometrics.info/en/Africa/nigeria.

Päuler-Kuppinger, Lena, and Regina Jucks. 'Perspectives on Teaching: Conceptions of Teaching and Epistemological Beliefs of University Academics and Students in Different Domains'. *Active Learning in Higher Education* 18, no. 1 (2017): 63–76.

Ross, Michael. 'Conceptions of Teaching: An Illustrated Review'. *The Clinical Teacher* 14, no. 1 (2017): 8–14.

———. 'Conceptions of Teaching: An Illustrated Review'. *The Clinical Teacher* 14, no. 1 (2017): 8–14.

Samuelowicz, Katherine, and John D. Bain. 'Conceptions of Teaching Held by Academic Teachers'. *Higher Education* 24, no. 1 (1992): 93–111.

———. 'Revisiting Academics' Beliefs about Teaching and Learning'. *Higher Education* 41, no. 3 (2001): 299–325.

Tavakoli, Mansoor, and Somayeh Baniasad-Azad. 'Teachers' Conceptions of Effective Teaching and Their Teaching Practices: A Mixed-Method Approach'. *Teachers and Teaching* 23, no. 6 (2017): 674–88.

Trigwell, Keith, and Michael Prosser. 'Changing Approaches to Teaching: A Relational Perspective'. *Studies in Higher Education* 21, no. 3 (1996): 275–84.

BRIDGING DISCIPLINES AND SKILLSETS: DISTRIBUTED CONSTRUCTIONISM DURING COVID-19, TEACHING WEARABLE DESIGN AND MENTAL HEALTH

Author:
TIA HALLIDAY, KATHRYN BLAIR

Affiliation:
UNIVERSITY OF CALGARY, CANADA

INTRODUCTION

In this publication we discuss *Art 465: Wearable Design for Mental Health*, a new and innovative undergraduate course designed for the University of Calgary's Department of Art and Art History. This course wove design thinking together with physical computing approaches, aiming to facilitate students' creation of wearable designs to aid in mental health. We present insight into how this course was envisioned, planned, and how it was completely redesigned for remote delivery due to the COVID- 19 pandemic. Furthermore, we discuss what the team of educators involved in the course learned from this experience and provide some insight into the student's experience of the course. This paper may be of interest to those who want to know more about transdisciplinary approaches to pedagogy and those interested in offering a "hands-on" studio-based course remotely.

THE COURSE

Art 465: Wearable Design for Mental Health was a senior-level undergraduate art course offered by the Department of Art and Art History at the University of Calgary.

From its outset, this course was designed to examine how engagement with art, design and electronics could be used as an impetus to design objects that could engage issues like mental health for University students. The course prompted such questions by using an inquiry-based and constructionist model. Emphasizing problem-solving, individual research and collaboration, this course provided students with the resources to forge their own questions and develop their own design-based solutions.

Motivation for the Course: Mobilizing Resources & Cross-Disciplinary Engagement

A primary conceptual goal of this course was to facilitate creativity and design thinking to create projects that span beyond the perimeters of art. The course faculty and media mentors worked together to help students realize their design ideas. Students' visions necessitated the use of diverse knowledge and skillsets, which were both found and built together with faculty and mentors through cooperative inquiry and experimentation.

In addition, we designed Art 465 to bring together several disciplinary fields across campus, such as the department of art & art history, campus mental health, and entrepreneurial resources. We wanted to increase knowledge and use of campus resources like a makerspace located within the University of

Calgary's Taylor Family Digital Library. The makerspace, called LabNext, is staffed by Media Mentors who can assist students in realizing their various projects with the tools provided. These tools include a CNC machine, several 3D printers, a 3D scanner, vinyl cutter, embroidery machine, and sewing machine. Our goal was to make full use of this under-utilized resource on campus.

Inspiration for the Course: Mobilizing Resources & Cross-Disciplinary Engagement

This course was inspired by the field of wearable technology and lead innovators in the field. Wearable technologies that aid in everyday life are an exciting and ever-evolving field of design research. A notable influence in the field is Dutch designer Borre Akkersdijk, who merges e-textiles and mental health by designing an electronic textile that can help Alzheimer's sufferers communicate with their caregivers through feeling and touch[1]. Akkersdijk, and the work of many other designers in the field, were inspirations for the course.

Other transdisciplinary designers that helped inspire the course include Wynnie Chung and Emily Ip. Chung and Ip's *Wo.Defy*[2] is a feminist-based wearable project which uses somaesthetics (somatic aesthetics)[3] to sense body biorhythms, to help the wearer gain a broader awareness of their emotional well-being.

XS Labs (Montreal) was another subtle influence on the course. XS labs create projects which blend design and technology to explore physical memory through textiles, these designs include the Spotty, Finger, and Intimate Memory dresses[4].

An additional avenue of inspiration were projects like Mind's soft surfaces workshop[5]. Mind is a mental health charity and provided a workshop for people who use its services in Nottinghamshire, UK. The workshops were a co-design tool to consider the intersection of technology and mental health in community contexts.

An addition pedagogical inspiration includes the work of Moeller and Kelly, who ran a course for design students in which they created mental-health themed accessories for community members[6].

These key innovators within the area of wearable technology and mental health represent a small fraction of the multidisciplinary and transdisciplinary influences informing our pedagogical design.

COMMUNITY INTERACTION AND ENGAGEMENT

Throughout the course, students interacted with key members of the campus and local mental health communities to aid in the research and production of their wearables. Students dialogued with experts in entrepreneurial strategy from the University of Calgary's Hunter Hub for Entrepreneurial Thinking. At the end of the course, students presented their projects at a public forum hosted by the Nickle Gallery[1] which included members of the Canadian Mental Health Association. At this event, individuals from these communities weighed in and offered their perspectives on the strengths of student's designs and how their designs could be improved.

COURSE DESIGN & PRAXIS

Before we present further detail about the course activities, it is important to note that the students in the course had a background in many disciplines relating to art, but not necessarily electronics, coding or design. So many of the practical skills needed to design wearable technologies were brand new to these students.

Envisioning Design Solutions

The design of the course drew heavily from Seymour Papert's theory of Constructionism, in which students are encouraged to build knowledge structures by making ideas concrete through active creation[7]. Additionally, we felt that Matt Ratto's Critical Making complimented this constructionist

approach[8], by encouraging students to extend their reflection via creating physical prototypes, which supports criticality in consideration of the objects being designed. Drawing from these conceptual bases, the course activities were designed to encourage a sense of play, experimentation and learning-as-making.

The course consisted of small electronic programming challenges which gradually built students' knowledge of programming electronics combined with research into common mental health challenges affecting University students and dialoguing with various industry professionals over zoom. The course culminated in each student researching, planning, and designing their own fully functional wearable prototype that would assist with mental health. Students presented numerous photos and videos of their wearable design for evaluation at the end of the course. Figures 1 and 2 depict sketches from two of the students' sketchbooks of the ideation for their final design, embodying the process they went through to develop these ideas.
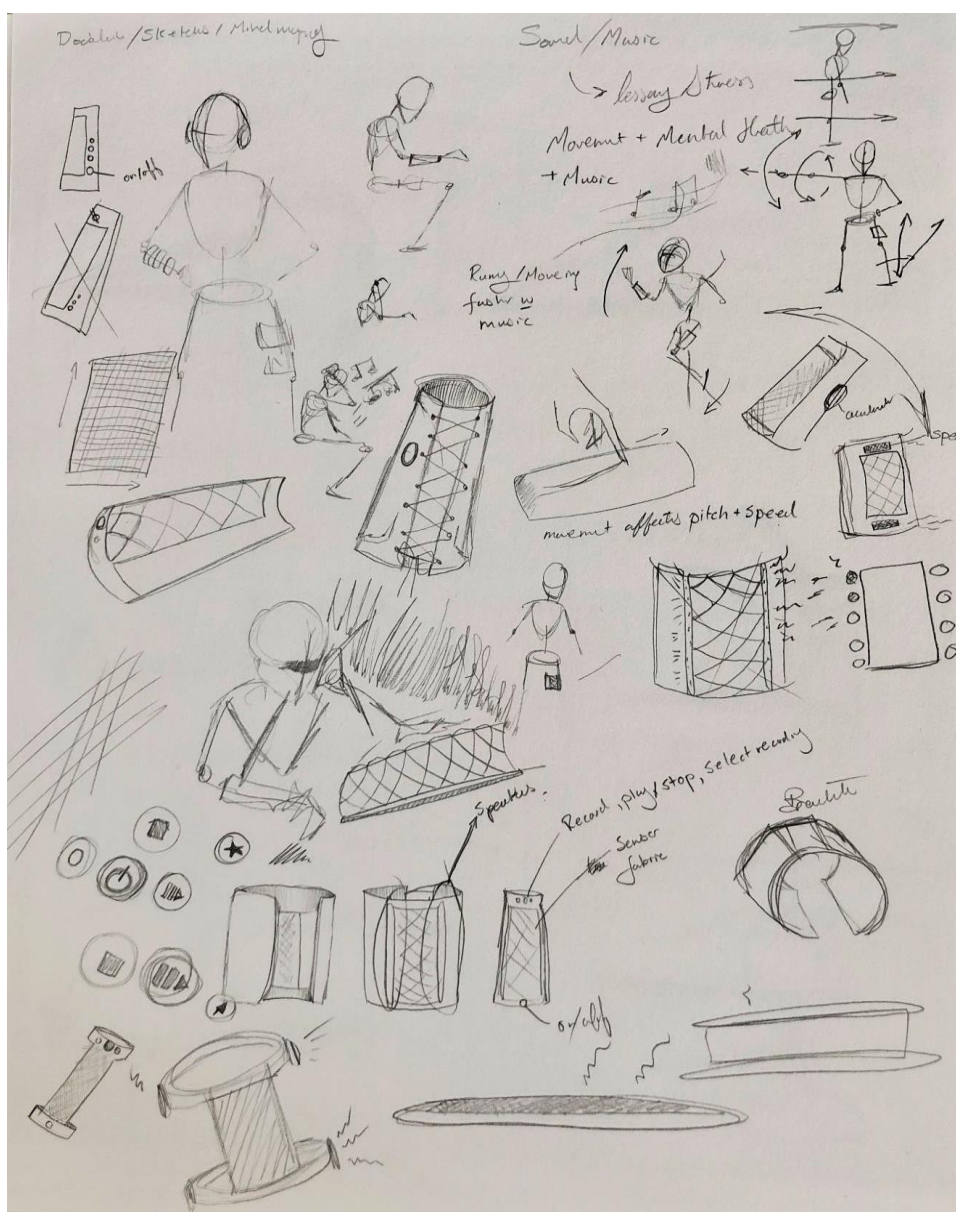
Figure 1. Sketches by an Art 465 student of their proposed design. Used by permission.
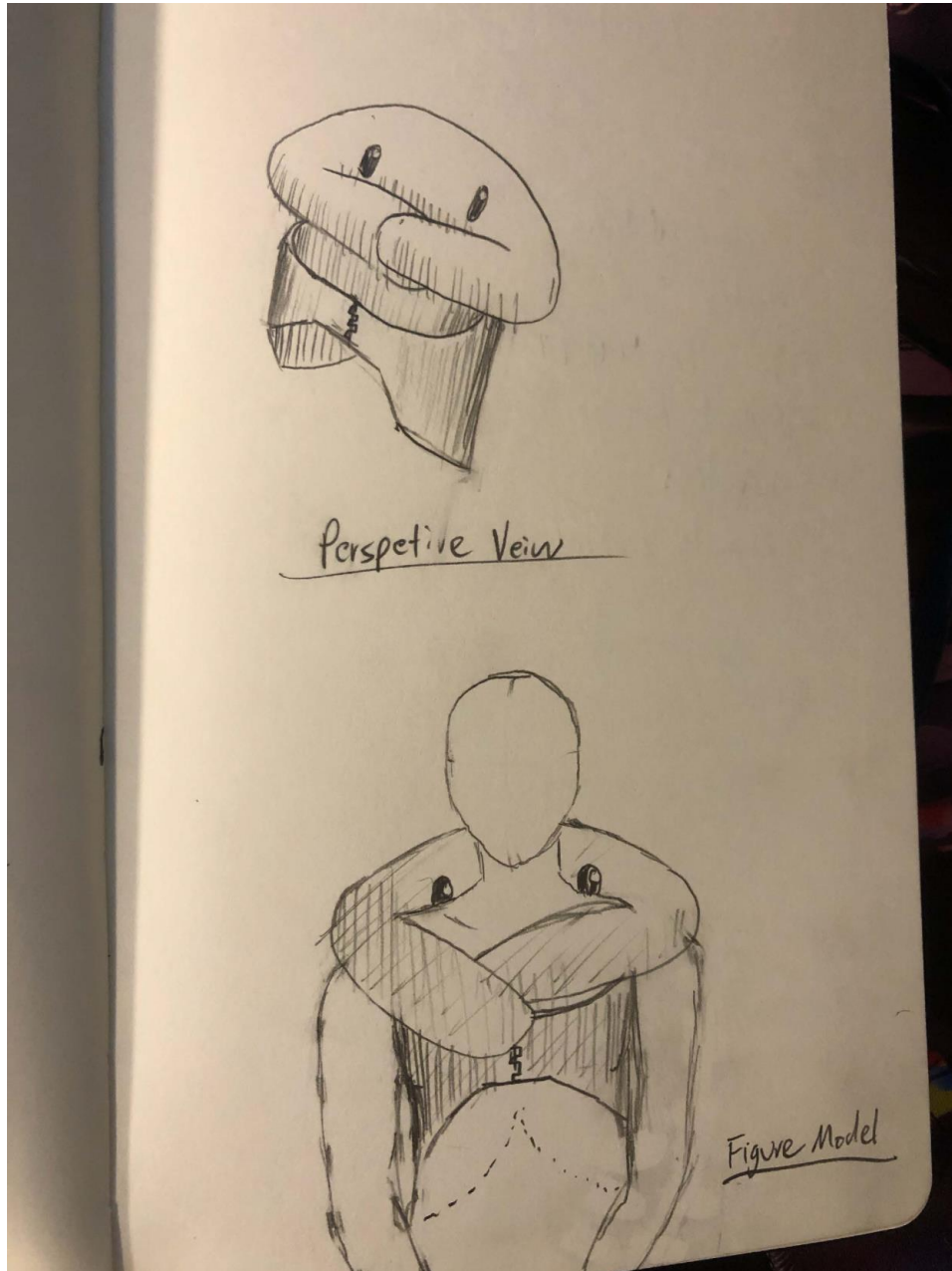
Figure 2. Some of Alex Mai's sketches for his final design. Used by permission.

Throughout the course students completed numerous sketching, ideation drawing and mind-mapping activities to explore, play, tweak and problematize their design ideas.

IMMEDIATE CHALLENGES DUE TO COVID 19

Approximately 6 months prior to the beginning of the course, we were informed that the course would need to be delivered remotely. In this situation, we drew from Resnick's Distributed Constructionism, in which constructionist thinking is undertaken in a distributed or online context[9].

COVID-19 meant that students were completely unable to access LabNext, on-campus equipment, in-person guidance or assistance on wearable designs, or in-person group work.

Without the use of LabNext, the educator team decided that the best path forward would be to purchase kits for every student which they could program at home.

Notable Challenge #1: Teaching Principles of Coding and Electronics Remotely Teaching people without programming experience to code enough to fully realize these wearable projects presented a formidable challenge, as much background knowledge is required to program one's own hardware applications.

Therefore, the team chose a hardware platform compatible with MakeCode, a block-based programming environment for hardware very similar to Scratch[10]. Using MakeCode meant that students did not have to learn programming syntax in detail, and made it much easier to avoid errors caused by typos. The specific platform the team went with for Art 465 was the Circuit Playground Express from Adafruit[2], which can be programmed using either MakeCode, javascript or circuit python, making it very extensible and flexible.

The Circuit Playground Express has sensors and outputs (such as a buzzer and ring of LEDs) built in, while still having connection points for external components. This made working with sensors and outputs much easier for students, as many things were possible without external hardware, but it left the option open for students who wanted to pursue adding additional hardware. Some students did pursue this option.

This platform made it possible to approach teaching hardware programming, which is normally a very difficult, hands-on skills via an online delivery medium, while still providing openings to extend beyond the basic functionality embedded in the Circuit Playground Express.

Notable Challenge #2: Identifying Students' Creative Process & Pathways to Learning
A common challenge to remote teaching and learning is identifying student's process and path to learning. One way we chose to mitigate this difficulty was asking students to keep detailed digital sketchbooks, which acted as detailed repositories for student's ideas, sketches, ideation drawings and more. The digital sketchbooks, combined with written reflection activities, in addition to online verbal discussions (held in small group zoom activities), provided students with multimodal ways of demonstrating their learning. In this context, the digital sketchbook became a fast and effortless way for students to present what they were thinking and ideas they hoped to explore. The digital sketchbooks were a primary way to get a broad sense of where students were at with their work amidst the deficits of the zoom meeting.

At midterm and at the end of the course, students were asked to culminate and reflect upon their digital sketchbooks which documented their entire process. The teaching team found these crucial for the purposes of evaluation, as they helped instructors avoid missing any areas of rich student development. The depth of reflection in their sketchbooks allowed the teaching team to evaluate their progress in the course with mutual confidence.

Notable Challenge #3: Supporting Students in Hands-On Construction of Wearable Devices
Even the seemingly simple challenge of assisting students in the actual construction of their work became complex due to the online format.

Throughout the course, several media mentors with technology and construction experience were available for students to meet with virtually. During these sessions, students could share their code or in-progress projects via their camera, so that mentors were able to get an in-depth understanding of what the student was working on to help troubleshoot any element. Mentors were also available via email, to help the students choose parts or find specific tutorials tailored to the student's project.

While this was not as fluid a process as debugging in-person, it made this process possible even under the circumstances of COVID-19.

Students made good use of these opportunities, some having several meetings with the mentors to work

through their ideas and troubleshoot issues as they came up. For these students, mentors were able to see as their projects changed and as they tried different approaches. It gave a much more thorough connection with some of the projects than is often possible even in hands-on classes, as mentors spent several one-on-one sessions, sometimes adding up to several hours, focusing on one project.

Notable Challenge #4: How did these Challenges Impact Student Learning?

After the team requested student feedback on the course, one of our students indicated that she would have liked more chances for peer feedback. She came to the course from a Computer Science background and would have liked additional artistic perspectives on her projects, and would have liked to provide technical perspectives to others.

This student also mentioned appreciating the mentors, but noted that these hands-on skills are very difficult to learn remotely, especially when it comes to thinking outside the box. Students relied on external tutorials they could find to help guide them, and it was scary to stray too far away from a tutorial or the documentation as troubleshooting if something went wrong wasn't as easy as it would be in person. One of the media mentors echoed this concern from the perspective of trying to help students work through these challenges.

How did these Challenges Impact Teaching?

Concern #1: Concerns about Flow of Course Components

A significant concern when teaching the course was whether components of the course supported one another or whether there were gaps in students learning. In practice, it was difficult for the instructors to determine whether or not a certain lesson "landed" with students or if many still required additional help. One way this issue was mitigated in Art 465 was to consistently offer students' abundant opportunities to meet individually discuss their work over zoom.

Concern #2: Has the Course become too Content-Dense?

Because remote learning requires an increased amount of pre-planning and administration, it was very easy for the teaching team to add more and more content to the course. Considering this impulse with the backdrop of a highly stressful pandemic (dramatically changing the home situations for many students), the teaching team decided that making the course a little "lighter" would have benefited the student's experience. Therefore, we recommend that anyone offering a similar course remotely should consider what it is possible to cut out or make simpler.

TEACHING THIS COURSE IN A POST-COVID ERA

First Author's Reflection:

Reflecting on this experience, I regret that students didn't have the opportunity to work together in the makerspace. Unbridled by Covid or the necessity for remote delivery, I would definitely run this course in the makerspace lab.

What I would keep would be the abundant interaction, dialogue and presentation to industry professionals and community stakeholders from across the globe over zoom.

In addition, I would definitely keep an emphasis on students sketching as a repository and ongoing reflection of their learning and progress of design development.

Second Author's Reflection:

I would have loved to help students hands-on, and better support them in "straying from the documented path" as our student feedback pointed out. Even so, I was absolutely amazed by students' creativity and

ingenuity. I think the potential for building in both online, asynchronous and in-person feedback and collaboration would be something to revisit in future iterations of the course in any format. I have experimented with "sketchblogs" in other online courses and think that could be an interesting format in this context, where students can comment on each other's nascent thoughts and collected resources as they go.

CONCLUSION

Art 465: Wearable Design for Mental Health was a new and innovative course we designed for the University of Calgary. The course merged art, design, coding, and electronics, aligned to help students research, conceive, and construct wearable apparatuses to aid in mental health concerns commonly faced by university students.

The course was conceived to break disciplinary boundaries and bring together campus resources in mental health and entrepreneurial thinking. The course loosely emphasized Papert's Constructionist model, combined with Ratto's emphasis on Critical Making. However, after the onset of the COVID-19 pandemic in Winter 2020, we looked to Resnick's Distributed Constructionist model to assist us in realizing how such a collaborative and hands-on course could be offered remotely.

After fully re-designing the course to be offered remotely instead of in a makerspace lab, we experienced many challenges but also forged innovative solutions. In practice, we were challenged by teaching principles of coding and introductory electronics to beginners, however, we chose an accessible and affordable electronic apparatus that students could program by themselves at home. Given the highly creative and experimental nature of the students' projects, we found it difficult to get a clear sense of their creative process in a remote setting. We successfully mitigated this challenge by asking students to keep a detailed digital sketchbook, acting as a complex visual repository of their creative process. We were challenged by the task of assisting students with constructing fully functional electronic wearables remotely. However, we were able to use publicly available online resources combined with skilled one-on-one remote instruction and support to help students define solutions to their design construction challenges.

In reflection, we as the designers, faculty, and media mentors of the course, feel that although the COVID-19 pandemic and shift to remote teaching and learning posed many significant challenges, we were impressed with the students' creativity and ingenuity demonstrated in this course. Students created fully functional wearable designs that combined their emerging understanding of the complexities of mental health, electronics, the body, garment construction, as well as marketing and entrepreneurial approaches.

Based on our experience, we suggest that educators interested in offering a similar course offer students' multimodal ways of demonstrating their learning and creative practice, like our use of a digital sketchbook, which displayed student's multifaceted creative process. Additionally, we suggest that educators interested in teaching beginner electronics through a remote online delivery, choose a platform like the Circuit Playground Express that allows students to code electronics from home. Also, we suggest an emphasis of the use of online platform to engage resources that may not be otherwise accessible in other settings, such as zoom visits from experts and community professionals from other cities or countries.

NOTES

[1] Ida Viani. "Borre Akkersdijk, Renais2015ance Man Meets The Matrix : A Beakerhead for a Better World Spotlight," *Trico Charitable Foundation.* (2015): Accessed April 22, 2020. https://tricofoundation.ca/borre- akkersdijk-renaissance-man-meets-the-matrix-a-beakerhead-for-a-better-world-spotlight/

[2] Thecla Schiphorst, Wynnie Chung, and Emily Ip. "Wo.Defy: Wearable Interaction Design Inspired by a Chinese 19th Century Suffragette Movement." TEI 2013 - Proceedings of the 7th International Conference on Tangible, Embedded and Embodied Interaction, (2013): 319–22. https://doi.org/10.1145/2460625.2460679.

[3] Kristina Höök, Martin P. Jonsson, Anna Ståhl, and Johanna Mercurio. "Somaesthetic Appreciation Design." *Conference on Human Factors in Computing Systems - Proceeding*s, 2016, 3131–42. https://doi.org/10.1145/2858036.2858583.

[4] Joanna Berzowska. "Intro." *XS Labs*. Accessed May 27, 2022. http://www.xslabs.net/intro.html.

[5] Sarah Kettley, Anna Sadkowska, and Rachel Lucas. "Tangibility in E-Textile Participatory Service Design with Mental Health Participants." *DRS2016: Future-Focused Thinking 8* (2016): 1–13. https://doi.org/10.21606/drs.2016.488.

[6] Trine Møller, and Sarah Kettley. "Wearable Health Technology Design: A Humanist Accessory Approach." *International Journal of Design* 11, no. 3 (2017): 35–49.

[7] Antigoni Parmaxi, and Panayiotis Zaphiris. "The Evolvement of Constructionism: An Overview of the Literature." *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics) 8523 LNCS, no. PART 1* (2014): 452–61. https://doi.org/10.1007/978-3-319-07482-5_43.

[8] Matt Ratto. "Critical Making: Conceptual and Material Studies in Technology and Social Life*." Information Society* 27, no. 4 (2011): 252–60. https://doi.org/10.1080/01972243.2011.583819.

[9] Mitchel Resnick. "Distributed Constructionism." *The 1996 International Conference of the Learning Sciences*, (1996): 280–84.

[10] Mitchel Resnick, John Maloney, Andrés Monroy-Hernández, Natalie Rusk, Evelyn Eastmond, Karen Brennan, Amon Millner, et al. "Scratch: Programming for All." *Communications of the ACM* 52, no. 11 (2009): 60–67. https://doi.org/10.1145/1592761.1592779.

BIBLIOGRAPHY

Berzowska, Joanna. "Intro." *XS Labs.* Accessed May 27, 2022. http://www.xslabs.net/intro.html.

Höök, Kristina, Martin P. Jonsson, Anna Ståhl, and Johanna Mercurio. "Somaesthetic Appreciation Design." *Conference on Human Factors in Computing Systems – Proceedings.* (2016): 3131–42. https://doi.org/10.1145/2858036.2858583.

Kettley, Sarah, Anna Sadkowska, and Rachel Lucas. "Tangibility in E-Textile Participatory Service Design with Mental Health Participants." *DRS2016: Future-Focused Thinking 8* (2016): 1–13. https://doi.org/10.21606/drs.2016.488.

Møller, Trine, and Sarah Kettley. "Wearable Health Technology Design: A Humanist Accessory Approach." *International Journal of Design* 11, no. 3 (2017): 35–49.

Parmaxi, Antigoni, and Panayiotis Zaphiris. "The Evolvement of Constructionism: An Overview of the Literature." *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* 8523 LNCS, no. PART 1 (2014): 452–61. https://doi.org/10.1007/978-3-319-07482-5_43.

Ratto, Matt. "Critical Making: Conceptual and Material Studies in Technology and Social Life." *Information Society* 27, no. 4 (2011): 252–60. https://doi.org/10.1080/01972243.2011.583819.

Resnick, Mitchel, John Maloney, Andrés Monroy-Hernández, Natalie Rusk, Evelyn Eastmond, Karen Brennan, Amon Millner, et al. "Scratch: Programming for All." *Communications of the ACM* 52, no. 11 (2009): 60–67. https://doi.org/10.1145/1592761.1592779.

Resnick, Mitchel. "Distributed Constructionism." *The 1996 International Conference of the Learning Sciences*, (1996): 280–84.

Schiphorst, Thecla, Wynnie Chung, and Emily Ip. "Wo.Defy: Wearable Interaction Design Inspired by a Chinese 19th Century Suffragette Movement." *TEI 2013 - Proceedings of the 7th International Conference on Tangible, Embedded and Embodied Interaction*, (2013): 319–22. https://doi.org/10.1145/2460625.2460679.

Viani, Ida. "Borre Akkersdijk, Renaissance Man Meets The Matrix : A Beakerhead for a Better World Spotlight," *Trico Charitable Foundation.* (2015): Accessed April 22, 2020. https://tricofoundation.ca/borre-akkersdijk-renaissance-man-meets-the-matrix-a-beakerhead-for-a-better-world-spotlight/

ON THE ARCHAEOLOGICAL AESTHETICS OF FOUND OBJECTS (WASTE) OR HOW I DIDN'T WANT TO PICK UP TRASH ON MY WAY TO SCHOOL

Author:
GREGORY W. HURCOMB

Affiliation:
LOUISIANA STATE UNIVERSITY, USA

INTRODUCTION

The aspiration of this paper is to examine and unwrap how one assignment within my syllabus evolved through the processes and steps as it was constructed in relationship to the overall learning objectives and to analyze and connect to a few of my current thoughts on creative learning and its connection to productive pedagogical methods. In addition, it will begin to interweave my new interest in a well-defined area of inquiry which revolves around Marcel Duchamp's readymade, objet trouvé, found object, waste, trash, or everyday objects, and their connection to three contemporary creator's current productions. This course was taught in the Fall of 2021 at the College of Art & Design, in the School of Interior Design at Louisiana State University. The course was titled Graphics and there were about forty students in the class. We met twice a week for about an hour and a half each session, for a total of three hours a week.

The Assignment

The students were prompted into the exercise, for Project 2 of the semester, with this quote:
Design doesn't always happen at your computer. If you have been sitting in your chair for too long, it's time to get up and make a mess. This is a process for turning moldy iconographies into something fresh. Use it to restore vital materiality to familiar visual languages. Make many iterations and make a mess. From the mass and the mess, you can come away with fresh ways of looking at commonplace artifacts. Begin the process with open-ended exploration and end it with ruthless editing. Images produced this way can become fodder for logos, identities, illustrations, or the pure visual substance of T-shirts or posters. Learn the how behind constructing meaning as you shift connotations and excavate personality from experimentation. Out with the new.[1]
From here, I will proceed to layout the structure of the exercises within Project 2:
Part 1: Find, discover ten objects, trash, garbage, waste, on the way to school, or around the town.
Photograph (1) your item and upload these along with your sentence.
Write (1) sentence about: what, why, how, where, when this item?
Interspersed within this text will be a series of images that will lead you through how the production of the final student posters evolved. For the first part of the assignment, we see a catalogue of detritus collected from the everyday surroundings of their lives. Some common objects were receipts, some

bags, money. Some of the students were invested more than others. And their analysis and examinations were curious, such as:

"I found this in my neighborhood. This piece is intriguing because of the bright colors and the text on the back that is in another language. It's crinkled but not worn, so it is most likely recent and fell out of a bag or a car."

"This movie ticket I found on campus. What is intriguing about it is the washed-out orange color and the worn look of the paper like it was folded for a while in someone's pocket, and that is has Lake Charles on it, which is two hours away from Baton Rouge."

There is the beginning of an archaeological examination of our daily lives beginning to unearth itself:

"I found this dollar and I picked it up because it was free money on the ground"

"This is a plastic Walmart bag I found and I like this object because it has a good contrast in colors and text on it, and it has a good texture"
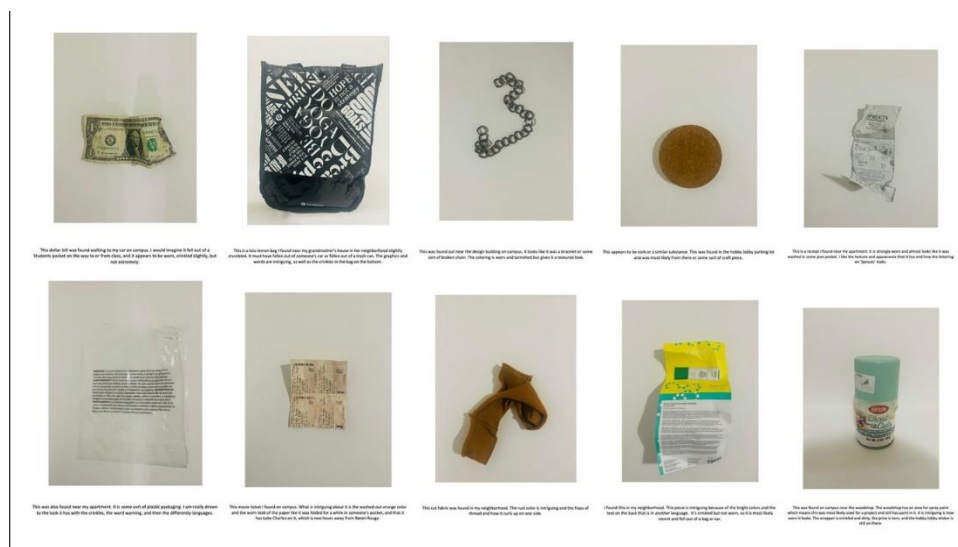
Figure 1. Photos and text by Anne Marie Bailey

Part 2: Choose One of Your Found Objects and Fixate on It.

Study it. What is it? What is it made of? What is it capable of doing? Of becoming? Explore its materiality and function.
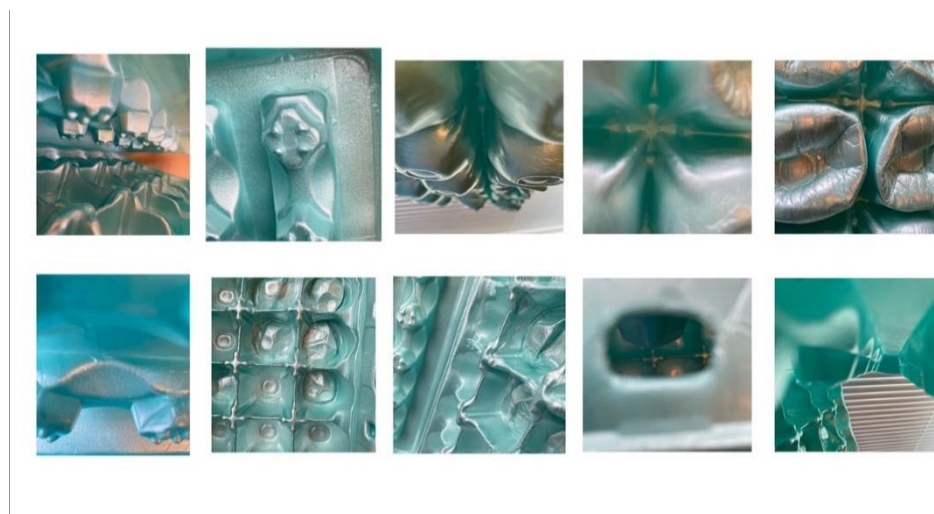
Figure 2. Photos by Grace Waguespack

Here are some fascinating images of an egg carton that one of the students discovered and focused on, taking these original photographs, and producing quite a lovely series. These pictures are particularly striking, and in many ways the original item is not quite recognizable. This results from the direction from which the images were taken in addition to the proximity, resulting from closeness, and what I would call dislocation, or disorientation. The egg carton has become transcendent and radiates enormous potential energy at this point.

For this begins the aesthetics of the projects. Reconfiguring and hyper fixating on the object. For a basic simplified encyclopedic definition of aesthetics: Aesthetics, is a branch of philosophy that deals with the nature of beauty and taste, as well as the philosophy of art (its own area of philosophy that comes out of aesthetics).[2] It examines aesthetic values, often expressed through judgments of taste.[3]

Part 3: Slice, Splice, and dice. Going digital, but you could go analogue as well:

Utilizing Photoshop as if it was the physical world. You can also make manipulations in the physical world and translate them to the digital. Adjust, shift, alter, recalibrate. Collage, remix, reinterpret, assemble, dissemble, reconfigure. Assemblage. Have fun. Revel.

Figure 3. Posters by Anne Marie Bailey, Grace Waguespack, and Carly Drennan

These are three of the first efforts to begin to translate the found object into something new. Chains layered and reconfigured. A stylized and aesthetically compelling image to me that utilizes the images of the chains in unique and compelling ways. The text, perhaps not as successful, but by utilizing the downward motion of the chains to create movement, the overall poster also included a self-referential nod to the chains themselves, which the assignment was asking for as one of the options to produce the final poster. The lighter has begun its transformation into an aesthetically complex image, layered through repetition, tonality, color shift, white space, balance, and rhythm. And the eggcellent or eggstravagant beginnings of the egg carton poster.

Part 4: Versioning: Produce 3 New Versions of your current Slice, Splice, and Dice poster.
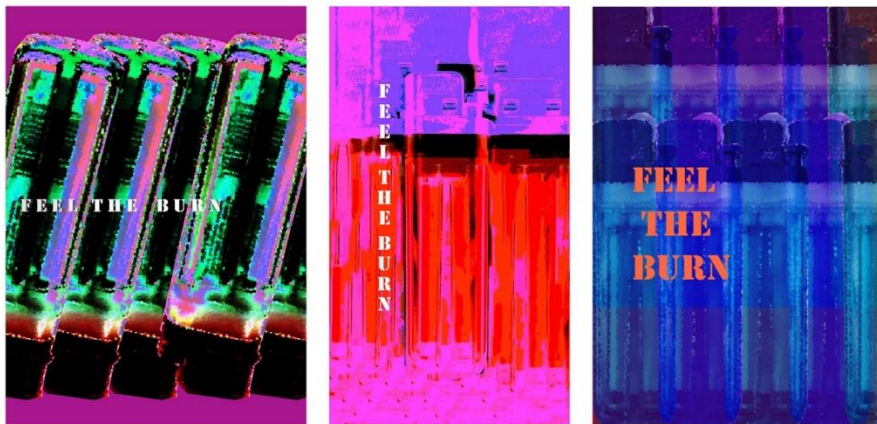
Figure 4. Posters by Carly Drennan

For the lighter image poster, there was quite a shift in the energy and enthusiasm. By accentuating the lighter and shifting, accelerating contrast the student was able to create three unique and varied images, that really push a certain aesthetic. High contrast, textured, repeated, dynamic.

And for the final part of the assignment: Focus: Produce 1 New Version of your current Slice, Splice, and Dice poster.

Figure 5. Posters by Dino Pellissier, Sofia Alves, and Caitlin Sutton
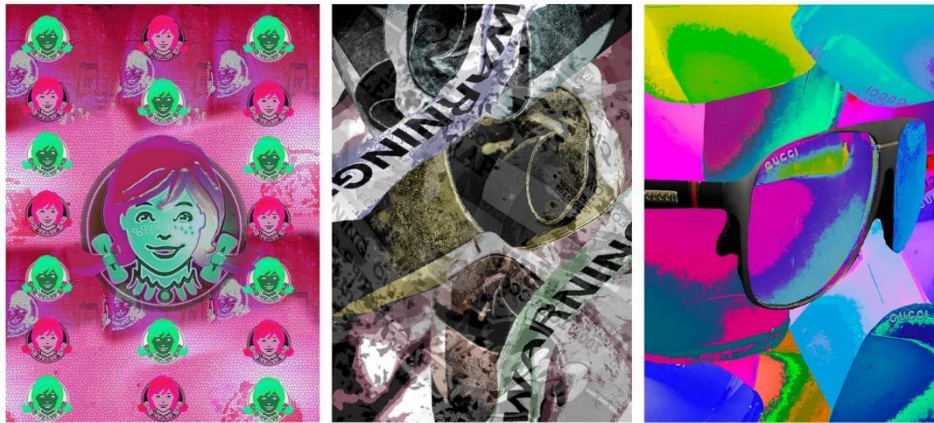
Figure 6. Posters by Catherine Donoho, Kaylie Cross, and Mary Moore

Upon Reflection

The course only met twice a week for an hour and a half, and I had around forty students. In some ways this was one of the main challenges - a rather short lecture class geared towards digital skills being shifted into more of an open-ended creative studio atmosphere. And to put some of the friction and frustration into words, I was faced with an attitude of what exactly is the assignment and how do I complete it without really stretching my mind or challenging myself.

Education has long sidelined playing as a means of learning, and my students—coming to my class after a dozen years of being taught to the test and pressured to achieve grades—had naturally developed strong tactical planning habits aimed at "completing the work." They had become academic "achievers," products of a system that rewards knowledge more than understanding or questioning. To them, doubt - in the form of unsureness - was anathema.[4]

For me this quote accurately and expeditiously contains the seed of what I was attempting to understand and relate to some of the frustration, both on my end and on the students as well. And as an educator and teacher, I was attempting to consider what was occurring, and I believe it has something to do with my relationship to creativity. For in my mind, there is a certain space, uncertainty one might call it, experimentation, drift, a particular process not completely verifiable, not quite tangible, where essence and essentials overlap, and this place, or moment, is what cannot be defined, what cannot be completely ascertained or understood directly, and how we get there is a movement, a symphony in development, undetermined, mysterious, the creative act, what we strive for, to find, discover, unfurl.

Although creativity is increasingly viewed as a key human ability that contributes to individual's personal development, everyday life problem solving, professional accomplishment, and societal growth, the process that underlies the production of creative work remains somewhat mysterious.[5]

This also began to further expand my interest into the field of education, its motivations and processes, expectations, and deliverables, which I had not possibly confronted in such a dramatic and procedural way previously. This paper is concerned with questions of subjective and objective knowledge and understanding, and how creativity, and more specifically, how aesthetics and the judgement of aesthetics can be situated within a framework of an academic assignment, an assignment that can be outlined to become more open-ended and exploratory, and not didactic and self-fulfilling.

Since ancient times, the creative process has been the source of interest and speculation. The "muse" as evoked in historical Greek texts involved a divine source which inspired mortals to express new ideas. The inspiration was divine but the delivery process involved people who served as scribes or oracles.[6\]

AN ARCHAEOLOGICAL AESTHETICS OF FOUND OBJECTS

Since the tubes of paint used by the artist are manufactured and ready-made products, we must conclude that all the paintings in the world are 'readymades aided' and also works of assemblage.[7]

Figure 7. Photo By Sharon Mollerus - Robert Rauschenberg, Retroactive II, 1963 1/26/18

The connection point to art history, and aesthetics could be seen in the production of work by artists such as Robert Rauschenberg whose image here entitled "Retroactive II" collages images of JFK, manned missions to the moon, and other images from the sixties. Art historians have categorized his art as part of Neo-Dada, which was a movement with audio, visual and literary manifestations that had similarities in method or intent with earlier Dada artwork. It sought to close the gap between art and daily life, and was a combination of playfulness, iconoclasm, and appropriation.[8] In the United States the term was popularized by Barbara Rose in the 1960s and refers primarily, although not exclusively, to work created in that and the preceding decade. There was also an international dimension to the movement, particularly in Japan and in Europe, serving as the foundation of Fluxus, Pop Art and Nouveau réalisme.[9]

Post-Pop-Neo-Dada

For the final part of this paper, I'd like to take a brief look at three artists' productions (two of whom consider themselves to be architects or were trained as architects). The inventions of Daniel Arsham are of particular interest to what I am calling an archaeological aesthetics of found objects, and Post-Neo-Dada (or even Post-Pop-Neo-Dada if we want to go for extra hyphenations), for Arsham approaches all of his creations, (even the work of his architecture firm Snarkitecture) with a certain pop sensibility that is rooted in the reproduction of everyday objects into aesthetic relics, fetishized and reconfigured, decayed ruins such as typewriters, calculators, cell-phones, VHS cassettes, and other contemporary devices either in use today or of a time near to our current epoch.

Figure 8. Fictional Archaeology, Daniel Arsham, Galerie Perrotin, Hong Kong, 2015

As we can see from this exhibition in Hong Kong from 2015 entitled Fictional Archaeology. Decayed contemporary artifacts of the recent past have been reproduced through sculptural techniques to appear decayed, fragile, and displayed as if discovered in the past, while the current day has become the future. As archaeological devices of display and museumification techniques are employed, an aestheticization of a contemporaneity produces this turn into Post-Pop-Neo-Dada artifacts.

Connected to the productions of Arsham are two projects of artist and architect Andreas Angelidakis situated along the interstices of architecture, art, and interiority through a corelated relationship with archaeology and aesthetics. These are DEMOS - a reconstruction, by architect and artist Andreas Angelidakis which was situated in the Museum of Contemporary Art in Toronto in 2017, and Crash Pad from 2014 at the 8th Berlin Biennale.

Andreas Angelidakis 'DEMOS – a reconstruction is an installation of 74 foam modules created for visitors of Toronto's Museum of Contemporary Art (MOCA) to move play with and rearrange in any configuration possible. free to the public and for people of all ages, the soft and lightweight modules can be used to create a seat, a stage, or even a monument, while each configuration is demolished after use to make way for the next one.[10]
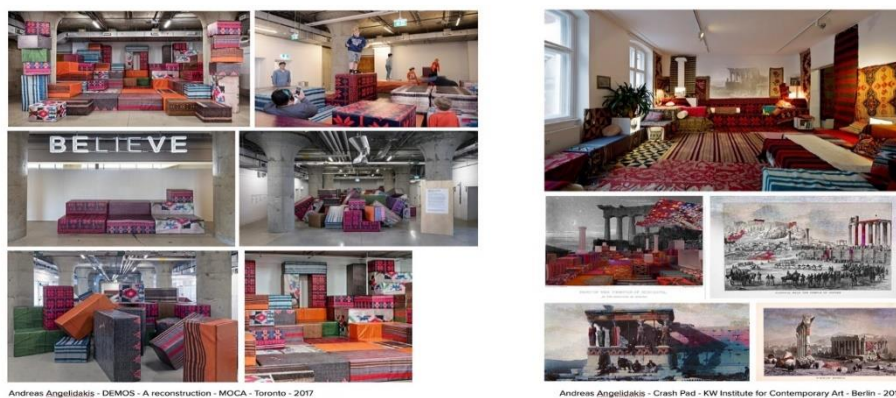
Figure 9. Demos, Andreas Angelidakis, Museum of Contemporary Art Toronto, Photos by Toni Hafkenscheid; Crash Pad, Andreas Angelidakis, KW Institute for Contemporary Art, Berlin, photos by Uwe Walter

The installation in Toronto in many respects was a continuation of a project began in 2014 by Angelidakis for the Berlin Biennale for Contemporary Art entitled Crash Pad: With Crash Pad Angelidakis creates a multi-purpose room with a library in the front building of KW Institute for Contemporary Art, drawing upon the idea of the 19th century salon as a setting for cultural and political conversations.[11]

The room is formed by an arrangement of ancient and folkloric rugs handmade in the Greek countryside, displaying a transitional iconography from an Ottoman to a European tradition, together with a set of columns. The carpets and the columns represent the two conflicting systems that modernized Greece in the 19th century: The Europeanized Greek diaspora (educated in Germany, France and England and influenced by the invention of antiquity there), and the peasant guerrilla fighters under general Theodoros Kolokotronis.[12]

As we can see in the postcard images of the archaeological ruins of ancient Greece which have been altered and adjusted, carpetized by Angelidakis. His exhibit "Crash Pad offers a space for events, discussion and exchange within the 8th Berlin Biennale, as well as a place for contemplation and exchange for the traveling artists arriving at KW: a domesticated ruin and a thank-you note from a Norwegian-Greek architect to the German idea of antiquity.[13] In connection and conversation with the exhibit in Toronto, we can see these modular foam reconfigurable elements partaking in a new notion of what can be architecture, archaeology, graphic patterns, cultural friction, temporality, ephemeral, full of potential and situational capacities.

Figure 10. Archaeology Now, Damien Hirst, Galleria Borghese, Photos by Gregory W. Hurcomb

The final artist whose productions I'd like to consider in the realm of the Post-Pop-Neo-Dada arena are some of the more recent sculptures by Damien Hirst, and an exhibition entitled *Archaeology Now* which was held at the Galleria Borghese in Rome. These were first shown in Venice in 2017 as part of the exhibition 'Treasure from the Wreck of the Unbelievable' at Palazzo Grassi and Punta della Dogana. The exhibition recounted the imaginary story of the ancient wreck of the largest ship of its day, the *Unbelievable* (from the Greek *apistos*), and presented its precious recovered cargo: the impressive collection that had once belonged to the freedman Aulus Calidisu Amotan, know as Cif Amotan II, and had been destined for a legendary temple dedicated to the Sun God in the East.[14] Made of marble, bronze, coral, rock crystal and semi-precious stone they are inserted amongst the Galleria's collection of masterpieces, in keeping with founder Cardinal Sipione Borghese's love of variety. His ambition was to go beyond categories, not only within the arts but also with respect to divisions between reality and

fiction.[15] Hirst's frank and explicit aesthetic encompasses, isolates and reconciles order and disorder, attraction and repulsion, banality and horror, the spiritual and the material, religion, and science.[16]

It is worth consideration, then that this return to these traditional materials, in counterpoise to the productions of Angelidakis, whose medium has become inflatable pillows (an everyday material wrapped in traditional patterns), and Hirst's, what could be considered a radically traditional production of art pieces now steeped in metaphor and mythology of an imagined connection to the ancient Greeks and Romans, antiquity, decontextualized, with an invented mythology, though one tangential and related to existing narratives and closely paralleling the productions of Arsham in terms of their materiality (which is a return to traditional materials such as bronze and marble), though not in their content. Consequently, in my opinion, all these exhibitions certainly exhibit a Post-Pop-Neo-Dada essence.

CONCLUSION

Upon considering the intermediate difficulties faced last semester with the students, their push back and frustrations with certain challenges posed by a somewhat ambiguous and open-ended creative process of inquiry that was comprised of exercises that asked for a speculative and creative growth mindset to grasp for an approximate solution to find and discover rather than to regurgitate, I am pleased and challenged with what I have discovered in this new and different collection of students, in and connected to the realm of understanding, knowledge, comprehension, creativity, and potentials. Questions remain to be considered and I think that this is worthwhile and part of the educational journey, both for myself and for the students taking part in my courses. I am also satisfied with the students' outcomes, their poster designs for this new exercise that asked them to consider found objects, for these also inspired the creation of another assignment this past Spring semester at the school, which I organized in a different fashion, with equally stimulating results. I believe that I have not discovered an answer to the challenges of this educational quandary, and by no means am I an expert in terms having a degree in education, or educational models of teaching, but these friction points between play and work and the ways that students and educators approach and consider the possibilities of both is an area of inquiry that I will continue to explore and consider in the future as an approach to further developing both myself and my students.

In reference to Post-Pop-Neo-Dada, I am elated that the strife of the past semester led me to begin to examine these contemporary artists and architects' productions through the lens of found objects, archaeology, and aesthetics. I believe that I have just barely scratched the surface of this topic, and I am looking toward discovering, analyzing, synthesizing, and unearthing more connections between the creative disciplines, linking similarities as opposed to differences, discerning possibilities and potentials through original and imaginative insight and research.

NOTES

[1] Ellen Lupton and Jennifer Cole Phillips, eds., *Graphic Design Thinking: How to Define Problems, Get Ideas & Create Form* (New York: Princeton Architectural Press, 2008), 180.

[2] "Internet Encyclopedia of Philosophy" accessed February 28, 2022,
 https://en.wikipedia.org/wiki/Internet_Encylopdia_of_Philosophy.

[3] Nick Zangwill, "Aesthetic Judgment", *Stanford Encyclopedia of Philosophy*, accessed February 28, 2022, https://plate.stanford.edu/entries/aesthetic-judgment/

[4] Christopher Bardt, *Material and Mind* (Cambridge, Mass: MIT Press, 2019), 10.

[5] Todd Lubart, *The Creative Process: Perspectives from Multiple Domains* (London, UK: Palgrave Macmillan, 2018), v.

[6] Todd Lubart, *The Creative Process: Perspectives from Multiple Domains* (London, UK: Palgrave Macmillan, 2018), 4.

[7] Marcel Duchamp, *Salt Seller: The Essential Writings of Marcel Duchamp* (New York: Thames and Hudson, 1975), 142.

[8] Bradford Collins, *Pop Art: the independent group to Neo Pop* (London: Phaidon, 2012), 25.

[9] Ian Chilvers and John Glaves-Smith, *A Dictionary of Modern and Contemporary Art* (Oxford: Oxford University Press, 2009), 503.

[10] "Andreas Angelidakis Installs 74 Reconfigurable Foam Modules at Toronto's MOCA", *DesignBoom*, accessed April 10, 2022, https://www.designboom.com/art/andreas-angelidakis-demos-reconstruction-toronto-moca-12-12-2018/

[11] "Andreas Angelidakis Installs 74 Reconfigurable Foam Modules at Toronto's MOCA", *DesignBoom*, accessed April 10, 2022, https://www.designboom.com/art/andreas-angelidakis-demos-reconstruction-toronto-moca-12-12-2018/

[12] "Andreas Angelidakis Installs 74 Reconfigurable Foam Modules at Toronto's MOCA", *DesignBoom*, accessed April 10, 2022, https://www.designboom.com/art/andreas-angelidakis-demos-reconstruction-toronto-moca-12-12-2018/

[13] "Andreas Angelidakis Installs 74 Reconfigurable Foam Modules at Toronto's MOCA", *DesignBoom*, accessed April 10, 2022, https://www.designboom.com/art/andreas-angelidakis-demos-reconstruction-toronto-moca-12-12-2018/

[14] Damien Hirst, *Archaeology Now, Galleria Borghese* (Venice: Marsilio Editori, 2021), 10.

[15] Damien Hirst, *Archaeology Now, Galleria Borghese* (Venice: Marsilio Editori, 2021), 10.

[16] Damien Hirst, *Archaeology Now, Galleria Borghese* (Venice: Marsilio Editori, 2021), 12.

BIBLIOGRAPHY

Bardt, Christopher. *Material and Mind*. Cambridge, Mass: MIT Press, 2019.

Chilvers, Ian and John Glaves-Smith. *A Dictionary of Modern and Contemporary Art*. Oxford: Oxford University Press, 2009.

Collins, Bradford. *Pop Art: the independent group to Neo Pop*. London: Phaidon, 2012.

Colomina, Beatriz and Mark Wigley. *Are we human?* Zurich, Switzerland: Lars Muller Publishers, 2016.

Daniels, Dieter, Olaf Nicolai, and Lutz Eitel. *Readymade Century*. Leipzig, Germany: Spector Books, 2019.

Hirst, Damien. *Archaeology Now: Galleria Borghese*. Venice, Italy: Marsilio Editori, 2021.

Kelley, Tom and David Kelley. *Creative Confidence: Unleashing the Creative Potential Within Us All*. New York: Currency, 2013.

Leski, Kyna. *The Storm of Creativity (Simplicity: Design, Technology, Business, Life)*. Cambridge, Mass: MIT Press, 2015.

Lubart, Todd, ed. *The Creative Process: Perspectives from Multiple Domains*. London, UK: Palgrave Macmillan, 2018.

Lupton, Ellen. *Design Is Storytelling*. New York: Cooper Hewitt, Smithsonian Design Museum, 2017.

Lupton, Ellen and Jennifer Cole Phillips, eds., *Graphic Design Thinking: Beyond Brainstorming*. New York: Princeton Architectural Press, 2008.

Molderings, Herbert, translated by John Brogden. *Duchamp and the aesthetics of change: art as experiment*. New York: Columbia University Press, 2010.

Taylor, Mark and Julieanna Preston, ed. *Intimus: Interior Design Theory Reader*. London, UK: Wiley Academy, 2006.

Weinthal, Lois, ed. *Toward a New Interior: An Anthology of Interior Design Theory*. New York: Princeton Architectural Press, 2011.

DESIGNING HYBRIDIZATION: ALTERNATIVE EDUCATION STRATEGIES FOR FOSTERING INNOVATION IN COMMUNICATION DESIGN FOR THE TERRITORY

Author:
MARCO QUAGGIOTTO, CLORINDA SISSI GALASSO

Affiliation:
POLITECNICO DI MILANO, DESIGN DEPARTMENT, ITALY

INTRODUCTION
Communication Design for the Territory

Within the broad context of design studies, Communication Design for the Territory stands as a hybrid discipline constantly interfacing with other fields of knowledge, that aims to generate communication systems capable of reading the stratifications of places. From an educational perspective, teaching activities are closely linked to research and can take on different levels of complexity: from the various forms of cartographic translation to the design of sophisticated transmedia digital systems.

Fundamental in this field of knowledge is the category of space, which has played a crucial role since the 1990s, taking shape in the studies of Edward W. Soja[1] who introduced the idea of *Spatial Turn*. With this concept the author underlines the renewed centrality of space in its real and imaginary dimensions. This turn affects geographical disciplines, but also extends to design practice: it adds a new dimension to communication design by introducing a focus on territory as a provider of information and communicative resources.[2] Communication Design for the Territory, starting from this paradigm, has adopted the theme of territory as its own specific dimension, combining the development of designed artifacts with traditional knowledge and technological innovation. Within this theoretical framework, is also relevant the principle of geolocalization involved in the creation of interfaces of the territory: any type of device that, through different systems of representation and mapping and experimenting with coherent communication formats, provides tools that can act as links to access the territory and its contents.[3] The interface thus understood must be able to convey a deep understanding of the territory to express its nature as a multi-layered entity.

Therefore, recognition of spatial stratification appears essential and different levels of vertical investigation can be identified:

- Physical: the level of materiality, surface, and itineraries;
- Narrative: the level of storytelling and literary descriptions, including fictional stories;
- Representative: the level of information, data, and orientation;
- Mnestic: the level of mnemotopes[4], traces of the past, and archives;
- Perceptual: the level of sensory experiences, and atmospheres.

The changes in the territory that are constantly taking place expand the extra-physical dimension and emphasize the hybrid realm in which the different layers coexist and confront each other. The cartographic paradigm is another essential reference when discussing Communication Design for the

Territory. For centuries maps have helped to reconstruct the past and geolocalize events: as an interpretation of reality, they are not only conventional visualizations of a geographical area, but they are able to convey the complexity of the elements that compose them. They are the final communicative artifact of a translation process in which different actors are involved: data, information, images, and texts that reveal their communicative nature.

Spatial turn, geolocalization and cartographic paradigm have made the study of territorial stratifications a living field of research that finds in Communication Design for the Territory a mature and prepared discipline. This leads to a different positioning of territorial communication projects, which are no longer only about the valorisation of physical emergencies, but about the polyphonic existence of the territorial levels.

Hybrid territories

With the arrival of the COVID-19 pandemic, the field of communication design for the territory has come to grips with a fundamentally transformed environment in terms of both limited access to physical space and the advent of new technologies for remote access[5]. The threats associated with the use of physical space, as well as the resulting constraints to its usage, have created extraordinary friction to the execution of many routine activities when compared to the execution of similar tasks in virtual space. While some changes in the interaction between digital and physical territories have persistently impacted the way individuals engage with one another, the interplay between "remoteness" and "presence" has become a fundamental element of how we understand space and our relationship with it. As a result of the COVID-19 epidemic, also the use of public space has been altered. The strategies enforced to limit the transmission of the virus have had considerable consequences on public space, where the imposition of severe limitations has harmed the social component of the local environment, eliminating the relational feature that characterized space in terms of interpersonal interactions to a large extent[6]. Many activities and relationships that are typically conducted in physical space have been supplemented by their digital equivalents: work activities, meetings, collaborative and creative activities, but also meetings among friends, grocery shopping, and commercial activities have found an analog in digital space that, albeit mediated through the use of software, has made it possible to maintain a number of relationships and achieve a range of objectives that were increasingly difficult to achieve in traditional space[7]. In some respects, the hazards associated with the use of physical space caused by the spread of the SARS-CoV-2 virus, as well as the resulting constraints to its use, have created unprecedented friction to the execution of many ordinary activities, which has surpassed the comparable friction to the execution of similar tasks in virtual space.

Communication formats for hybrid territories

While this pandemic-related configuration of physical space is hopefully temporary, and we will eventually return to using physical space without the limitations and hesitations imposed by the pandemic, some changes in the relationship between digital and physical territories have persistently altered the ways in which individuals interact with one another, establishing the dialogue between "remoteness" and "presence" as an integral part of the way we interact with one another. This is fueled not just by advances in the design of virtual environments and remote experiences, as well as a shift in public perception of their usage, but also by the seamless integration of real and virtual places that these same technologies have enabled.

In this context, there is evidence of an emerging difficulty in finding communication models suitable for conveying content that is articulated between the physical and digital reality levels. Formats inherited from the tradition of communication design, which has always been concerned with the translation of heterogeneous content into forms suitable for its dissemination, comprehension, and

interpretation by various types of audiences, often prove insufficient in a context in which fruition is not analog or digital, but simultaneously analog and digital.

METHOD
Hybridization as a creative tool

In this unique context, we propose a pedagogical strategy that focuses on the hybridization of communication artifacts with the aim of fostering design experimentation.

In biology, hybridization is the crossing of two organisms of different species resulting in an organism that is different from either parent. The offspring does not manifest the sum of the traits of the starting organisms, nor does it represent the average of the two parents. The mule, for instance, which represents one of the most common examples of biological hybrid among animals close to us, has characteristics of the horse, such as its speed and its height, and characteristics of the donkey related to its strength, its intelligence, and its character. In other cases, the descendant has features that are even more pronounced than in either parent, as in the case of the liger, whose size is larger than both the lion and the tiger. Extending the metaphor beyond the biological realm from which it originates it can be argued that hybridization refers to the creation of a new type through the combination, selection and crossing of known types by selecting characters from one and the other to give rise to a novel type. In cycling, *hybrid bicycles* are bicycles that mix the characteristics of more specialized bikes such as mountain bikes with those of touring and racing bikes so they typically have the straight handlebars and posture of mountain bikes, but have the wheels and gears for racing bikes or touring bikes. In the technological context hybrids are found everywhere: *hybrid cars* are cars that mix different types of engines and driving systems; *hybrid computers* are PCs that mix the features of laptops with those of tablets and allow the conversion of one to the other.

Artifacts hybridization in Communication Design

In communication design, we propose to talk about *hybrid artifacts* (or at least we want to use the metaphor of hybridization) as a key to analyzing communication artifacts that are innovative with respect to the starting context, i.e., communication artifacts that strategically mix existing types in terms of formats, structures, languages, tools, and media, but do so strategically, to achieve a specific goal.

The metaphor of hybridization, when controlled by the designer, allows to break out of traditional typologies, to experiment with hybridizations of formats, structures, and modes of expression, to identify novel communication strategies suited to the territory, to the target audiences, and to the content to be conveyed. As a creative tool, hybridization leads to the design of innovative systems by strategically combining the characteristics of different artifacts to achieve specific communication goals. Hybridization, in biology as well as in its metaphorical applications, enables the combination of different traits to produce original solutions. Evolutionarily, it amounts to a strategy of adaptation to change that allows species to combine existing characters to increase their fitness with regard to a changed environment. From a pedagogical standpoint, by experimenting with these creative strategies, students are led to critically reflect on existing communication artifacts' features and explore original designs that deliberately combine different media, contents, and communication languages in innovative ways. Through hybridization, the methods for territorial knowledge production appear more effective, effectively combining the skills and knowledge embodied in multiple subject areas.

RESULTS
Application context

The paper presents the experience developed in the teaching laboratories of the DCxT[8] (Communication Design for the Territory) research group of the Design Department of Politecnico di Milano. The

teaching experience shows how hybridization strategies can increase effectiveness in learning about territorial specificities, in acquiring critical knowledge about communication systems, and in developing innovation strategies that allow to influence the evolution of traditional communication models. The Final Synthesis Design Studio of the Master's program in Communication Design was structured as an experimental laboratory from an educational point of view, with two major innovations compared to the traditional organization of design studios:

From a didactic point of view, the Studio was conceived as a "research laboratory", without a defined brief to be answered as in a client-customer interaction, but on the contrary, the activity of the groups is based on the development of a research hypothesis, where the students themselves must identify an original concept with the aim of innovating the state of the art in the context of communication design. In terms of artifacts, the workshop requires the development of experimental devices and projects. Students are not asked to implement a technical skill, but to propose new approaches and inventions that can be an innovation in the field of communication design.

In this specific framework, by invention we do not mean a magical process of divine inspiration, but an activity that requires the ability to look at things differently. An ability that often depends on experience, on reflecting on one's own projects or the projects of others, taking them apart and putting them back together to understand what the innovative process was. The goal is to present something that was not there before.

Teaching methodology

From a methodological point of view, several lectures were given during the Studio on the topic of hybridization, presenting the biological metaphor, its extension to other contexts, and the possibilities offered by this approach in the context of communication design. Following these theoretical presentations, some examples of hybridization in the context of communication artifacts were shown both from a historical perspective and with reference to emerging formats, such as the hybridization of books and maps in the creation of travel guides in the late 1800s and the proliferation of "longform storytelling," a digital format that mixes the characteristics of journalistic writing with the richness of audiovisual materials generally used for other types of channels. Finally, the traditional types of communication formats related to communication design for the territory were described. Classic and contemporary guidebooks, various forms of cartography, digital devices and apps, brochures, environmental communication, video documentaries, micro-signage, and other more or less conventional modes of communication were enumerated, and their characteristics and the possibilities of their reinterpretation were described.

Following these ex-cathedra interventions, the groups were asked to:

1. Identify a territorial content from which to design a novel storytelling format.

2. Gather extensive documentation related specifically to the selected territorial content in terms not only of information, data, but also documents, images and multimedia content that could be used in the context of storytelling.

3. Identify two established formats of territorial communication, selected according to the characteristics of suitability for communication of the collected content, on which to experiment with hybridization operations to verify their expressive potential.

4. Design hybrid communication artifacts that: strategically combine the characteristics of different artifacts; focus not on the idea of juxtaposition, but on the idea of combination; integrate media, content, languages and different modes of communication; work mixing the physical and the digital levels; use the idea of combination to achieve specific communicative goals; stimulate the reflection on the innovative components.

Outcomes

During the Final Synthesis Design Studio, students were divided into groups, and each autonomously chose a target area and developed a specific concept to be narrated through hybrid communicative artifacts. Very different territories were selected, each with its own content to be translated. Below is a selection of case studies in which hybridization was particularly evident as a driver of innovative outcomes.

Manifista

The first case study is related to a city in Italy called Lodi, and in particular to its most famous poetess Ada Negri who in her components narrates the territory and its specificities in an evocative way. To describe the figure of Ada Negri and her personal view on Lodi the group of students decided to hybridize two different communicative artifacts: the magazine and the poster generating the *manifista* (a portmanteau of the Italian words "manifesto" and "rivista"). From the typical structure of the magazine, they took the variety of languages and the thematic columns putting them together with the large format of the poster, its territorial positioning, and its public fruition. The result is a hybrid communicative artifact composed by a series of large format pages that combines different themes and contents: original illustrations directly realized by the students, historical insights about the Lodi territory, visual poetries, and orientation maps.

Figure 1. Manifista prototype, 2022.

The paper prototype of the *manifista* has been then positioned in the streets of Lodi to evaluate the general effect on place and people. Each page had several reading levels depending on the distance of the user: from a great distance the user is only able to see the illustrations and the big titles but looking at the posters more closely the user can carefully read the thematic insights.

Figure 2. Manifista prototype on the territory, 2022.

Talking about the results of the project, the hybrid was able to enhance literary territorial memories and to reveal unexplored itineraries not only to tourists but also to people living in Lodi that do not know about their poetic history. The *manifista* generates also a physical public involvement with the contents and turned out to be a model to be applied in the future to other cities. One of the main problems detected during the testing of the prototype, is the difficulty of discovering the *manifista* without a digital map that signals the presences of the various pages in the city. In addition, unlike the magazine, the *manifista* is a temporary and non-transportable experience, also subject to possible damage from atmospheric agents.

Temporale

The second case study is called *Temporale*, "Storm", and is related to the bunkers and air-raid shelters used in Milan during the Second World War. It aims to communicate their invisible history hidden under the surface of the city and to valorize their territorial presence in the city. In this case the students worked not on literary memories but on traumatic testimonies related to the war. They decided to hybridize three different artifacts: an audio-documentary, realized with on-site research collecting oral testimonies and environmental sounds; a music album, in this case a vinyl with several different tracks; original video-art contents to produce evocative suggestions.

The result has been called *sound docu-album*, analogically accessible through the vinyl record or digitally in the online version. While listening to the vinyl, the user can enjoy the visual video-art contents that enriches the experience.

Figure 3. Temporale vinyl prototype, 2022.

The project focuses on the audio experience: listening to the oral testimonies of survivors, people who personally lived through the bombing, combined with a sound base and an experimental documentary narrative, creates an original immersive experience. The vinyl is also accompanied by additional editorial content that completes the narrative experience (maps and booklets).

Figure 4. Temporale editorial content, 2022.

As in the case of the *manifista*, the hybridization helped to enhance invisible memories and little- known places like bunkers and to valorize their history. On the other hand, the collection of the archival documents and the oral testimonies have been very time consuming, and the places were often inaccessible.

CONCLUSION

In conclusion, hybridization appears as a valid strategy in the field of communication design for the territory. It is capable of increasing the effectiveness of learning about territorial specificities, providing students with critical knowledge about communication systems, and, in particular, encouraging the production of innovative artifacts that support the development of traditional communication models.

It should be noted, however, that students' feedbacks at the end of the course indicated that the concept of hybrid was difficult to understand and interpret, especially because it led to confusion between the idea of combination and juxtaposition. In some projects, hybridization was limited only to the esthetic level and to that of graphic languages. However, this initial obstacle did not affect the innovative contribution of hybridization, which was considered evident by almost all students.

During the course, students were also asked to write a scientific paper on their project to encourage critical analysis of their contributions, reinforce the role of the hybridization process, highlight innovations, and show the limits of their interventions. The structured format of the paper allowed to systematically highlight the main features of each hybridized artifact and then to show with greater awareness the value of the combination and its innovative contribution.

The general impression of the teaching staff was positive, and the experience will be proposed again with the aim of developing an analytical model for hybridization of communication artifacts to make this strategy clearer for students. It is also conceivable to apply this model in other contexts – outside academia – to retest its effectiveness.

NOTES

[1] Edward Soja, *Thirdspace, Journeys to Los Angeles and Other Real-And-Imagined Places*. (Malden, MA: Oxford Blackwell, 1996).

[2] Giovanni Baule and Marco Quaggiotto. "Communication of the Territory and Cartographic Interfaces. The Spatial Turn in Communication Design." In Proceedings of the Cumulus Conference, Milano 2015. The Virtuous Circle Design Culture and Experimentation, 1067–77. McGraw-Hill Education, 2015.

[3] Ibidem.

[4] Clorinda Galasso. "Mnemotopic Perspectives: Communication Design as Stabilizer for the Memory of Places." In World Academy of Science, Engineering and Technology, Open Science Index 174, International Journal of Psychological and Behavioral Sciences (2021), 15(6), 226 – 233. https://publications.waset.org/10012111/pdf

[5] Jordi Honey-Rosés et al. "The Impact of COVID-19 on Public Space: An Early Review of the Emerging Questions–Design, Perceptions and Inequities." Cities & Health, 2020, 1–17.

[6] Valera Saladino et al. "The Psychological and Social Impact of Covid-19: New Perspectives of Well-Being." Frontiers in Psychology 11 (2020): 2550.

[7] Erik Brynjolfsson et al. "COVID-19 and Remote Work: An Early Look at US Data." National Bureau of Economic Research, 2020.

[8] Communication Design for the Territory research group of Politecnico di Milano, Design Department, http://www.comunicazionedelterritorio.it

BIBLIOGRAPHY

Baule, Giovanni, and Marco Quaggiotto. "Communication of the Territory and Cartographic Interfaces. The Spatial Turn in Communication Design. In Proceedings of the Cumulus Conference, Milano 2015. The Virtuous Circle Design Culture and Experimentation, 1067–77. McGraw-Hill Education, 2015.

Brynjolfsson, Erik, John J. Horton, Adam Ozimek, Daniel Rock, Garima Sharma, and Hong-Yi TuYe. "COVID-19 and Remote Work: An Early Look at US Data." National Bureau of Economic Research, 2020.

Galasso, Clorinda. "Mnemotopic Perspectives: Communication Design as Stabilizer for the Memory of Places." In World Academy of Science, Engineering and Technology, Open Science Index 174, International Journal of Psychological and Behavioral Sciences (2021), 15(6), 226–233.

Honey-Rosés, Jordi, Isabelle Anguelovski, Vincent K. Chireh, Carolyn Daher, Cecil Konijnendijk van den Bosch, Jill S. Litt, Vrushti Mawani, Michael K. McCall, Arturo Orellana, and Emilia Oscilowicz. "The Impact of COVID-19 on Public Space: An Early Review of the Emerging Questions–Design, Perceptions and Inequities." Cities & Health, 1–17, 2020.

Iacoli, Giulio, *La percezione narrativa dello spazio*. Roma: Carocci, 2008.

Quaggiotto, Marco, *Interfacce per l'accesso agli spazi della conoscenza*. Milano: FrancoAngeli, 2012.

Saladino, Valeria, Davide Algeri, and Vincenzo Auriemma. "The Psychological and Social Impact of Covid-19: New Perspectives of Well-Being." Frontiers in Psychology 11, 2020: 2550.

Segal, Zef and Vannieuwenhuyze Bram. *Motion in Maps, Maps in Motion: Mapping Stories and Movement through Time*. Amsterdam: Amsterdam University Press, 2020.

Soja, Edward, *Thirdspace, Journeys to Los Angeles and Other Real-And-Imagined Places*. Malden, MA: Oxford Blackwell, 1996.

Stebbins, G. Ledyard. "The Role of Hybridization in Evolution." Proceedings of the American Philosophical Society 103, no. 2 (1959): 231–51.

Westphal, Bertrand, *La géocritique. Réel, fiction, espace*. Paris: Les Editions de Minuit, 2007.

WHAT'S IN IT FOR ME? INTEGRATING SERVICE-LEARNING INTO HIGHER EDUCATION CURRICULA

Authors:
LORINA CULIC, ANIȘOARA PAVELEA

Affiliation:
BABEȘ-BOLYAI UNIVERSITY, ROMANIA

INTRODUCTION
Service-Learning in higher education

Nowadays, universities focus on their triple mission: teaching, research and contribution to society,[1] and the pressure to sustain the third one is increasing.[2] Universities are encouraged to contribute to social, economic and cultural change in their region.[3] Civic engagement is often a part of the third mission of universities, emphasizing the reciprocity of social relationships developed and the advantages of the partnership between the academia and other institutions or organizations. It is a mutually beneficial relationship, as the universities can benefit from feedback on teaching and research, the students have the opportunity to learn in real life situations, and society leverages new avenues for problem-solving, deals with social issues efficiently and contributes to the discovery of new knowledge.[4] The Universities are no longer ivory towers, separated by the community they are established in. They have to broaden their microscopic, specialized, narrow research, with sharply defined borders and to reach interdisciplinary ties, connecting their academic efforts with the real problems within communities.[5]

The idea that "civic learning needs to be an integral component of every level of education" is not a new one.[6] Oftentimes, civic engagement in universities comes in the shape of internships, volunteering, community development, civic education, experience based and project based learning, or service learning.

The development of a strong community-university partnership is quintessential in generating "new knowledge for the academic field and transformative experiences for community members".[7] During the last decade, The European Higher Education Area (EHEA) has promoted the use of innovative teaching and learning methodologies in order to enhance students' instrumental, interpersonal and systemic skills.

Service-learning is recommended among these educational proposals as it is recognised as one of the high-impact educational practices in higher education.[8] It combines community service with academic learning[9] into "a single well-integrated project where participants learn while working on the real needs of their environment to improve it", declares Bringle.[10] Service-learning promotes change in the university curriculum, impacting the lives of students, faculty and communities[11] thus "becoming a significant contributor to defining, refining, and redefining the public purposes of institutions of higher education and their relationships to local, national, regional, and global communities that are increasingly diverse".[12]

Though SL was first introduced in the US and then spread at a different pace in other regions, in Europe, there have been two distinct groups of countries adopting SL pedagogy and methodology: one of them at full speed (if we are looking at UK, Germany, Spain, Ireland), and another emerging group (Portugal, Austria, Belgium etc.).[13] In the south-eastern part of Europe, SL is in the incipient phase in Universities, and some argue that it is still under-researched.[14] There are no SL centers in Romanian Higher education, even though community engagement as a strategic direction under the umbrella of the third mission is highly preached and encouraged on a declarative level. Romanian universities have joined several SL networks (Central and Eastern European Service-learning Network, EASLHE) and joint projects (for example: Engaged Students Erasmus+, Service-learning in Higher Education: Fostering the Third Mission of Universities and Civic Engagement of Students - SLIHE), but for faculty intending to develop SL projects there are no formal frameworks and incentives yet.

Many support the idea of institutionalizing SL in universities, stating that this process is beneficial for all the actors involved in the process. Faculty benefitting from support, in the form of resources allocated for staff familiarizing with SL methodology, training and preparation, financial rewards and other incentives[15] receive the proper tools for developing quality SL projects.[16] There are three main aspects of SL projects, according to CLAYSS (the Latin-American Center for Service-Learning): 1) a solidarity service developed within a community of place, identity or interest, with real needs addressed, 2) the active involvement of students in all areas of designing, planning, implementing and evaluating the project, and 3) the link between learning contents and service.

What does SL has to offer to students and faculty?

One of the most inspiring aspects of SL methodology is that it encourages students to develop personal learning objectives and to seek opportunities of applying the academic contents in real-life settings in order to fulfill the needs of the comunities.[17] The benefits are important for students (personal growth, raised self-efficacy, awareness of diversity, teamwork and collaboration skills, increased leadership, collaboration and problem solving skills), faculty (improved teaching methods and experience, recognition of efforts, long-term collaborations, mentorship opportunities, increased satisfaction and extra points for promotion), community (expertise, products and projects, reduced stereotypes, cultural understanding, useful service), and university (increased visibility, partnerships and positive community relations, escalated retention rates, aligned goals, actions and objectives) as well.

Institutionalization of SL

As previously mentioned, the institutionalization of SL increases the quality of SL projects developed within universities. Studying the process of institutionalization in forty-five academic institutions in the USA, Bell discovered that the strongest predictors of SL institutionalization in higher education is faculty involvement and support.[18] Three strategies strengthen faculty involvement: connecting SL projects with the research agenda of faculty, with other campus goals, strategies and initiatives, and with the academic work of the disciplines.

Nonetheless, especially in research universities, SL project partnerships come with the challenge of giving the power to community leaders, and oftentimes, researchers within academia and research-based faculty are standoffish about using participatory action research.[19] Another important payoff for faculty implementing SL projects is related to increased visibility of the academic team, of research projects and research agenda, which can leverage tenure prospects. Collaborations within and between departments can be established through SL initiatives, thus enabling junior faculty members to approach seniors with more experience and expertise and can therefore become an opportunity to encourage a more proactive approach to identifying mentorship connections, with multiple benefits for retaining and developing junior faculty.[20] Also, by entering these joint ventures, faculty members can overcome the

danger of professional isolation in academia, which has been proven to be a key contributing factor to mental illness in academia especially for early career researchers and junior faculty.[21]

SL has to be wired into the campus goals, strategies and initiative, to become viable in the long run. Even though it is declaratively supported by the academic body, some argue that SL has been proven to have several institutional, political and pedagogical limits, and it is "overwhelmingly used by the least powerful and most marginalized faculty (e.g., people of color, women, and the untenured), by the "softest" and most "vocational" disciplines and fields (e.g., education, social work), and with minimal exchange value (e.g., tenure and promotion prioritization)".[22] Also, previous studies have found individual differences in relation to emotional investment, tenure concerns, and tie commitment".[23]

SL pedagogy is very versatile. It can be adapted to almost any disciplines and curricular contents, according to the American Association for Higher Education[24], like arts and humanities, business and economics, engineering,[25] physics,[26] public health,[27] ICT[28] etc. even though it is implemented predominantly within social sciences (especially education and business studies), and humanities.[29]

When faculty members perceive SL as a legitimate initiative, being granted within the research community, approached at the highest level by renowned peer-review journals, and promoted within professional associations from diverse disciplines and institutions in the form of round tables, conferences, debates and partnerships, their engagement with this pedagogy increases and becomes long-term orientation.

METHODS

Two research questions were addressed:
(1) Which are the main benefits of SL for students' personal growth and skills development?
(2) Which are the SL implications for junior faculty?

Sample

Our sample consists of 188 freshmen (Mage=20, [18, 25], 68% female) majoring in Advertising and Communication participated in the mandatory Interpersonal Communication course. Students were grouped in predefined teams of four or five, in alphabetical order, to encourage team-working and collaboration. The project was their first encounter with the SL methodology and pedagogy, and we have documented the SL experience in a previous article tackling the effectiveness of SL methodology for developing students` leadership and interpersonal skills, social responsibility and civic engagement.[30]

Research Design

Students were invited to complete a final assessment online questionnaire. A total of 188 questionnaires were received, the response rate being 82%. The questionnaire consists of 60 questions, with some open-ended questions capturing students' reflection of the benefits of SL projects for themselves, for the community, and their positive and negative experiences. In order to analyze these reflections we have used qualitative thematic analysis (TA), according to Braun & Clarke.[31]

Personal growth and skills development

Multiple studies have proven the positive impact of SL on students` personal, social, moral and cognitive development.[32] Students undertaking SL projects go through a personal transformation that has been diversely documented. For our research, students report increased communication skills, leadership skills, organizational skills and time-management, problem solving skills, adaptability and teamwork. Concerning communication skills, most students mention both active listening and oral and

written communication: *"I can easily communicate with diverse people, of different ages, educational level or social status."*

Leadership skills have been identified in the form of managing a team, taking decisions, taking initiative and being proactive, displaying negotiation and conflict resolution skills, being assertive and attentive with the needs of the members of the group, strategic thinking, assuming responsibilities, and decision-making,

Organizational skills and time-management are especially important for advertising students, as they work in project-based assignments. Managing time effectively, working under pressure, meeting deadlines, planning skills, prioritizing, multitasking. While most of the students mentioned increased time-management skills, some of them report encountering difficulties related to procrastination and organizational hardship. Students report patience to be an important character trait that they have developed through the service experience.

As SL is usually perceived as an active learning method, involving experiential learning, students have mentioned important gains in terms of problem-solving skills. *"I have learnt that I can manage situations that seem to be impossible at first sight", "I can surely overcome difficulties if I give it a try and am willing to put the effort into it".*

Teamwork was frequently mentioned by the students as one of the most important challenges of the SL project, as "it is difficult to work in a team with students I don`t know". "with people who are disengaged" or with people who are dissimilar. Still, some students reported significant changes related to their ability to work in teams. Teamwork challenged students`adaptability skills and self-efficacy. "I can handle almost any situation", "I can manage utmost, new and unpredictable, stressful situations", "I am open to new concepts and ideas, to people and situations". Self-efficacy beliefs were very prominent, "I have learnt that I can do things on my own, without receiving the help of others", "I am perfectly capable of constructing ideas in areas that I do not master", "I have become more self-confident".

Besides the list of identified skills some students mentioned several improvements in career related skills, such as: written and oral communication, event planning, social media management, creativity and designing skills, or career alternatives like working in the NGO sector, environment protection, entrepreneurship or teaching.

Communication skills 19%	• "I have learnt how to be a good listener and a good communicator." • "My oral and written communication skills have improved significantly."
Time management 18%	• "I have found that organization is essential, in order to have good project management"
Leadership skills 16%	• "I can be a good leader, I take initiative, when I have to I step up" • "When things don't go as expected I can convince people to follow me, to trust me, and listen my ideas"
Teamwork skills 12%	• "I have learnt that I work best in a team and I really like it" • "I can be effective when working in a team and I have teamwork spirit"
Problem-solving skills 12%	• "I am capable of finding solutions to new problems" • "I can complete assignments without difficulty"
Self-efficacy 11%	• "I can. I just have to give it a try!", • "I am in charge of my life more than I thought I am"
Patience 9%	• "I have learnt to be patient, not to hurry, to stay calm when I work with people who do not show much interest" • "They have challenged my patience several times"

Figure 1. Reported personal growth and skills development

Community development

Usually the community involved in the implementation of SL projects is seen as an active member, whose voice is taken into account in shaping projects' activities, which will develop students' cultural appreciation and empathy. In our case, students' feedback reveals a community depicted in antithetical terms (as seen in figure 2).

Most of the projects had adolescents and children beneficiaries, perceived to be involved, determined to learn new information, curious, inquisitive, interested in major issues like environmental protection, education and diversity. The positive characteristics are underlined by the preponderance of attributes such as: "brave", "involved", "tolerant", "curious", "full of love", "interested"; attributes that describe a community eager for change, consisting of members with different expertise and interests, as well as sensitive to the surrounding social issues: environment protection, diversity and gender inequality.

However, on the opposite spectrum, the community is personalized in negative terms: seen as reluctant to new topics, to strangers, apprehensive on interactions with public institutions, ashamed to discuss taboos, uninformed and uneducated, misinformed, and holding rigid, strong beliefs. We have identified significant differences between the perceived attitudes of the beneficiaries' and their will to engage in actual behavior that would support community development. They are willing to learn new things, but the major problems are lack of information, lack of institutional support and general distrust: "We realized that in order to give continuity to the project and to achieve its objectives, the community must be analyzed in depth. The State does not provide the necessary support to this community." Also, the lack of change in the community stems from its procrastinating behavior, in which the community either does not need change, or expects change to happen from the outside.

- fearful
- reluctant
- vulnerable, disadvantaged, marginalized
- lacking interest and education
- lack of models, social trust, institutional support

- willing to change
- creative and open to new
- courageous, tolerant
- determined
- with experience and expertise
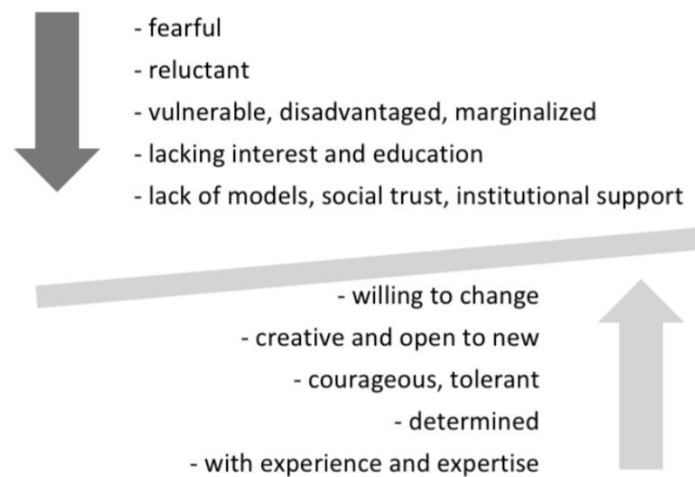
Figure 2. Reflection on communities' characteristics

What was the most fulfilling experience for me?

Students' feedback thematic analysis revealed that the most fulfilling experience of the project is related to the projects' results and impact, followed by the task completion), opportunities to practice prosocial behavior, and, to a lesser extent, to teamwork or personal benefits insights. In order to complete the project, students showed determination and motivation, worked efficiently, they had to pay attention to time management and thus fulfilled their initial objectives, but also meeting the deadlines.

In order to achieve the project objectives, student's exercised their persuasive skills and improved their self-efficacy, by engaging the community to become civically involved, not just passive. In terms of changed behaviors, the community became actively involved and cultivated their prosocial behavior through different activities: people donated goods (toys, furniture, books), money (vouchers), and their time to get involved in activities that benefit the whole community: "seeing people together helping each other gave me a feeling of wellbeing."

Output & Outcome **71%**	• *"We have built an online community"* • *"People attended our webinars and provided excellent feedback"* • *"We had such a large number of people involved in our project (beneficiaries, speakers, experts)"* • *"We had a good online reach""*
Task completion **13%**	• *"I was very happy that we managed to organize and finish the project in time"* • *"We reached our target audience and achieved our SMART goals."*
Prosocial behavior **11%**	• *"I convinced people to donate and adopt doggies"* • *"We brought happines to two families"* • *" I am most happy that we managed to get vouchers for our beneficiaries"* • *" We cleaned the city and the river"* • *" We had an impact on adolescents' lives"*
Teamwork **4%**	• *"I have managed to work effectively with my team* • *"I got to work with hard-working and creative colleagues "*
Personal insights **2%**	• *"I found support in my colleagues and got to know them"* • *"I realised that I can speak in front of people"* • *"I discovered excellent people and received an invitation to work as a volunteer in in the association"*

Figure 3. The most fulfilling experience

What was the most unfulfilling experience for me?

Unsurprisingly, since students had to work in preset teams, they ranked teamwork as the most unfulfilling experience, followed by the lack of community's involvement, and lack of interest and enthusiasm in projects' activities, while failure to fulfill projects' requirements was also mentioned. Teamwork is in line with the dysfunctional teams pattern established by Lencioni: the lack of trust is manifested by "colleagues' carelessness", lack of unity in the team, by "immature and selfish colleagues"; the fear of conflict is indicated by a poor communication, not sharing problems and not acknowledging the projects' or team mistakes, or hiding reactions from other team members.[33] Moreover, the lack of commitment can become frustrating for colleagues with the initiative: "I kept pushing them to do something". The lack of commitment, the fourth factor, is affected by the lack of good interpersonal communication skills and can come from a faulty division of team roles and commitments: "I'm sorry to say, but I didn't feel in an environment of (future) communication graduates' '. Also, poor communication is also reported in the working-relationship established with the community partners and public institutions, or with project beneficiaries, who do not openly communicate their interests or needs. Lastly, the teams' accountability is visible through the extra work done by some students, the lack of support and the initiative "you give your soul to succeed and others do not care at all" and through the focus on individualistic and not common goals. However, we should note the small percentage of students (5%) who could not indicate negative feedback, in close connection with their satisfaction with fulfilling the project tasks.

Teamwork **62%**	• *"Uninvolved, unaffected, distant colleagues"* • *"Colleagues' lack of interest and communication"* • *"We had constant conflicts in our team and some colleagues failed to do their job"*
Lack of community involvement **14%**	• *"Local antrepreneurs didn't have time for our activities"* • *"We were often rejected by NGOs and highscools"* • *"Lack of response from public institutions and faulty communication with the City Hall"*
Failure to complete tasks **11%**	• *"We didn't get to organize all the activities we have planned"* • *"We didn't get to plant trees and reach our goal"* • *"We would have liked to have more on-site activities"*
Disinterested beneficiaries **7%**	• *"Many were interested but only a few attended the activities"* • *"We were trolled during the webinar and many people have avoided direct interraction with us on social media"* • *"Students were quite passive"*
There were no negative aspects **5%**	• *"I can't recall any"* • *"I couldn't find any negative experience. I was extremely happy for our results"*

Figure 4. The most unfulfilling experience

Faculty's angle/viewpoint

From a faculty perspective, the first conclusion drawn refers to the immense untapped potential students have. As SL projects require a very diverse range of skills, students get the opportunity to set personal learning objectives that challenge their potential, employ diverse resources. SL projects open students' appetite for civic engagement and help instill their moral responsibility for change in society. After implementing SL projects with students two years in a row, we agree that there is a need to encourage students to make projects personally meaningful and constantly reflect on the experience.[34]

Nevertheless, SL projects are a source of accomplishments for teachers due to the large numbers of beneficiaries, the high student satisfaction rate, increased self-efficacy, improved skills, increased civic awareness, and change in beliefs and stereotypes. but, as previous studies mention, SL is a time-cost methodology. It requires faculty to balance administrative tasks, teaching and research with community development and outreach. Having a model with proper tools, like the CLAYSS methodology can facilitate the implementation of SL projects, but the effort and the workload is still considerable.

Last, institutional support is extremely valuable and benefitting from the expertise and experience of a SL center staff is quintessential. Students might want to develop partnerships on their own, seek donations and organize fundraising campaigns, which require institutional tools, like fundraising contracts, collaboration protocols etc. that junior faculty members are not familiarized with.

CONCLUSION

SL, as we have seen, is a versatile pedagogy and therefore could be embedded in diverse curricula. One of the most important aspects for junior faculty is that SL ties the academic content to community needs. Partnerships with local businesses, institutions and NGOs, developed under the university umbrella, could represent a valuable resource for faculty at the beginning of their career. They can identify professional networking opportunities and establish long-term collaborations with community leaders, organizations, fellow researchers and professors. Institutional support (like resources, training and preparation, financial rewards and other incentives) constitutes an array of tools for developing quality SL projects.

Within academia, junior faculty can seek mentorship and interdisciplinary collaborations, from which they can gain significant experience and expertise, increased proactivity, enabling retaining and personal growth and development. SL projects are followed by increased visibility of the academic team, of research projects and research agenda, which can frequently leverage tenure prospects. Recognition of SL initiatives' results and special prizes for faculty supporting university's third mission are also an incentive worth mentioning.

Nevertheless, as SL is considered to be an innovative pedagogy, junior faculty can use it in order to invert the academic pyramid. They can be seen as leading experts on a new pedagogy introduced in university and senior faculty could seek joint projects or advice on how to implement SL projects.

Previous research has shown that research-based faculty are standoffish about using participatory action research, therefore SL projects can bridge faculty's intention to connect learning with service, to identify community needs, to test research topics first hand in the community, to develop topics for research and to gain long-term orientation regarding research methodology and research agenda.

We know that often academia has been regarded as an ivory tower, isolated from the community, but even within this ivory tower, people feel the danger of professional isolation, as separated by research areas and teaching majors, departments, units, campuses and other cleavages. SL projects are able to connect faculty and students from various departments, and are often seen as a major source of increasing both students' and faculty motivation, engagement, satisfaction, retention, self-esteem and wellbeing.

NOTES

1 Christian Berthold, Volker Meyer-Guckel, and Wolfgang Rohe. "Mission Gesellschaft. Engagement und Selbstverständnis der Hochschulen. Ziele, Konzepte, internationale Praxis." *Edition Stifterverband. Abgerufen am* 1 (2010): 2019.

2 Lorenzo Compagnucci, and Francesca Spigarelli. "The Third Mission of the university: A systematic literature review on potentials and constraints." *Technological Forecasting and Social Change* 161 (2020): 120284. doi: 10.1016/j.techfore.2020.120284.

3 Tomasso Agasisti, Cristian Barra and Roberto Zotti. "Research, knowledge transfer, and innovation: The effect of Italian universities' efficiency on local economic development 2006− 2012", *Journal of Regional Science*, 2019, 59, no. 5, 819-849.

4 Christian Berthold, Volker Meyer-Guckel, and Wolfgang Rohe. "Mission Gesellschaft. Engagement und Selbstverständnis der Hochschulen. Ziele, Konzepte, internationale Praxis." *Edition Stifterverband. Abgerufen am* 1 (2010): 2019.

5 Christopher J. Lucas, *American Higher Education: A History*. New York: St. Martin's Press, 1994.

6 The National Task Force on Civic Learning and Democratic Engagement. *A crucible moment: College learning and democracy's future.* Washington, DC: Association of American Colleges and Universities, 2012: 13-14.

7 Yolanda Anyon, and María A. Fernández. "Realizing the potential of community-university partnerships." *Change: The Magazine of Higher Learning* 39, no. 6 (2007): 40-45. doi: 10.3200/CHNG.39.6.40-45.

8 Alexander C. McCormick, Jillian Kinzie, and Robert M. Gonyea. "Student engagement: Bridging research and practice to improve the quality of undergraduate education." In *Higher education: Handbook of theory and research*, pp. 47-92. Dordrecht: Springer, 2013.

9 Andrew Furco. "Advancing service-learning at research universities." *New directions for higher education* 2001, no. 114 (2001): 67-78. doi: 10.1002/he.15.

10 Robert G. Bringle and Julie A. Hatcher. "Implementing service learning in higher education," The Journal of Higher Education 67, no. 2 (1996): 221-239. doi: 10.2307/2943981.

11 John Saltmarsh, Matthew Hartley and Patti Clayton, *Democratic engagement white paper* (Boston, MA: New England Resource Center for Higher Education, 2009).

12 Robert G. Bringle, Miguel A. Santos Rego, and Bibiana Regueiro. "Service-learning, Educational Innovation, and Social Transformation." In *Frontiers in Education*, p. 542. Frontiers, 2022.

13 Alexandre Sotelino-Losada, Elena Arbués-Radigales, Laura García-Docampo, and José L. González-Geraldo. "Service-learning in Europe. Dimensions and understanding from academic publication." In *Frontiers in Education*, vol. 6, p. 44. Frontiers, 2021.

14 Duraku, Zamira Hyseni, and Mirjeta Nagavci. "Building Upon Service-Learning in Higher Education: Lessons Learned and Future Recommendations." *European Journal of Sustainable Development* 11, no. 1 (2022): 175-175. doi: 10.14207/EJSD.2022.V11N1P17.

15 Lucas CPM. Meijs, Stephanie A. Maas, and Pilar Aramburuzabala. "Institutionalisation of service learning in European higher education 1." In *Embedding Service Learning in European Higher Education*, pp. 213-229. Routledge, 2019.

16 Miguel, Rego, et al. "A Guide for the Institutionalization of Service-Learning at University Level", Santiago de Compostela: Servizo de Publicacións e Intercambio Científico da Universidade de Santiago de Compostela. (2018). https://www.usc.gal/libros/es/comunicacin/580-a-guide-for-the-institutionalization-of-service-learning-at-universitylevel-.html.

17 Patrick L. Yorio and Feifei Ye. "A meta-analysis on the effects of service-learning on the social, personal, and cognitive outcomes of learning." *Academy of management learning & education* 11, no. 1 (2012): 9-27.
Cong Wang, Xiao Zhang and Meilin Yao. "Enhancing Chinese college students' transfer of learning through service-learning." *Studies in Higher Education* 44, no. 8 (2019): 1316-1331. doi: 10.1080/03075079.2018.1435635.

18 Rebecca Bell, Andrew Furco, Mary Sue Ammon, Parisa Muller and V. Sorgen. "Institutionalizing service-learning in higher education: Findings from a study of the Western Region Campus Compact Consortium." *Berkeley, University of California* (2000).

19 Andrew Furco. "Advancing service-learning at research universities." *New directions for higher education* 2001, no. 114 (2001): 67-78. doi: 10.1002/he.15.

20 Caroline S. Zeind et al., "Developing a sustainable faculty mentoring program," American Journal of Pharmaceutical Education 69, no. 5 (2005). doi: 10.5688/AJ6905100.

[21] Meriam Belkhir et al., "Isolation in globalizing academic fields: A collaborative autoethnography of early career researchers," Academy of Management Learning & Education 18, 2 (2019): 261-285

[22] Dan W. Butin, "The limits of service-learning in higher education," The review of higher education 29, no. 4 (2006): 473-498. doi: 10.1353/RHE.2006.0025

[23] Joan M. Blakey, Shirley Theriot, Mary Cazzell and Melanie Sattler, "Is service-learning worth it?: A mixed-methods study of faculty's service-learning experiences." *International Journal of Research on Service-Learning and Community Engagement* 3, 1 (2016): 21572.

[24] American Association for Higher Education Series. http://bonnernetwork.pbworks.com/w/page/33663540/AAHE%20Series%20on%20Service-Learning%20in%20the%20Disciplines.

[25] Marián Queiruga-Dios, María Jesús Santos Sánchez, Miguel Ángel Queiruga-Dios, Pedro Mauricio Acosta Castellanos and Araceli Queiruga-Dios, "Assessment methods for service-learning projects in engineering in higher education: A systematic review." *Frontiers in psychology* (2021): 2817. doi: 10.3389/fpsyg.2021.629231.

[26] María Maravé-Vivas, Jesús Gil-Gómez, Teresa Valverde-Esteve, Celina Salvador-Garcia and Oscar Chiva-Bartoll, "A Longitudinal Study of the Effects of Service-Learning on Physical Education Teacher Education Students." *Frontiers in Psychology* (2022): 880. doi: 10.3389/fpsyg.2022.787346.

[27] Meghan R. Mason and Elizabeth Dunens, "Service-learning as a practical introduction to undergraduate public health: Benefits for student outcomes and accreditation." *Frontiers in public health* (2019): 63. doi: 10.3389/fpubh.2019.00063.

[28] Juan García-Gutiérrez, Marta Ruiz-Corbella and Ángeles Manjarrés Riesco, "Virtual Service-Learning in Higher Education. A theoretical framework for enhancing its development," Frontiers in Education, p. 306. Frontiers (2021). doi: 10.3389/feduc.2020.630804.

[29] Ana Cayuela and Pilar Aramburuzabala, "A review of service-learning in European higher education." *European Observatory of Service-Learning in Higher Education* (2020).

[30] Lorina Culic and Anisoara Pavelea, "Enhancing Students' Interpersonal and Leadership Skills through an Experience-based Service-learning Project: A Case of Active Learning". In *Active Learning in Higher Education, edited by* Kayoko Enomoto, R ichard Warner & Claus Nygaard, 153-179. Oxfordshire, U.K.: Libri Publishing Ltd., 2022

[31] Braun, Virginia and Victoria Clarke. "Using thematic analysis in psychology." *Qualitative research in psychology* 3, no. 2 (2006): 77-101. doi: 10.1191/1478088706qp063oa.

[32] Maimoona Salam et al.,. "Service learning in higher education: A systematic literature review," Asia Pacific Education Review 20, no. 4 (2019): 573-593. doi: 10.1007/S12564-019-09580-6.

[33] Patrick M. Lencioni, *The Five Dysfunctions of a Team (*San Francsico, CA: Jossey Bass, 2002).

[34] Judith G. Chapman and Joseph R. Ferrari. "An introduction to community-based service learning (CBSL)." *Journal of Prevention & Intervention in the Community* 18, no. 1-2 (1999): 1-3. doi: 10.1300/J005v18n01_01.

BIBLIOGRAPHY

Agasisti, Tomasso, Cristian Barra, and Roberto Zotti. "Research, knowledge transfer, and innovation: The effect of Italian universities' efficiency on local economic development 2006− 2012", *Journal of Regional Science*, 2019, 59, no. 5, 819-849.

American Association for Higher Education Series. http://bonnernetwork.pbworks.com/w/page/33663540/AAHE%20Series%20on%20Service-Learning%20in%20the%20Disciplines.

Anyon, Yolanda, and María A. Fernández. "Realizing the potential of community-university partnerships." *Change: The Magazine of Higher Learning* 39, no. 6 (2007): 40-45. doi: 10.3200/CHNG.39.6.40-45.

Belkhir, Meriam, Myriam Brouard, Katja H. Brunk, Marlon Dalmoro, Marcia Christina Ferreira, Bernardo Figueiredo, Aimee Dinnin Huff, Daiane Scaraboto, Olivier Sibai, and Andrew N. Smith. "Isolation in globalizing academic fields: A collaborative autoethnography of early career researchers." *Academy of Management Learning & Education* 18, 2 (2019): 261-285.

Bell, Rebecca, Andrew Furco, Mary Sue Ammon, Parisa Muller, and V. Sorgen. "Institutionalizing service-learning in higher education: Findings from a study of the Western Region Campus Compact Consortium." *Berkeley, University of California* (2000).

Berthold, Christian, Volker Meyer-Guckel, and Wolfgang Rohe. "Mission Gesellschaft. Engagement und Selbstverständnis der Hochschulen. Ziele, Konzepte, internationale Praxis." *Edition Stifterverband. Abgerufen am* 1 (2010): 2019.

Blakey, Joan M., Shirley Theriot, Mary Cazzell, and Melanie Sattler. "Is service-learning worth it?: A mixed-methods study of faculty's service-learning experiences." *International Journal of Research on Service-Learning and Community Engagement* 3, 1 (2016): 21572.

Braun, Virginia, and Victoria Clarke. "Using thematic analysis in psychology." *Qualitative research in psychology* 3, no. 2 (2006): 77-101. doi: 10.1191/1478088706qp063oa.

Bringle, Robert G., and Julie A. Hatcher. "Implementing service learning in higher education." *The Journal of Higher Education* 67, no. 2 (1996): 221-239. doi: 10.2307/2943981.

Bringle, Robert G., Miguel A. Santos Rego, and Bibiana Regueiro. "Service-learning, Educational Innovation, and Social Transformation." In *Frontiers in Education*, p. 542. Frontiers, 2022.

Butin, Dan W. "The limits of service-learning in higher education." *The review of higher education* 29, no. 4 (2006): 473-498. doi: 10.1353/RHE.2006.0025.

Cayuela, Ana, and Pilar Aramburuzabala. "A review of service-learning in European higher education." *European Observatory of Service-Learning in Higher Education* (2020).

Chapman, Judith G., and Joseph R. Ferrari. "An introduction to community-based service learning (CBSL)." *Journal of Prevention & Intervention in the Community* 18, no. 1-2 (1999): 1-3. doi: 10.1300/J005v18n01_01.

Compagnucci, Lorenzo, and Francesca Spigarelli. "The Third Mission of the university: A systematic literature review on potentials and constraints." *Technological Forecasting and Social Change* 161 (2020): 120284. doi: 10.1016/j.techfore.2020.120284.

Culic, Lorina, and Anișoara Pavelea. "Enhancing Students' Interpersonal and Leadership Skills through an Experience-based Service-learning Project: A Case of Active Learning". In *Active Learning in Higher Education, edited by* Kayoko Enomoto, Richard Warner & Claus Nygaard, 153-179. Oxfordshire, U.K.: Libri Publishing Ltd., 2022

Duraku, Zamira Hyseni, and Mirjeta Nagavci. "Building Upon Service-Learning in Higher Education: Lessons Learned and Future Recommendations." *European Journal of Sustainable Development* 11, no. 1 (2022): 175-175. doi: 10.14207/EJSD.2022.V11N1P17.

Furco, Andrew. "Advancing service-learning at research universities." *New directions for higher education* 2001, no. 114 (2001): 67-78. doi: 10.1002/he.15.

García-Gutiérrez, Juan, Marta Ruiz-Corbella, and Ángeles Manjarrés Riesco. "Virtual Service-Learning in Higher Education. A theoretical framework for enhancing its development." In *Frontiers in Education*, p. 306. Frontiers, 2021. doi: 10.3389/feduc.2020.630804.

Lencioni, Patrick M. *The Five Dysfunctions of a Team.* San Francsico, CA: Jossey Bass, 2002.

Lucas, Christopher J. *American Higher Education: A History*. New York: St. Martin's Press, 1994.

Maravé-Vivas, María, Jesús Gil-Gómez, Teresa Valverde-Esteve, Celina Salvador-Garcia, and Oscar Chiva-Bartoll. "A Longitudinal Study of the Effects of Service-Learning on Physical Education Teacher Education Students." *Frontiers in Psychology* (2022): 880. doi: 10.3389/fpsyg.2022.787346.

Mason, Meghan R., and Elizabeth Dunens. "Service-learning as a practical introduction to undergraduate public health: Benefits for student outcomes and accreditation." *Frontiers in public health* (2019): 63. doi: 10.3389/fpubh.2019.00063.

McCormick, Alexander C., Jillian Kinzie, and Robert M. Gonyea. "Student engagement: Bridging research and practice to improve the quality of undergraduate education." In *Higher education: Handbook of theory and research*, pp. 47-92. Dordrecht: Springer, 2013.

Meijs, Lucas CPM, Stephanie A. Maas, and Pilar Aramburuzabala. "Institutionalisation of service learning in European higher education 1." In *Embedding Service Learning in European Higher Education*, pp. 213-229. Routledge, 2019.

Queiruga-Dios, Marián, María Jesús Santos Sánchez, Miguel Ángel Queiruga-Dios, Pedro Mauricio Acosta Castellanos, and Araceli Queiruga-Dios. "Assessment methods for service-learning projects in engineering in higher education: A systematic review." *Frontiers in psychology* (2021): 2817. doi: 10.3389/fpsyg.2021.629231.

Rego, Miguel Anxo Santos, and Mar Lorenzo Moledo. "A Guide for the Institutionalization of Service-Learning at University Level." Santiago de Compostela: Servizo de Publicacións e Intercambio Científico da Universidade de Santiago de Compostela. https://www.usc.gal/libros/es/comunicacin/580-a-guide-for-the-institutionalization-of-service-learning-at-universitylevel-.html.

Salam, Maimoona, Dayang Nurfatimah Awang Iskandar, Dayang Hanani Abang Ibrahim, and Muhammad Shoaib Farooq. "Service learning in higher education: A systematic literature review." *Asia Pacific Education Review* 20, no. 4 (2019): 573-593. doi: 10.1007/S12564-019-09580-6.

Saltmarsh, John, Matthew Hartley, and Patti Clayton. "Democratic engagement white paper." (2009).

Sotelino-Losada, Alexandre, Elena Arbués-Radigales, Laura García-Docampo, and José L. González-Geraldo. "Service-learning in Europe. Dimensions and understanding from academic publication." In *Frontiers in Education*, vol. 6, p. 44. Frontiers, 2021.

The National Task Force on Civic Learning and Democratic Engagement. *A crucible moment: College learning and democracy's future.* Washington, DC: Association of American Colleges and Universities, 2012.

Wang, Cong, Xiao Zhang, and Meilin Yao. "Enhancing Chinese college students' transfer of learning through service-learning." *Studies in Higher Education* 44, no. 8 (2019): 1316-1331. doi: 10.1080/03075079.2018.1435635.

Yorio, Patrick L., and Feifei Ye. "A meta-analysis on the effects of service-learning on the social, personal, and cognitive outcomes of learning." *Academy of management learning & education* 11, no. 1 (2012): 9-27.

Zeind, Caroline S., Martin Zdanowicz, Kathleen MacDonald, Christine Parkhurst, Cynthia King, and Phillip Wizwer. "Developing a sustainable faculty mentoring program." *American Journal of Pharmaceutical Education* 69, no. 5 (2005). doi: 10.5688/AJ6905100.

Zomer, Arend, and Paul Benneworth. "The rise of the university's third mission." In *Reform of higher education in Europe*, pp. 81-101. Brill Sense, 2011.

THE IMPACT OF STEAM EDUCATION ON MASTER AND PHD THESIS FROM STUDENTS OF LISBON SCHOOL OF ARCHITECTURE, UNIVERSITY OF LISBON

Author:
SUSANA ROSADO, JORGE T. RIBEIRO

Affiliation:
UNIVERSITY OF LISBON, LISBON SCHOOL OF ARCHITECTURE, PORTUGAL. UNIVERSITY OF LISBON, LISBON SCHOOL OF ARCHITECTURE AND CERENA, PORTUGAL

INTRODUCTION

The STEM (Science, Technology, Engineering and Mathematics) teaching/learning approach has been adopted in several universities around the world. In this approach, mathematics plays a central role, as it is the fundamental tool for logical, methodical and systematic reasoning, essential in the development of thought, namely in Physics and Engineering. However, today's young students, who were stimulated from an early age by technological innovations, are eager to acquire knowledge in a more attractive way.

The STEAM (STEM+ART) approach, which includes Art in the teaching/learning of science and technology, seems to be the attractor that activates the interest of young students, especially those who are further away from these areas but who need them for their professional success, as is the case of architecture. With its foundations in transdisciplinary working, STEAM provides students with the knowledge and understanding needed for the jobs of the future. STEAM is seen to increase intellectual curiosity and creativity. Its collaborative approach and focus on group working allows individuals to learn socially as well as broadening their perspectives and knowledge. Further, the critical thinking and radical openness elements open routes to innovation. STEAM thinking and practices have been used to address complex challenges as well as nurturing techniques such as data visualization.[1]

Through examples, this article seeks to show that Mathematics plays a crucial role in the STEAM teaching/learning approach, especially in the area of Architecture (and even in its practice), fostering and helping the creative process. More specifically, it is intended to show the influence of the STEAM approach in the elaboration of master's and doctoral theses of architecture students at the University of Lisbon and also focusing on the importance of using this methodology when practicing architecture.

THE STEM AND STEAM EDUCATION

Human culture around the world has been driven by creative advances in several areas: science, technology, philosophy, arts and humanities.[2] Creative thinking is much more than having spontaneous ideas that may or may not lead to something substantial. Marr recalls that "modern science depends completely on collaboration, shared realization and happy accidents, more than on an isolated genius who jumps naked from the bathtub screaming «Eureka!»".[3] Creative thinking is a tangible competence

based on knowledge and practice, which allows and achieves better results, often in restricted challenging environments.

In his last interview in 1996, Carl Sagan stated that "We live in a society exquisitely dependent on science and technology, in which hardly anyone knows anything about science and technology."[4] Many countries, including Portugal, have sought to implement STEM approaches in education so that future generations can increase their knowledge of science and technology. In fact, the STEM skills are understood as critical to foster economic development, while occupations are among the highest paying, fastest growing, and most influential in driving innovation. STEM graduates enjoy low unemployment rates as well. According to Horta the STEM goals were:

1.increase the proficiency of all students in STEM in order to improve the ability of students to address increasingly complex problems, employ STEM concepts and apply creative and innovative solutions to their daily lives

2.increase the number of students who pursue STEM careers and advanced studies by raising awareness of the importance of STEM and by raising interest in STEM subjects.[5]

However, with a hasty youth focused on leisure and the immediate technologies that make everyday life easier, efforts should be made to make the STEM approach more attractive to young people. In this sense, the integration of the arts in the STEM approach, called the STEAM approach, can bring a breath of fresh air to education, providing a more interesting and appealing approach as it stimulates sensory awareness,[6] as outlined in Figure 1.

For Peppler and Wohlwend[7] the inclusion of A in STEM implies a mutual enrichment as, on the one hand, artists can expand their creative potential of design through computational flexibility and versatility (referred in this case only to the T of STEM). On the other hand, the inclusion of A in STEM would have proven to be equally transformative as it not only generates new content knowledge. It also invites participation from populations historically underrepresented in STEM fields.
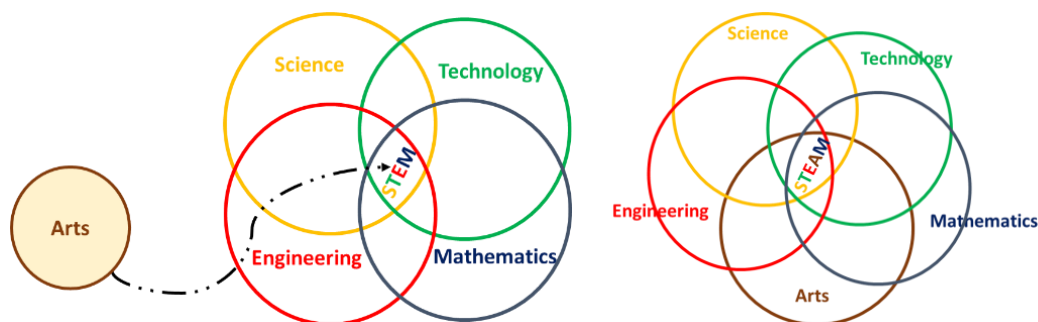
Figure 1. Transition from STEM to STEAM Education.

STEAM can be defined as "education for increasing students' interest and understanding in scientific technology and for growing STEAM literacy based on scientific technology and the ability to solve problems in the real world".[8]

A STEAM education could also be defined as one that proposes an integrated teaching of scientific-technological, artistic and, in general, humanistic competencies, with integration understood in a progressive sense that goes from interdisciplinarity to transdisciplinarity.[9]

The STEAM approach becomes even more appealing in training young people in areas such as architecture with deep roots in art, but with an increasing need for science and technology.

Figure 2 seeks to illustrate the importance of mathematics in the STEAM approach to architecture, in line with the Stanford University's d. loft STEAM education that combines STEAM education with design thinking.[10]
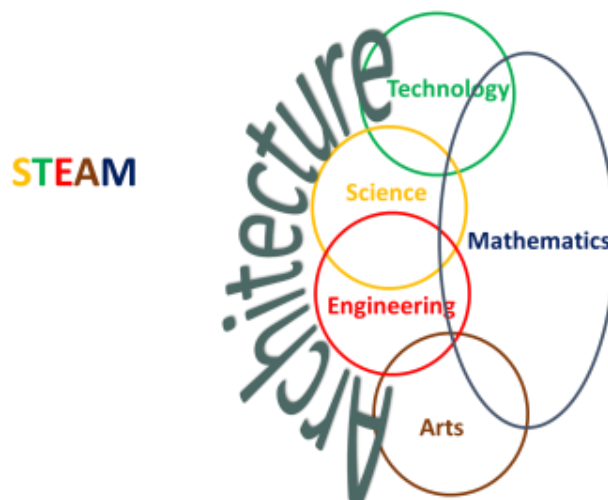
Figure 2. Maths in STEAM Education and Architecture.

According to Franken creativity as the tendency to generate or recognize ideas, alternatives or possibilities that can be useful in solving problems, in communicating with others and for entertainment.[11] In this sense, mathematics helps to systematize this recognition of ideas in the sense of solving problems and is therefore an essential tool for creativity.

In this approach STEAM education is seen as a contribution of Mathematics in the creative process in arts, Mathematics as part of the process of learning through thinking, planning and creating or performing a work of art.[12]

It is not coupling STEM with ARTS but it is much more than that. It is about all the interdisciplinarity that is possible when you include STEM in ARTS, particularly Mathematics. In higher education the need for a systematic, methodic and well-structured reasoning is crucial to better learn the concepts and assimilate them. When arts are involved, like Architecture, this reasoning is as important as it is something that you create for people to use, to live on, to enjoy.

When, for example, you have the challenge of creating a building for people to live in, in a certain place, first you have to "understand" that place, find out about the needs, the potential to be used, you have to collect information, treat that information and take conclusions so that the decisions you make are informed ones and the best in terms of the architectural design you are going to create, develop and implement. This is what we define as a STEAM approach of the problem that consists of creating a certain architecture design and defining a certain program for that project.

STEAM education increases collaboration, enhances creativity, and develops the scientific inquiry Skills.[13]

Kim and Kim[14] categorized STEAM teaching competencies as follows: cognitive ability in subjects (understanding and using convergent knowledge); advanced thinking ability (creativity, problem-solving ability, critical thinking ability, ability to use information, and decision-making ability); ability to contribute to the community (ability to communicate, ability to engage in social relationships, and ability to cooperate); and individual emotional ability (self-respect, positive emotion, consideration, and civil awareness).

Following the STEAM Approaches Handbook, in Architecture courses all the four key elements identified in the Handbook – Behaviour, Culture, Engagement, Space – are present.

Behaviour – Participants must be prepared to behave collaboratively, adopting an open mind-set and ready to embrace radical openness. Key behaviours include an acceptance that ideas are not necessarily right or wrong and that trying things out can have as much value as finding a solution.

Culture - accepts, celebrates and thrives on differences as well as seeking diversity and advancing inclusivity. Differences can be discipline, age, experience, ethnicity, job roles and organisational position. This positive culture fosters peer-led support with an open outlook to learning something new.

Engagement – with external organisations, communities and partners. Not only involves different disciplines, but people, beyond the organising institution, with different backgrounds, agendas and understandings. Includes sharing principles and perceptions with communities.

Space – is an area dedicated to activities that visibly encourages engagement as well as being safe, to allow behaviour and cultures to be nurtured and flourish. Preferably this is a physical meeting space, for knowledge sharing.

Architecture practice should always be developed in pluridisciplinary working groups in a collaborative way (Behaviour), is innovative and often go against the established (Culture). The more architects interact with other areas of knowledge the better are the outcomes produced (Engagement). All architectural designs require spaces for constant knowledge sharing (Space).

The STEAM approach is illustrated ahead with some MSc and PhD examples where tables are developed synthesizing the information collected and based on that the ideas for the architectural design start, problems are identified, relevant data is collected, information is analyzed, conclusions are taken and informed decisions are made concerning the project to be developed. It is clearly highlighted that mathematical thinking is intrinsic in this approach strategy for the search of an architectural solution. All these procedures can also be implemented in architecture practice.

EXAMPLES OF THE STEAM APPROACH OF MSC THESIS
Example 1 of MSc Thesis[15]

In this first example, Barreira organized the information in a two-entry table, which crosses three reference cases (in columns) with the main characteristics (in lines) adopted in architectural rehabilitation (fig. 3 left). The systematization of information made it possible to highlight the aspects that Barreira intended to explore in the rehabilitation project she was developing in her MSc Thesis. This way, the reasoning was being systematized in order to organize the inputs to enrich the outputs that will ultimately be the ideas for the rehabilitation project.

Understanding the help that this table brought to the perception of her case study, Barreira also created a characterization table on the building she intended to rehabilitate (fig. 3 right). She crossed, in this table, the three wings of the building with their respective valences, in order to propose a rehabilitation project that would make the specificities of the convent compatible with the new proposed use.

All this procedure was developed before any architectural design ideas. This constitutes a previous diagnosis in the architectural design developing process. Resuming the information was fundamental for the reflections that precede the initial development of the architectural design and to establish the main guidelines.

Figure 3. Organization of information made by Barreira.

Example 2 of MSc Thesis[16]

Fernandes (publication forthcoming) also used a similar process in her MSc Thesis. Figure 4 illustrates the synthesis performed. It established the relationship between the six reference cases (in columns) and their respective characteristics (access, interior-exterior transition, colors, materials, environments, etc.), as well as how to explore these characteristics in the rehabilitation project that was being carried out to develop in her MSc Thesis - architectural rehabilitation project of an old military infrastructure for temporary emergency residences. This systematization of information allowed Fernandes to develop in a simpler way the creative process corresponding to her proposed rehabilitation project. The visualization of the information in a very synthetic and systematized way helps the brain to process the information in a more organized form, even if it is unconsciously made. As in the previous example the mathematical thinking was crucial to point out the main characteristics to include in the architectural rehabilitation design.

Figure 4. Organization of information made by Fernandes (publication forthcoming).

EXAMPLES OF THE STEAM APPROACH OF PHD THESIS
Example 1 of PhD Thesis[17]

Baptista drew up a flowchart to clearly illustrate the methodology for addressing the housing problem in rural areas of Angola to prevent the massive exodus of these populations to the cities (fig. 5 left). Combining local information in a GIS (Geographic Information System) produced a new map of Angola (fig. 5 right). Each color on this new map represents an area in which conditions (climatic, ethnographic, and local building resources) are common.
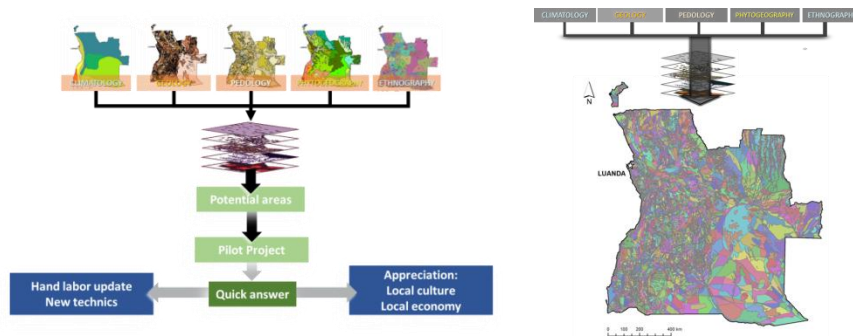
Figure 5. Methodology and new map of Angola made by Baptista.

In other words, by selecting areas of the territory, a synthesis of local information is obtained (fig. 6) that allows defining the guidelines for the development of the architectural design in each area. Both in terms of strategies (fig. 7 top) that guarantee comfort to the housing to be designed and better suited to the physical-geographical conditions of each area, and in terms of the main local materials available (fig. 7 bottom).

			Namibe (South Coast)	Lubango (Interior Plateau)	Menongue (Cuango-Cubango)
ETHNOGRAPHY	Ethnic Group			*Nhaneca* and *Humbe*	*Ganguela*
	Ethnicity		*Mucubais, Mucubales or Cuvales*	*Mumuilas* or *Muilas* with many *Ovibundos*	*Ganguelas*
CLIMATOLOGY (Azevedo, *et al.*, 1972)	Koppen Classification		Desertic dry (BWh)	Tempered hot tropical, with dry winter (Cwb)	Tempered tropical, with dry winter (Cwa)
	Insolation (h)	Yearly	1962	2532	2863
		Maximum monthly	November and December: 194	May: 276	August: 313
		Minimum monthly	August: 107	March: 155	February: 154
	Annual average air temperature (°C)		20.5	18.7	20.0
	Average monthly maximum temperature (°C)		March: 29.0 July: 19.8	September: 28.0 June: 23.1	October: 32.0 June: 26.1
	Average monthly minimum temperature (°C)		March: 20.7 June: 12.6	March: 14 June: 8	March and December: 16 July: 3.3
	Precipitation (mm)	Yearly	40	960	1041
		Maximum	March: 15	March: 201	January: 201
		Minimum	May to September: trace	June to September: trace	June to September: trace
	Annual Precipitation (number of days)		19	101	112
	Averge relative humidity 9am (%)	Yearly	78	50	62
		Maximum	July and August: 86	March: 72	March: 78
		Minimum	November: 72	September: 28	August: 44
	Average wind speed 2m ground (km/h)		November: 7.6 July: 5.5		
GEOLOGY (Carvalho, 1981)	Rock type		Waist green rocks (?) of SW (a. 3000 MYears?): crystalline limestone, "*chertes*", etc.	Biotite granites of Central Region (regional granites)	Cenozoic-Quaternary: Undifferentiated Cenozoic-Tertiary-Neogene: undifferentiated *Calaári* and various deposits
PEDOLOGY	Average granulometric composition (%)	Pebble	1.7	3.7	0.0
		Sand	65.9	53.3	93.8
		Silt	9.0	3.1	0.5
		Clay	23.4	39.9	5.7
PHYTOGEOGRAPHY (Barbosa, 1970: 246)			Sublittoral steppe formations, shrubby and herbaceous	*Mlombo*, savanna and *ongote*	Herbaceous savannas or shrub; forests and patches of dense forest, dry

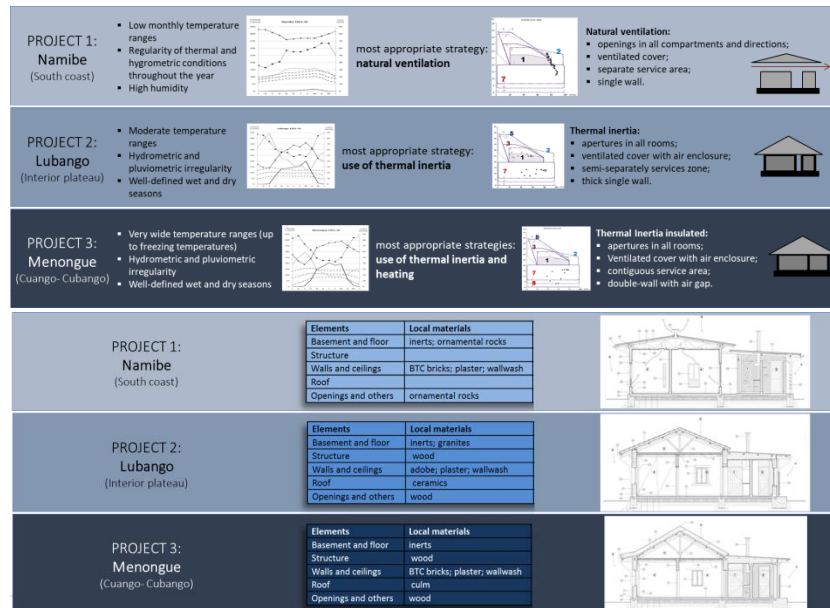*Figure 6. Synthesis of local information obtained by Baptista.*

Figure 7. Main strategies, main local materials and main architectural guidelines according to physical-geographical conditions obtained by Batista.

The proposed methodology allows the use of a georeferenced smartphone application in the creation of a database with the local resources available for a specific area (geology, soil, vegetation cover, climate, and cultural specificities). This allows the dissemination of knowledge with instructions for construction techniques, adapted to local specificities, as well as linking to specific internet sites.[18]

Example 2 of PhD Thesis[19]

Vieira used statistical techniques to assess a sample of 37 buildings in Lisbon (fig. 8 left), in terms of their suitability to be considered networked buildings. The architectural and urban variables that best translate the concept of a networked building were defined (fig. 8 right) and the complete disjunctive matrix was constructed that contains the information on the variables for the selected buildings (Fig. 9).
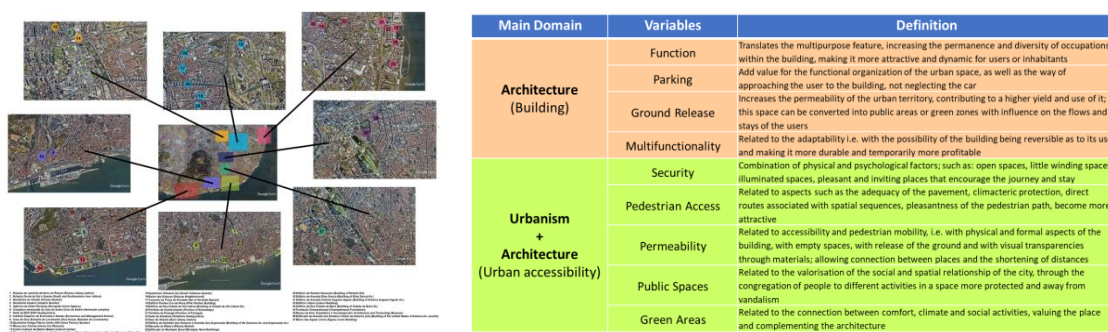

Figure 8. Lisbon sample buildings and architectural and urban variables defined by Vieira.

In practice, the data matrix (Fig. 9) was submitted to the barycentric discrimination algorithm[20] (EdR and EdNR lines as active and the rest as supplementary), projecting the buildings in the discriminant axis that defines the arbitrary scale of classification of the Network Buildings, and whose extremes are given by the archetypes EdR and EdNR. The results obtained were rescaled on a scale of 0 to 10.

Building	Function		...	Ground Release		...	Green Areas	
	MUy	UUn		Yes	No		Yes	No
1	1.0	0.0	...	0.0	1.0	...	0.0	1.0
2	1.0	0.0	...	0.0	1.0	...	0.0	1.0
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
36	0.0	1.0	...	1.0	0.0	...	0.0	1.0
37	1.0	0.0	...	0.0	1.0	...	1.0	0.0
EdR	1.0	0.0	...	1.0	0.0	...	1.0	0.0
EdNR	0.0	1.0	...	0.0	1.0	...	0.0	1.0

Figure 9. Complete disjunctive matrix made by Vieira.

For the sake of clarity the results were divided into three groups (Fig. 10) illustrated by an example of each group. The group of twelve buildings that obtained higher ranks (9 and 10) meets the large majority of established criteria and may in fact be considered Network Buildings. The group of six buildings with smaller scores (< 4.5) meets few of the criteria considered and is Not Network Buildings. The group of nineteen buildings that obtained ranks between 5 and 8, occupies an intermediate position.

Figure 10. Assessing results obtained by Vieira.

Mathematics and Statistical methods provide essential tools to assess the network buildings classification in a single value easily understood by professionals and nonprofessionals. These tools enable important architectural and urban decisions and contribute to the city planning improvement.

CONCLUSION

The examples presented in this article highlighted the fundamental role that Mathematics can play in areas of knowledge in the field of the arts, such as Architecture and Urban Planning. This study could somehow counter some prejudices related to the role of Mathematics in the creativity sector and even reverse the underlying concept in the STEAM education approach that aims to incorporate the arts in STEM education.

In fact, Mathematics plays a role as a tool that systematizes and facilitates the understanding of problems by students, allowing that after this acquisition of knowledge, countless possibilities for creative expansion are opened.

Demonstrated that this pedagogical methodology of STEAM teaching can be understood in the complementary direction, that is, the importance of incorporating mathematics in the teaching of the arts and the tools it provides in the development of their abstract thinking, of their capacity for synthesis to better develop thinking. Creativity, and all the methodical ability to collect, process and analyze information, crucial for the development of research in Architecture.

The students that learn under STEAM education approach are able to continue to implement this methodology as future professionals and contribute to better decisions throughout their professional lives.

NOTES

[1] Heather Barnett et al. *STEAM Approaches Handbook*, 2021

[2] Beth A. Hennessey, Teresa M. Amabile. Creativity. *Annual Review of Psychology*, 61:1 (2010): 569-598.

[3] Andrew Marr. *A History of the World*, 2014

[4] Remembering Carl Sagan, accessed February 15, 2022, https://charlierose.com/videos/2625

[5] Hugo Horta. Consultant Report, Securing Australia's Future, STEM: Country Comparison - STEM education in Portugal: Education, policies and labor market, ACOLA, 2013

[6] Michelle H. Land. Full STEAM Ahead: The Benefits of Integrating the Arts Into STEM. *Procedia Computer Science*, 20 (2013): 547-552

[7] Kylie A. Peppler, Karen Wohlwend. Theorizing the nexus of STEAM practice. *Arts Education Policy Review*, 119(2) (2018): 88–99. https://doi.org/10.1080/10632913.2017.1316331

[8] KOFAC. Concept and Definition of STEAM; The Korea Foundation for the Advancement of Science and Creativity—KOFAC: Seoul, Korea, 2017, accessed June 5, 2022, https://steam.kofac.re.kr/?page_id=11269

[9] Francisco Javier Perales, José Luis Aróstegui. The STEAM approach: Implementation and educational, social and economic consequences, *Arts Education Policy Review*, (2021), DOI: 10.1080/10632913.2021.1974997

[10] Jie Li, Heng Luo, Leilei Zhao, Min Zhu, Lin Ma, Xiaofang Liao. Promoting STEAM Education in Primary School through Cooperative Teaching: A Design-Based Research Study. *Sustainability* 14, 10333 (2022). https://doi.org/10.3390/su141610333

[11] Robert E. Franken. *Human Motivation*. 3rd Edition. Brooks/Cole Publishing Company, 1994

[12] Linda Carol Edwards. *The creative arts: A process approach for teachers and children.* 5th Edition. Upper Saddle River, NJ:Merril Publishing. 2010

Lisa LaJevic. Arts integration: What is really happening in the elementary classroom? *Journal of learning through Arts*, 9:1 (2013):1-28

[13] Kelly W. Guyotte, Nicola W. Sochacka, Tracie E. Costantino, Nadia N. Kellam, Joachim Walther. Collaborative creativity in steam: Narratives of art education students' experiences in transdisciplinary spaces. *Int. J. Educ. Arts* (2015)

Yi Zhang, Yiaping P. Zhao, Ling He, Qingyu Y. Bai. Interdisciplinary Teaching Design and Practice Based on STEM. *Mod. Distance Educ. Res.* 1 (2017): 75–84

[14] Bang-Hee Kim, Jinsoo Kim. Development and validation of evaluation indicators for teaching competency in STEAM education in Korea. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(7), (2016): 1909–1924. https://doi.org/10.12973/eurasia.2016.1537a

[15] Carolina Barreira. *Re(h)abilitate for shelter – Intergenerational Housing in the rehabilitation of the former Convento da Boa Hora*. MSc Thesis in Architecture. University of Lisbon, Lisbon School of Architecture, 2021

[16] Matilde Fernandes. *Revitalize The Military Barracks - Temporary residences for emergency housing in Quartel dos Lanceiros 2*. MSc Thesis in Architecture. University of Lisbon, Lisbon School of Architecture (publication forthcoming)

[17] Júlio Londrim Baptista. *Vernacular Technology vs. Global Technology: Creation of a Project Methodology for Developing Countries*. PhD in Architecture. University of Lisbon, Lisbon School of Architecture, 2015

[18] Júlio Londrim Baptista, Jorge T. Ribeiro, Fernando Costa. Testing an operative tool for building design, supported by a CIM (Construction Information Map) in the Cape Verde archipelago. *19th International Conference Architectonics Network – Mind, Land, Society; The new sense of place after the bio-revolution: education, profession and social interaction* (2021): 215-225. Barcelona: Grupo GIRAS – UPC Research Group

[19] Alexandra R. Vieira. *Network buildings: new centralities*. PhD in Architecture. University of Lisbon, Lisbon School of Architecture, 2018

[20] Jorge T. Ribeiro. *Formulação de Índices Quantitativos com base na Discriminação Baricêntrica*. PhD Thesis on Engineering Sciences, UTL/IST, Lisboa, 1999

Jorge T. Ribeiro. *Contributos da Análise Estatística Multivariada para o Tratamento de Dados do Edifício, da Cidade e do Território*. Lição de Síntese de Provas de Agregação em Arquitetura, especialização em Tecnologia e Gestão da Construção. FA-ULisboa – Faculdade de Arquitetura da Universidade de Lisboa, Lisboa, 2018

BIBLIOGRAPHY

Baptista, Júlio Londrim. *Vernacular Technology vs. Global Technology: Creation of a Project Methodology for Developing Countries*. PhD in Architecture. University of Lisbon, Lisbon School of Architecture, 2015.

Baptista, Júlio Londrim; Ribeiro, Jorge T.; Costa, Fernando. Testing an operative tool for building design, supported by a CIM (Construction Information Map) in the Cape Verde archipelago. *19th International Conference Architectonics Network – Mind, Land, Society; The new sense of place after the bio-revolution: education, profession and social interaction* (2021): 215-225. Barcelona: Grupo GIRAS – UPC Research Group

Barnett, Heather; Berry, Jo; Brouwer-Zupancic, Natasa; Cohen, Nathan; Columbano, Alessandro; Brinck, Jaana; Durall, Eva; Fischer, Robert; Greulich, Henriette; Holme, Adrian; Hurley, Mairead; Leinonen, Teemu; Lordick, Daniel; Nack, Frank; Naudin, Annette; Newman, Andrew; Nickolaus, Lisa; Nusselder, André; Sandberg, Jacobijn; O'Shea, Jean; Ussher, Shaun. *STEAM Approaches Handbook*, Birmingham City University, 2021

Barreira, Carolina. *Re(h)abilitate for shelter – Intergenerational Housing in the rehabilitation of the former Convento da Boa Hora*. MSc Thesis in Architecture. University of Lisboa, Lisbon School of Architecture, 2021.

Edwards, Linda C. *The creative arts: A process approach for teachers and children*. 5th Edition. Upper Saddle River, NJ:Merril Publishing. 2010

Fernandes, Matilde. *Revitalize The Military Barracks - Temporary residences for emergency housing in Quartel dos Lanceiros 2*. MSc Thesis in Architecture. University of Lisboa, Lisbon School of Architecture (publication forthcoming)

Franken, Robert E. *Human Motivation*. 3rd Edition. Brooks/Cole Publishing Company, 1994.

Guyotte, Kelly W.; Sochacka, Nicola W.; Costantino, Tracie E.; Kellam, Nadia N.; Walther, Joachim. Collaborative creativity in steam: Narratives of art education students' experiences in transdisciplinary spaces. *Int. J. Educ. Arts* (2015)

Hennessey, Beth A.; Amabile, Teresa M. Creativity. *Annual Review of Psychology*, 61:1 (2010): 569-598. doi:10.1146/annurev.psych.093008.100416

Horta, Hugo. Consultant Report, Securing Australia's Future, STEM: Country Comparison - STEM education in Portugal: Education, policies and labor market, ACOLA, 2013

Javier Perales, Francisco; Aróstegui, José Luis. The STEAM approach: Implementation and educational, social and economic consequences, *Arts Education Policy Review*, (2021), DOI: 10.1080/10632913.2021.1974997

Kim, Bang-Hee; Kim, Jinsoo. Development and validation of evaluation indicators for teaching competency in STEAM education in Korea. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(7), (2016): 1909–1924. https://doi.org/10.12973/eurasia.2016.1537a

KOFAC. Concept and Definition of STEAM; The Korea Foundation for the Advancement of Science and Creativity—KOFAC: Seoul, Korea, 2017, accessed June 5, 2022, https://steam.kofac.re.kr/?page_id=11269

LaJevic, Lisa. Arts integration: What is really happening in the elementary classroom? *Journal of learning through Arts*, 9:1 (2013):1-28

Land, Michelle H. Full STEAM Ahead: The Benefits of Integrating the Arts Into STEM. *Procedia Computer Science*, 20 (2013): 547-552. doi: 10.1016/j.procs.2013.09.317

Li, Jie; Luo, Heng; Zhao, Leilei; Zhu, Min; Ma, Lin; Liao, Xiaofang. Promoting STEAM Education in Primary School through Cooperative Teaching: A Design-Based Research Study. *Sustainability* 14, 10333 (2022). https://doi.org/10.3390/su141610333

Marr, Andrew. *História do Mundo* (vol. VI). Texto Editores, 2014.

Peppler, Kylie A.; Wohlwend, Karen. Theorizing the nexus of STEAM practice. *Arts Education Policy Review*, 119(2) (2018): 88–99. https://doi.org/10.1080/10632913.2017.1316331

Ribeiro, Jorge T. *Formulação de Índices Quantitativos com base na Discriminação Baricêntrica*. PhD Thesis on Engineering Sciences, UTL/IST, Lisboa, 1999.

Ribeiro, Jorge T. *Contributos da Análise Estatística Multivariada para o Tratamento de Dados do Edifício, da Cidade e do Território*. Lição de Síntese de Provas de Agregação em Arquitetura, especialização em Tecnologia e Gestão da Construção. FA-ULisboa – Faculdade de Arquitetura da Universidade de Lisboa, Lisboa, 2018.

Vieira, Alexandra R. *Network buildings: new centralities*. PhD in Architecture. University of Lisbon, Lisbon School of Architecture, 2018.

Zhang, Yi; Zhao, Yiaping P.; He, Ling; Bai, Qingyu Y. Interdisciplinary Teaching Design and Practice Based on STEM. *Mod. Distance Educ. Res.* 1 (2017): 75–84

THE USE OF ICT IN MATHEMATICS HIGHER EDUCATION TEACHING AND LEARNING

Author:
SUSANA ROSADO, JORGE RIBEIRO

Affiliation:
UNIVERSITY OF LISBON, LISBON SCHOOL OF ARCHITECTURE, PORTUGAL. UNIVERSITY OF LISBON, LISBON SCHOOL OF ARCHITECTURE AND CERENA, PORTUGAL

INTRODUCTION

Pedagogy in mathematics teaching in artistic courses, such as architecture, should raise awareness of the need for mathematical concepts to solve concrete problems of architecture/urbanism/creation in general. The architectural examples that show the application of mathematical concepts and illustrate the topics to be taught must be present in the teaching of this subject. In addition to allowing the development of a critical and methodical spirit in approaching problems, it instills rationality and dexterity in their resolution.

These skills, which are developed by the systematic study that mathematics demands, give students the ability, in their daily lives, to be more prepared to make decisions easily, with systematic thinking in both the professional and personal fields.

The use of interactive games to attract and test students' knowledge throughout the learning process has been widely used in class, as well as the visualization of works and examples in which the Mathematical concepts are used both in everyday life and in the human being's relationship with the surrounding space. This study shows the acknowledgment, by students, of these capacities that learning mathematics develops and also of the satisfaction level due to the Information and Communication Technologies (ICT) tools use. First it is emphasized the importance of Mathematics and its relevance in Architecture, secondly the inquiry implemented is presented and thirdly the results are shown and discussed.

The importance of Mathematics

Since the beginning of Humanity, the human being has sought to understand the "universe" and the "space" he inhabits, using multidisciplinary points of view.

Rossi[1], referring to Antiquity, wrote about the relationship between Architecture and Mathematics in Ancient Egypt – where, among many exciting subjects, "the power of the triangle" stands out.

In Classical Antiquity, the mathematics of Socrates (mentor of Plato, founder of the Athens Academy, and who had Aristotle as a pupil) was only introduced into academic training at around 16 years old. By this age, the intellectual maturity allowed to understand the concepts and develop the critical spirit necessary to know how to apply and investigate them. The pupils ended up continuing the work of the master and making fundamental contributions to the mathematics studied today. The development of thought in areas such as philosophy and poetry, complemented with mathematical knowledge,

catapulted Greek civilization, making it a reference for thinkers that continues to this day as a model of knowledge.

Mathematics was also responsible for the significant scientific advances in various areas of knowledge (Physics, Chemistry, Astronomy, Engineering, etc.) during the Renaissance and Illuminism periods and which came to be reflected in the exponential technological development that has been witnessed since the second half of the 20th century.

The essential of studying Mathematics is to develop a critical and methodical spirit in the problem's approach and to implement rationality and dexterity in its resolution. And even if students will rarely use directly the learned calculus in their lives, it has an inexorable role in their scientific growth, training, and skills acquisition.

These skills provide the ability to, in everyday life, have more significant preparation to face and analyze problems, enabling decision-making that requires systematic thoughts both in the professional and personal fields.

Mathematics can thus be considered a fundamental tool to understand the "space" in which we live in.

Mathematics in Architecture

The first influence of mathematics on architecture was perhaps that of Pythagoras. For this Greek philosopher and mathematician, and for the Pythagoreans, "number" had a religious meaning. The Pythagorean belief that "all things are numbers" clearly had great significance for architecture; geometry and proportions were the study of "shapes" and "shapes" were determined by numbers.

In ancient times, Architecture was considered a topic of Mathematics, and these disciplines have maintained a close relationship until contemporary times. Perhaps it's when Mathematics is understood essentially as a "patterns" study that the link to architecture becomes clearer.

According to Sorguç[2] mathematics in architecture must be a "course" that makes explicit the relationship between these two domains, where the role of mathematics stands out in this new era of informatics and the so-called "algorithmic thinking" that is, by some, questioned in the architectural design.

Starting with the basics, the concepts of "sets" and "(relationships between) functions" are used throughout the course in order to support the discussion of issues related to shape/geometry and structural/material stability.

To illustrate the relationship between these subjects, examples are chosen from among the most popular architectural works (Figure 1). For example the impressive Greek and Roman columns, the Pantheon of Rome with the imposing dome, and the Coliseum with its curved shape. Also, the Calatrava bridges and railway stations with hyperbolas and, finally, the ancient Japanese art of paper folding – origami – which is also used to study geometry/shapes/structural stability and the relationship between two-dimensional and three-dimensional spaces.
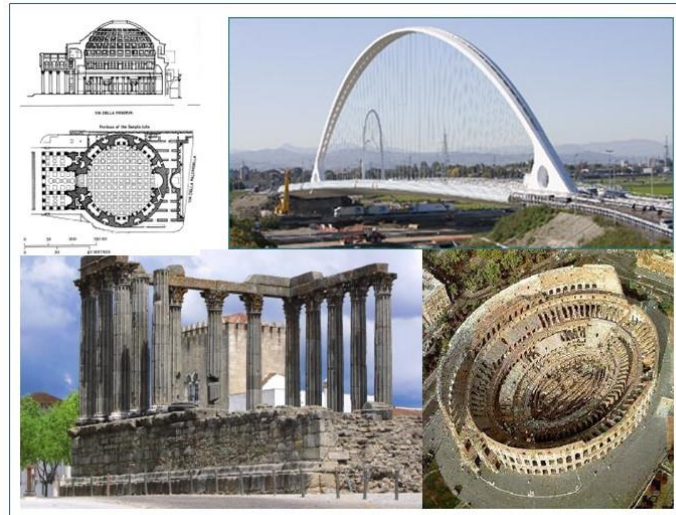
Figure 1. Pantheon, Rome, Italy; Calatrava Bridge, Reggio Emilia, Italy; Diana's Temple, Évora, Portugal; Coliseum, Rome, Italy.

Another interesting example given by Sorguç[2] concerns the book "Gulliver's Travels" by Swift[3] where initially students only emphasize aspects of the story itself, but after some assimilated concepts, the dominant feature of the book becomes related to "scales" – isometries and similarities.

These examples illustrate and "demonstrate" how simple and fundamental mathematics is in the art of creating.
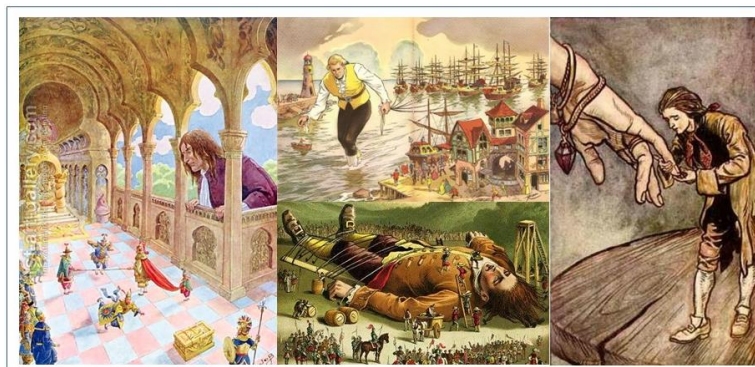
Figure 2. Gulliver's Travels by Jonathan Swift.

Tyng[4] also has a very interesting point of view, as he argues that geometry is not only a metaphor for thought and the creative process. It is also a spatial demonstration of how the mind generates associations through the combination of patterns and change. "If you have a big building, you have to have things within things within things within things… (...) And the room shapes, they all have to have acute or obtuse angles? You need to think in terms of the form as an asset to your solution – how you can fit things within things…"

More recently, geometric and topological optimization[5] works were developed using operational research techniques and methods.

It is necessary for students to discover that mathematical tools are particularly suitable for describing shapes found in architecture and art. They should be encouraged to "read" the shapes mathematically and learn the fundamental theory to this goal. It is obvious that they will understand, by themselves,

that mathematics, with its rules, is not in opposition to their thoughts but, on the contrary, provides them with real and effective support to become more creative and innovative.

The noblest aspect of the mathematics contribution to education through art (STEAM – Science, Technology, Engineering, Arts, and Mathematics – education approach) is in the well-organized habits of thought, of problem-solving approach through the desire to reach an elegant rational solution to a problem and this stylishness can be precisely the link between mathematics and architecture.

Architect Siza Vieira corroborates this idea, stating in an interview[6] that "What I feel was left from this learning of mathematics (from the Architecture course) were habits of reasoning, of clarity of ideas. (...) When I'm designing a project (...) I'm very fascinated by the relationship between the numbers of measurements, and I find order from there: for example, when having to decide the size of a room, I choose one multiple of the largest measure." Some of Siza Vieira's work is shown in Figure 3.

Figure 3. Portugal Pavillion, Parque das Nações, Portugal; Art Museum, Porto Alegre, Brasil; Curvilinear building located over a lake of 100 thousand m² in the city Jiangsu, China.

In order to be able to create in full harmony with the laws that rule the universe, students of architecture and arts must use the knowledge of mathematics as a tool to see and interpret the world.

Quoting PISA report[7], from 2016 – "More than ever, students need to engage with mathematical concepts, think quantitatively and analytically, and communicate using mathematics."

Introducing ICT (preferably as gaming and attractive tasks) allows students to understand Mathematics more as a tool to develop reasoning and skills to better perform design studio activities.

The term ICT is described as the information dissemination, storage, and management of various sets of technical tools and resources that are accepted and for information and communication technologies. ICT has become one of the primary building blocks of our modern society.[8]

There is a positive relationship within students' learning and the use of ICT.[9] Both NCTM (The National Council of Teachers of Mathematics) and BECTA (British Educational Communications and Technology Agency) focused on the technology as enabling, as well as encouraging the learner to focus on reflection, verification, decisions making and problem-solving.[10]

Moreover, globalization and technological change have created a new global economy driven by technology, data-driven, and knowledge-driven.[11] It has been proposed that the development of ICT has become a vital issue to meet the needs of the education system.[12] ICT is a tool that supports the learning process and holds the promise of new solutions to all the challenges that education is facing.[13]

ABOUT THE TEACHING AND LEARNING MATHEMATICS OF ARCHITECTURE STUDENTS

The universe of BSc Architecture students at Lisbon School of Architecture is very diverse concerning their mathematical knowledge background. This turns out to be a determining factor in how to teach mathematics to these students. In Portugal, as in some countries, Mathematics is subjugated to a secondary role in the curriculum of Architecture teaching. However, Portuguese teachers try to improve its attractivity and change it to a primary role by introducing different types of ICT.[14]

Mathematics is an essential tool to interpret the world and provide methodical and systematic reasoning in developing skills for future architects.
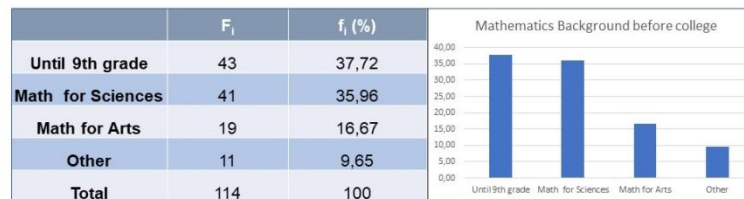
Figure 4. Mathematics background in BSc students of Architecture, in Lisbon School of Architecture.

Figure 4 shows the majority of our students are evenly distributed in the two extremes of Mathematics background knowledge: 37.72% had Mathematics the last time three years before going to college, and 35.96% had Mathematics until going to college, and the most abstract and theoretical one.

To better understand the impact of ICT used for teaching and learning mathematics in the Architecture BSc, we carried out an inquiry of our students.

The inquiry

The inquiry was anonymous and optional, done at the end of the semester and after the final assessment. It consisted of an evaluation by the students about: the contents of the mathematical course; the examples of architecture related to the topics taught; the slides shown in class with the theoretical explanation and the examples; the interactive games done in class concerning the contents taught; the interactive games done in class in terms of relevance to their learning (realizing their difficulties); the interactive games done in class in terms of usefulness to better understand the concepts; the contribution of this subject to the development of the abstract reasoning; the contribution of this subject to solving problems that have arisen in other subjects and the contribution of this discipline in daily life.

About the architecture examples shown in class, some were about the triangles in their different applications in architecture to introduce trigonometry (Louvre, Taj Mahal, Milan Cathedral, and Maia Temple Kukulcán) and functions (Sydney Opera House, Golden Gate Bridge, and USA Capitolio) - Figure 5.
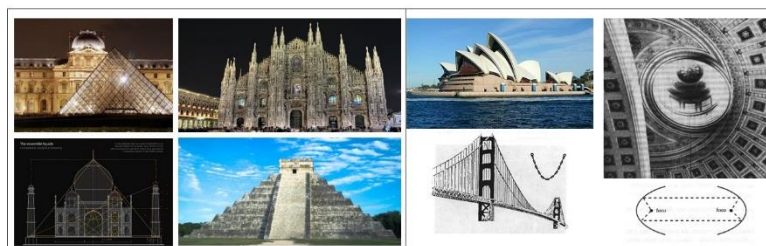

Figure 5. Examples of Architecture for trigonometry and functions.

The interactive game made in class was *Kahoot* (a free game-based learning platform with multiple choice answers using mobile phone and the internet) and it allows for making short questions about the various subjects taught, and the students can realize their difficulties.

The game is very user-friendly (Figure 6). In each question, after everyone answers, the teacher discusses the right answer with the students and analyses the reasons for the wrong answers.
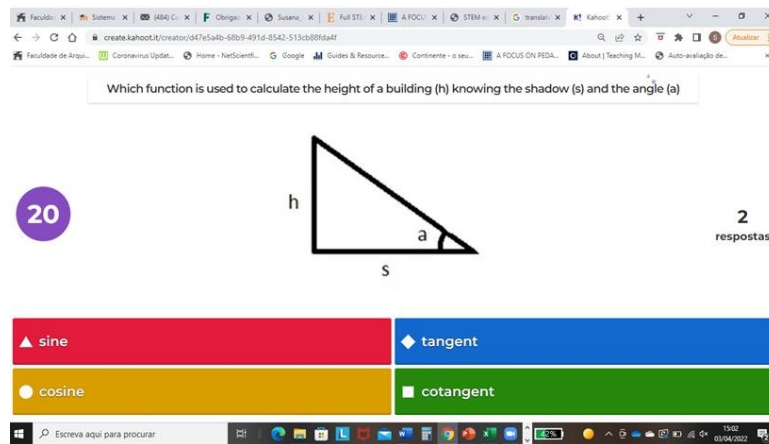

Figure 6. Example of a Kahoot made in class.

RESULTS

There were 114 students answering the inquiry, all attending the BSc in Architecture and represents about 50% of all the 1st year students at Lisbon School of Architecture.

The ICT used were evaluated in its different components. As the lectures on Mathematics are concerned, the evaluation was about the examples of architecture, the slides to support the theory, and the interactive games about the different subjects taught.
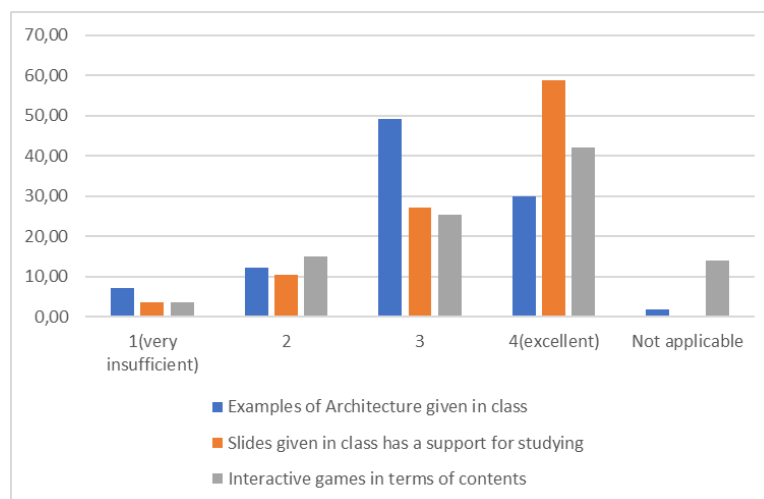

Figure 7. Evaluation concerning Math lectures

Analyzing Figure 7 the slides given in class and the interactive games were mostly excellent whereas the examples of Architecture given in class were mostly very sufficient. In the end, about 80% of the students considered there were good examples of Architecture given in class (49.12% scored very sufficient and 29.82% scored excellent). Less than 15% considered sufficient and very insufficient the

examples and the slides showed in class. Around 20% of the students scored the interactive games very insufficient and sufficient.

Specifically, about the interactive games, the majority of the students considered it more than just relevant (Figure 8) which means that we should continue doing this but possibly improve the questions – 63% considered it more than relevant to assess difficulties (35.09% scored relevant and 28.07% very relevant), and about 61% more than relevant in terms of being useful to better understand the subjects lectured (32.46% scored relevant and 28.07% scored very relevant). Less than 10% of the students consider both components not relevant to evaluate mathematics knowledge with interactive games during class.
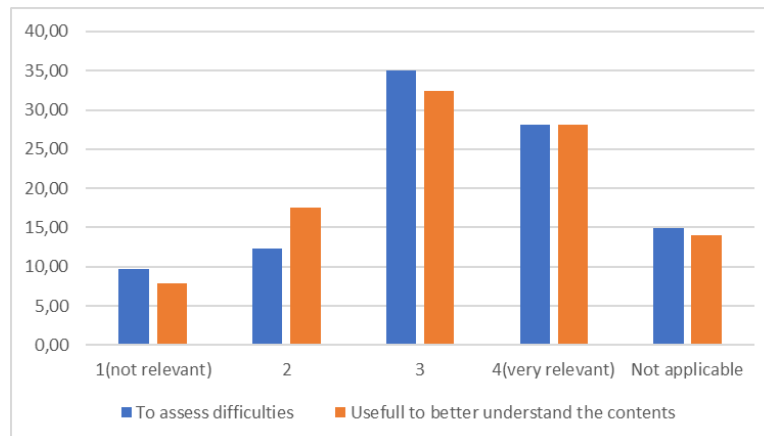

Figure 8. Evaluation concerning the interactive games made during class

The games made during class were better to assess difficulties than to understand the contents taught. This is easily explained since the questions were about applications of the concepts and not about the theory itself.

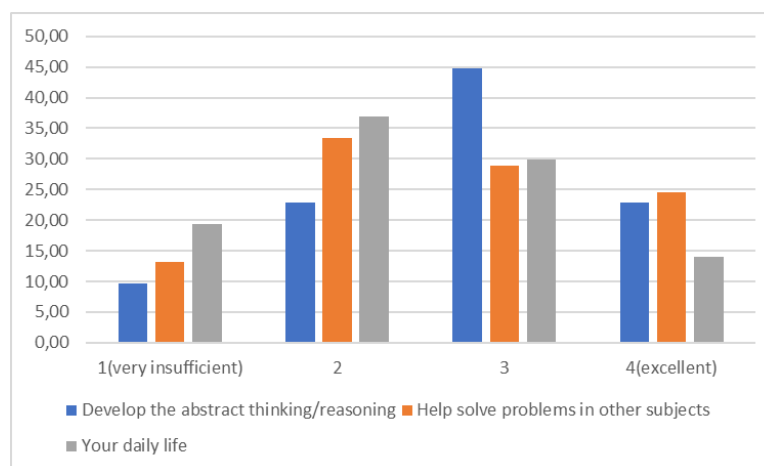The contributions of Mathematics lectures and contents taught were evaluated in the last questions of the inquiry.

Figure 9. Contributions of Mathematics lectures in Architecture BSc

It is very interesting to see that about 45% of the students consider that Math helped develop abstract thinking and reasoning in a very sufficient way and more than 20% scored this help as excellent. Around 54% consider that it helps solve problems in other course subjects (28.95% scored very sufficient and 24.56% scored excellent) and about 44% (29.82% scored very sufficient and 14.04% scored excellent)

feel that Mathematics taught in class helps in daily life (Figure 9). Less than 15% of the students considered very insufficient the development of the abstract thinking/reasoning and the help to solve problems in other subjects. Concerning daily life, the contribution of mathematics lectures was scored very insufficient by less than 20% of the students in Architecture BSc (Figure 9).

Competence in the use of ICT is considered critically important in today´s world and is assigned a fundamental rule in all theoretical frameworks of 21st century skills.[15]

ICT tools allow for innovative ways of teaching and have the potential to enrich learning activities.[16]

CONCLUSION

Students realize the importance of Mathematics for developing a critical and methodical spirit in the approach to problems and implementing rationality and dexterity in its resolution. It's very important to emphasize that the majority of students inquired agree that Mathematics develops abstract thinking and reasoning. This is a major milestone in terms of the importance of mathematics in artistic areas such as Architecture.

These skills, which are developed by the methodical study that mathematics demands, give students the ability, in their daily lives, to be prepared to more easily make decisions that require systematic thinking in both the professional and personal fields.

Also, the architectural examples that show the application of mathematical concepts and illustrate the topics to be taught must be present in the teaching of this subject, as we have seen from the results of the inquiry.

We are able to conclude that ICT is very useful in teaching and learning Mathematics in higher education as it helps to understand the application of the concepts in a more easy way and adapted to the generations of today.

NOTES

[1] Corinna Rossi. *Architecture and Mathematics in Ancient Egypt*. University Press, Cambridge, 2003

[2] Arzu Gönenç Sorguç. Teaching Mathematics in Architecture. *Nexus Network Journal* 7 (1) (2005): 119-124

[3] Jonathan Swift. *As viagens de Gulliver*. Virtual Books, 2000

[4] Anne Tyng. Number is Form and Form is Number. *Nexus Network Journal* 7 (1) (2005): 127-138

[5] Panos Y. Papalambros, Douglass G. Wilde. *Principles of optimal design, modeling and computation*. University Press, Cambridge, 1988

Jeremy J. Michalek, Ruchi Choudhary, Panos Y. Papalambros. Architectural layout design optimization. *Eng. Opt.* 34 (5) (2002): 461-484

[6] Luís Reis. A Matemática e a Arquitectura - Entrevista a Álvaro Siza. *Educação e Matemática*, Jan/Fev, 66 (2002)

[7] OECD. Equations and Inequalities: Making Mathematics Accessible for All, PISA, OECD Publishing, Paris, accessed June, 2016, http://dx.doi.org/10.1787/9789264258495-en

[8] Kaushik Das. Role of ICT for Better Mathematics Teaching. *Shanlax International Journal of Education* 7(4) (2019): 19-28

[9] Colin Harrison et al. *ImpaCT2: the impact of information and communication technologies on pupil learning and attainment*. Becta, Coventry, 2002

[10] BECTA. *What the research says about using ICT in Math,* 2003

NCTM. *Principles and Standards for School Mathematics*, 2000.

[11] Victoria L. Tinio. *ICT in Education*, UNDP Bureau for Development Policy, New York, 2009

[12] Gertrude Mariam Chao. Impact of Teacher Training on Information Communication Technology Integration in Public Secondary Schools in Mombasa County. *Human Resource Management Research* 5 (4) (2015): 77-94

[13] Christian Ajim Oduma, Chika Madu Ile. ICT Education for Teachers and ICT Supported Instruction: Problems and Prospects in the Nigerian Education System. *African Research Review* 8 (2) (2014):199-216

[14] Aishah Siddiquah, Zeema Salim. The ICT Facilities, Skills, Usage, and the Problems Faced by the Students of Higher Education. *Eurasia Journal of Mathematics, Science and Technology Education* 13 (8) (2017): 4987-4994

[15] David Camargo Pongutá. Using Information Communication Technologies to Foster The Communicative Competence in Undergraduate Students at the UPTC. *Cuadernos de Lingüística Hispánica* 31 (2018): 117–135. https://doi.org/10.19053/0121053X.n31.2018.7745

[16] Gisela Pilliza Luguaña, Luz Parra Iñacasha. Uso de las tecnologías de la información y la comunicación (tic) su impacto en el rendimiento académico de los estudiantes en tiempos de covid-19. *Kronos – The Language Teaching Journal* 3(1) (2022): 81–94. https://doi.org/10.29166/kronos.v3i1.3572

BIBLIOGRAPHY

BECTA . *What the research says about using ICT in Math,* 2003

Camargo Pongutá, David. Using Information Communication Technologies to Foster The Communicative Competence in Undergraduate Students at the UPTC. *Cuadernos de Lingüística Hispánica* 31 (2018): 117–135. https://doi.org/10.19053/0121053X.n31.2018.7745

Chao, Gertrude Mariam. Impact of Teacher Training on Information Communication Technology Integration in Public Secondary Schools in Mombasa County. *Human Resource Management Research* 5 (4) (2015): 77-94

Das, Kaushik. Role of ICT for Better Mathematics Teaching. *Shanlax International Journal of Education* 7(4) (2019): 19-28

Dhakal, Prem Kumari. Use of ICT Tools in Teaching Mathematics in Higher Education: A Case of Mid-Western University. *International Journal of Multidisciplinary Perspectives in Higher Education* 3 (1) (2018) https://www.ojed.org/jimphe

Harrison, Colin, et al. *ImpaCT2: the impact of information and communication technologies on pupil learning and attainment*. Becta, Coventry, 2002

Michalek, Jeremy J.; Choudhary, Ruchi; Papalambros, Panos Y. Architectural layout design optimization. *Eng. Opt.* 34 (5) (2002): 461-484

NCTM. *Principles and Standards for School Mathematics*, 2000.

Oduma, Christian Ajim; Ile, Chika Madu. ICT Education for Teachers and ICT Supported Instruction: Problems and Prospects in the Nigerian Education System. *African Research Review* 8 (2) (2014):199-216

OECD. Equations and Inequalities: Making Mathematics Accessible for All, PISA, OECD Publishing, Paris, accessed June, 2016, http://dx.doi.org/10.1787/9789264258495-en

Papalambros, Panos Y.; Wilde, Douglass G. *Principles of optimal design, modeling and computation*. University Press, Cambridge, 1988

Pilliza Luguaña, Gisela; Parra Iñacasha, Luz. Uso de las tecnologías de la información y la comunicación (tic) su impacto en el rendimiento académico de los estudiantes en tiempos de covid-19. *Kronos – The Language Teaching Journal* 3(1) (2022): 81–94. https://doi.org/10.29166/kronos.v3i1.3572

Reis, Luís. A Matemática e a Arquitectura - Entrevista a Álvaro Siza. *Educação e Matemática*, Jan/Fev, 66 (2002)

Rossi, Corinna. *Architecture and Mathematics in Ancient Egypt*. University Press, Cambridge, 2003

Sorguç, Arzu Gönenç. Teaching Mathematics in Architecture. *Nexus Network Journal* 7 (1) (2005): 119-124

Swift, Jonathan. *As viagens de Gulliver*. Virtual Books, 2000

Siddiquah, Aishah; Salim, Zeema. The ICT Facilities, Skills, Usage, and the Problems Faced by the Students of Higher Education. *Eurasia Journal of Mathematics, Science and Technology Education* 13 (8) (2017): 4987-4994. https://doi.org/10.12973/eurasia.2017.00977a

Tinio, Victoria L. *ICT in Education*, UNDP Bureau for Development Policy, New York, 2009

Tyng, Anne. Number is Form and Form is Number. *Nexus Network Journal* 7 (1) (2005): 127-138

A SENTIMENTAL STUDIO AND THE POWER OF MAKING: A DISTANCE LEARNING WORKSHOP ON REPRESENTATIONS

Author:
ANTHI KOSMA

Affiliation:
SCHOOL OF ARCHITECTURE, UNIVERSITY OF THESSALY, GREECE

INTRODUCTION

This article presents the experience and pedagogical approach of a hands-on theoretical and practical workshop on representations, and how the former has transformed after two semesters of distance learning (spring semester of academic years 2019-20 and 2020-21) due to covid-19. The hypothesis is that the power of making and the sentimental approach are also transmitted in the virtual environment of distance learning and that, thanks to them, creative pedagogical approaches and affective knowledge can be produced and flourish. The elective course "Special topics on representations", offered at the School of Architecture, University of Thessaly (Greece), has served as case study. "Special topics on representations" was called "sentimental (online) studio" because senses and feeling were cultivated and worked as a medium to understand aesthetic theories and as a 'glow' and 'electric waves' to connect participants even in unexpected distances as those that circumstances of covid-19 produced.

PEDAGOGICAL PRINCIPLES
A practice-based learning theoretical course

"Special topics on representations" is a theoretical course built on practice-based learning. Sessions investigate and present some important principles and tendencies on contemporary visual representations such as: anti-ocularcentric culture, senses, drawing as action and not a mere object, traces as a tool to explore and imagine new worlds and forms. Theoretical approaches on images and their birth are experimented empirically mainly through the actions of drawing and writing.[1] Reproducing the process of the emergence of images, first with their traces and then with their writings, participants have the opportunity to reflect on the occurrence. Through their own gestures and traces, whether they are sketches or texts, people have the opportunity to assist and observe the phenomenon of the appearance of the image, draw their conclusions, comprehend theoretical texts and interpret artworks based on their experiences.

By putting themselves in the place of the author, observing form the process point of view the birth of the image, participants are introduced to theories of images by practicing the art of interpretation. According to Dewey, in 'Art as experience', artwork can be understood by going back to the experience of their creation.[2] Placed 'here and now', from 'inside', through 'making', according to their criteria, senses, idiosyncrasy and experience, participants assist at the phenomenon of the birth of the image. Using the word 'experience' in Dewey's sense and observing things as they appeared participants are

introduced in the 'embodied situated perception' and 'lived moment' of the phenomenological tradition in visual arts.

Learning through an empirical way engages participants converting them from passive to emancipate spectators. This transformation, what Rancière considers as the radical transformation at the look of the spectator engages participants, familiarized them with artworks and how to understand themselves and Others through their traces. As Rancière puts it "*The effect of the idiom [exhibited manifestations] cannot be anticipated. It requires spectators who play the role of active interpreters who develop their own translation in order to appropriate the 'story' and make it their own story. An emancipated community is a community of narrators and translators*".[3] By "reducing the irreducible distance" between actors and spectators but also between experts and non-experts, theory and practice, artistic disciplines and art, experiential knowledge manages to form in workshop and foment a community of emancipated spectators.

Drawing-form images- and writing -reflect on action- was the double action that structured sessions, workflow and understanding. In this practice-based sentimental learning practice reflections on the appearance of the images and specifically those of drawing was a key issue. Drawing was presented as a writing practice, a universal kind of writing, non-significant, picturesque way of thinking. A practice related with the configurational process, the appearance of traces and sings. Drawing as a language, an embodied language, a gesture, an "exscription [excription]".[4] In this case individual process of tracing -drawing and writing- and collective (that of the group) interpretation of art-work was an introduction to reflection as a state of getting consciousness, observe oneself and its actions, consider and rethink workflows drawing for each one new territories of learning.

The sentimental parameter

In this pedagogical environment-community-, based on equality and practice, the power of making was used to access aesthetical issues and theories around image. Sentimental studio practically used empirical approximation on poetical process, acceptance of feelings as undeniable receptors and the artistic appearance as sensible, embodied interpretation. Senses mediate in order to interpret and approach aesthetic theories.[5] Senses were the base; they worked as a filter which mediates in order to undergo artwork, theories and oneself. It was the experience participants had to trace and verbalize. Empirical base facilitates the link between theories of aesthetics and senses (aesthesis -ancient Greek) restore what since its begging linked body-senses with art and beauty. Senses was used both as feelings and giving meaning.[6]

Knowledge and learning that derived from the sensory faculties, were constantly renovated as images were produced and affection was facilitated by the power of making. The sensible factor in higher education integrate experience in theoretical issues managed to bring, link and enrich knowledge with general culture and personal temperament, character and preferences.[7] Focusing on relations and on a sentimental approximation of the poetical process, and also on affective and personal approximations, interpretations enrich this process by openings in a subjective and relational approximation with oneself, others, the environment and, of course, art. Thanks to focus on sentimental approach, senses and sensory knowledge pedagogical principles of the course managed to be transferred in distant learning.
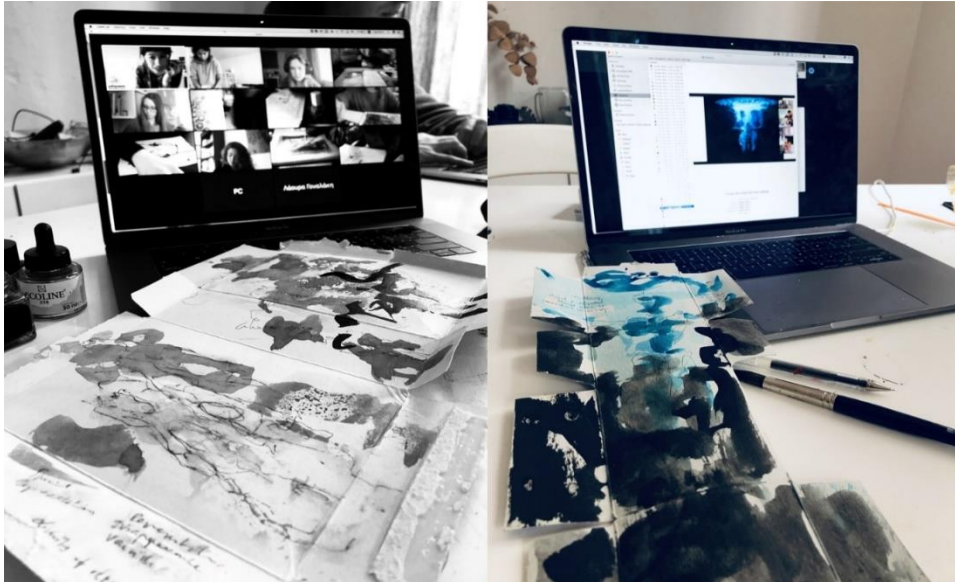
Figure 1. Sentimental studio, spring 2020.

FROM PHYSICAL TO ONLINE, THE GLOW

The aim of the workshop was to create an environment of unconditional acceptance, equality, and nonhierarchical structures. An ambience where freedom of expression, force of self-esteem and hidden creativity, cultivate imagination, curiosity, mixed media techniques and the desire to learn. In digital 'classroom' it was necessary to keep these aims and participants could feel safe to develop their skills, abilities and dreams in unexplored and new territories to them.

The structure

Course, practically, was organized between action and interpretation, drawing and writing, pictures and texts, practice and reflections on it. Every session, after an introduction-presentation on a specific issue-question, consisted of two parts. First interpretation through drawing and sketches and then interpretation with comments on produced images and with short texts (200 words) with reflections on the experience of the birth of the images. Although participants could use analogic or digital tracing, 'handwriting' was preferred because of its immediacy and capacity to produce many images. All works were later, after each session, published by participants in a blog or webpage of their preference and which was created on purpose for "sentimental workshop". This exhibition part facilitated a spirit of sharing between members, getting knowing each other through their traces and, importantly, introduced them in a workflow -organize produced material, elaborate images, edit texts- and form a short but significant digital portfolio. Being seeing through the images of their trace's subjects were establish their relationship with representations with an implicit way.[8]
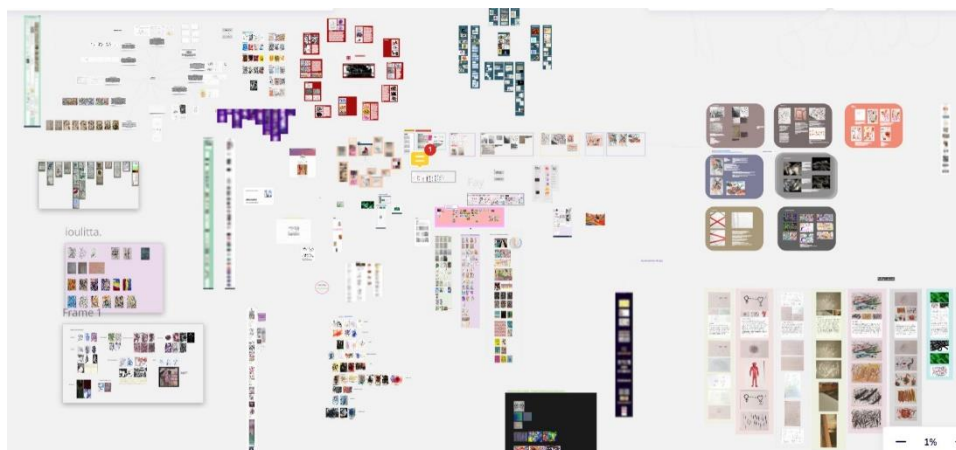
Figure 2. Miro-online whiteboard tool

The "classroom"

Moving from presential to "distance classroom" occurred during spring semester of academic year of 2019-20. After 4 presential sessions the rest of the course was held in distance and, during the spring of 2021, all session were online. The intention was to transport the sense of the community and the principles of the course: creativity, equality and poetry in remote learning. In new environment the main preoccupation was to reestablish practice-based learning besides the lack of physical contact. The purpose was to maintain the empirical part as a way to form sessions full of stimulus with as much [inter]action as possible. Gestural movements were used to transmit sensible knowledge and draw attention apart from pandemic difficulties. Action of live writing and drawing with hands projected in screens was in a sense a live performance. In fact, the protagonists, placed in equal windows in screen was forming a mosaic of 'hand-dances'. The course was, in a way, a live video-based learning and even a learning experience facilitated by multiple videos of tracing actions at the same time.
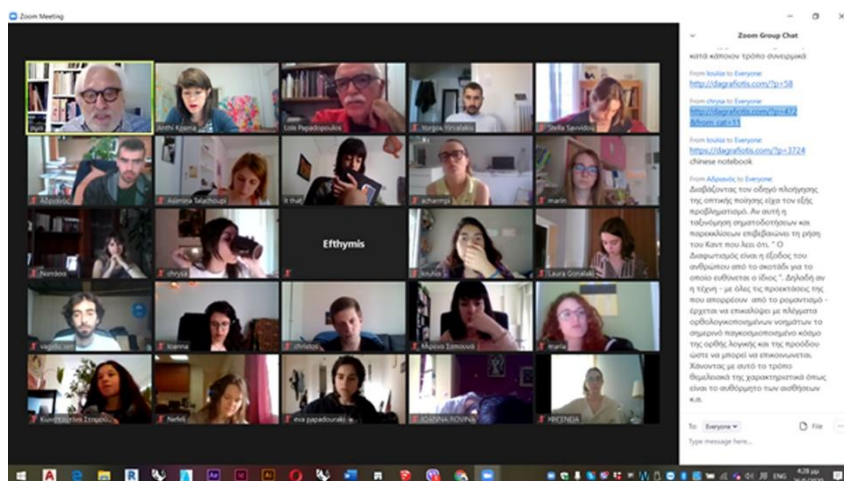

Figure 3. Lecture -Special session with the artist Demosthenis Agrafiotis

Trying to avoid the conversion of the course into a theoretical lesson between active and passive agents the platforms that were used were elected or applied in order to enforce communication and interchange between members. Through 'e-class', university's open-source platform to store and share pedagogical material, 'zoom-platform' for live-classes, blogs that each participant has created and 'miro-online whiteboard tool', to store and share participants artworks and texts physical classroom was expanded in web. [9] These platforms and mediums were chosen among others because in them simultaneous and

easy access (videos or posting) was facilitated. Personal involvement through making, their shift from ordinary spectators to emancipated participants, as they produce and interpret their own images, the ability to understand their work and that of others were, surprisingly, reinforced through distance learning as everyone is working from home [i.e., small workshop and safe personal sphere], and was at the same time able to participate in the collective community online.
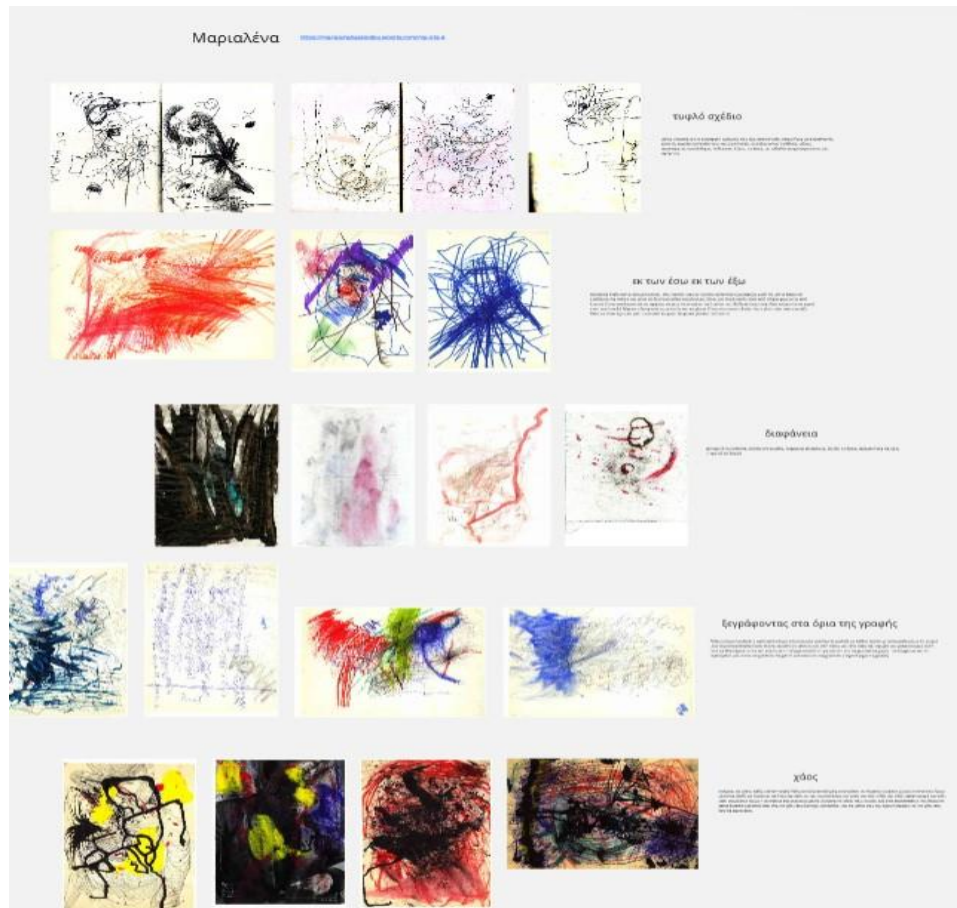

Figure 4. Fragment of miro board. Works of Marialena Chasekidou.

The course was structured in 10 characteristic modules-aspects of representations. All units were different, were related with important literature on images and were searching to estrange and stimulate:

1. Blind drawing: Based on the text of Jacque Derrida "Memoirs of the blind" introduction in anti-ocularcentric culture. [10]

2. At the limits of writing: Introduction to gestural aesthetic and the connection between pictures and texts, drawing and writing as process and not as mere objects. [11]

3. Inside-Out: How inner experience is a gesture of exteriorization. Traces as signs and movements of an unknown corpus.[12]

4. Diagram as a catastrophe: Deleuze in "*Francis Bacon: The logic of sensation*" uses diagram as catastrophic gesture and key factor in the appearance of new images, images that go against cliches. [13]

5. Water dairies: Based on the artwork of Dong Song 'Writing Diary with Water' (1995) the ephemeral and immaterial aspect of images was commended. [14]

6. A-praxia. Drawing nothing.[15] Introduction to drawing with a purposiveness without purpose[16]. Participants experience a radical session where they find themselves being allowed to felt boring and doing nothing in class. [17]

7. Senses: Concerns around the search of lost time, the scent of time was followed by experiments in images and senses such as taste.[18]

8. Ethnographic drawing: Pictures, drawing and narratives as a way to analyze and imagine futures. Introduction to architectural ethnography.[19]

9. Cartographies: The art of contemporary cartography.[20]

10. Collective mapping: Drawing together in digital platforms brought the possibility of a drawing without author.[21] Creating and co-writing in a diverse collective "literature" space. [22]

Non representations

Although 'sentimental studio' is a course of representation theories of non-representations, meaning a focus on cognate terms such as performance, embodiment, and performativity, were used to indicate that the workshop is based on the appearance of the images as an experience, an action and an estrangement. Images were not presented only as merely objects but also as objects connected with the process of their appearance and interpretation.[23] The main objective was to present some contemporary approaches and definitions in the field of representations and drawing away from classical rules of representation, visual similarities and ocularcentric culture, in general.

By expressing their thoughts/concerns, developing critical thinking skills and making participants explored the use of sketches and texts as vehicles carrying ideas, notions and messages to "read" and "interpret". Drawing in this case was used as a universal kind of writing, as a part of corporal movement, away of styles and the culture of the 'gifted' and 'talented' hand. [24] The aim was to link theory to practice and vice versa in a creative and experiential way. Between drawing (action) and writing the experience (interpretation) thematic modules start from a different "place" each time – texts, installation-experience, sketches, videos, a presentation, discussion, images – through a well prepared, pluralistic approach in order to draw participant's attention and interest, offering motivation, new images, positions and, therefore, insight into the theory and history of architectural representations.

The empirical approach through different approximations each time give the possibility for the development of a transformative learning. Drawings and images were examined through the experience of the designer-drawer. That means that outcomes and interpretations were the result of personal experience, on one´s way of thinking doing, comprehend and being in the world. This personal approach, from the author position situated participants in the process of making and shifted them from "consumers" of images -passive spectators- to authors-creators and emancipative spectators and agents. Comprehend the Others through making, situated in their place, acquire empathy and furthermore form criteria and conclusions based also on own and not imposed judgmental criteria. Based on prior knowledge, experiences and personal way of learning educative process cultivate experience, connection and empathy as filters to understand the appearance of the images.

The sentimental studio, breaking the distance

Absence of physical contact in distance learning, isolation in a personal place (often parents' house) and geographical distances could bring also a sentimental distance. Knowing that a sentimental approach in the "society of burn out", "the society of transparency", of "topology of violence" is a core, necessary and also delicate issue, in general, and artistic education, in concrete. [25] The intention was to form a safe place to experiment, a place which enhances the feeling of community and sharing, where knowledge is made possible through emotion, personal experience, and the power of making.

Working in distance in one's "workshop" and sharing through video his/hers/its "workspace" participants had the opportunity to work with freedom, have access to more mediums, have the possibility to do other things in parallel, be heard by everybody (through open microphones) any time they need. The possibility to work individually form home but at the same time collectively through the

platform, being concentrated and at the same time able to observe others gave an important equilibrium in this online workshop.

Maturana spoke about "autopoiesis" and the strong connection between making and environment and also between environment and love, love and education. Beings are inseparable from their environment and we make ourselves through making.[26] It can be said that making was the connected factor, the transmitter of the energies and therefore of feelings. Whether participants where drawing or writing they were all the time in action. Hands forming images, people commending and writing formed a continuous cinematographic action able to engage this creative community. Acceptance of sentimental approach in interpretations, of senses as sensors and of feelings as mediators to comprehend own artwork and that of others worked as glow to connect and enforce individuals and their community.

Education of equality and radical acceptance

Organize a course on representations beyond styles, preconceived ideas, personal preferences and well-established aesthetic criteria, tendencies and mainstream influences on visual culture mainly circulate through social media, was of high importance. Learn to take distance and confront each image as the product of a process, as an object produced by a specific subject, was a different approximation than the common implication of stylistic criteria to evaluate an image. Approximate and 'judge' images away from personal preferences and stylistic tendencies, accept any kind of expression as a statement of a subject that traces facilitated the creation of an environment of trust, freedom and acceptance. What among participants we called radical acceptance guaranteed the use of workshop as a safe place to express and share.

Jacques Ranciere in the "ignorant schoolmaster", based on the example of the professor Jacotot, introduces his believes about equality in education.[27] The belief and confidence that everyone has his/her own unique/personal way of learning, a way which one understands the world, get conscious and, respectively, develops his skills and interests was used. Francisco Mora, from the field of neuroeducation sustains that "we learn only what we love" mentioning the importance of developing the field between neuroscience and education, between the knowledge of oneself and that of understanding of a science, art, or technique.[28] So, drawing as a personal-free writing and writing as a creative process to self-narrate and observe the appearance of the images was key in learning, learn though senses, learn oneself and others by making.

AS AN EPILOGUE

Unconditional acceptance of personal expression in this educational environment has led to some important observations and understandings. First of all, feelings and sensorial knowledge as agents have a significant role in remote learning by 'reducing' distances and lack of physical contact. create a safe environment emphasized the importance of being together through making are requisites for the development of a workshop also in online education. It was also noticed the (huge) necessity of participants to express themselves graphically, feel that their creations are accepted and judged not as mere external objects but as part of their developing process and individuation. This conclusion has also led to enforce their voice, understand that their opinion and points of view are significant and that pluralism in expression is able to break stereotypes and give access to new meanings. Evaluate the necessity and vital importance to participate in a community (digital in this case) of equality, where you can share problems, considerations, thoughts and above all admiration for the work of others even in periods of isolation and social changes. Finally, establish relationships and network sharing knowledge and traces offers another way to learn and get in contact with the Others and oneself.

NOTES

[1] Martin Seel, *Aesthetics of appearing* (Stanford University Press, 2005), 12.

[2] John Dewey, *Art as experience* (Penguin, 2005), 43.

[3] Jacques Rancière, *The emancipated spectator* (Verso Books, 2009), 22.

[4] Jacques Derrida, *On Touching, Jean-Luc Nancy* (Stanford University Press, 2005), 33.

[5] Jacques Rancière, *Aisthesis: Scenes from the aesthetic regime of art* (Verso Books, 2013), 19.

[6] Jean-Luc Nancy, "Art today" in *Journal of Visual Culture* 9, no. 1 (2010): 91-99.

[7] Monica Kennedy, Stephen Billett, Silvia Gherardi, and Laurie Grealish. "Practice-based learning in higher education: Jostling cultures." In *Practice-based learning in higher education*, 1-13. Springer, Dordrecht, 2015.

[8] Kaja Silverman, *The threshold of the visible world*. (Routledge, 2013), 11.

[9] Miro-online whiteboard course 2021, accessed May 30, 2022, https://miro.com/app/board/o9J_kg2U1NM=/

[10] Jacques Derrida and Musée du Louvre. *Memoirs of the blind: The self-portrait and other ruins* (Chicago: University of Chicago Press, 1993) ; Martin Jay, *Downcast Eyes* (University of California Press, 1993).

[11] Giorgio Agamben, *Infancy and history: the destruction of experience*. (Verso, 1993), 87-88; Tilo Reifenstein, "The sense of the line between drawing and writing." *Tracey* 15, no. 1 (2021): 3.

[12] Jean-Luc Nancy, *Corpus* (Fordham Univ Press, 2008).

[13] Gilles Deleuze and Francis Bacon. *Francis Bacon: The logic of sensation* (U of Minnesota Press, 2003).

[14] Francois Jullien, *La gran imagen no tiene forma o del no-objeto por la pintura: ensayo de des-ontología* (Alpha Decay, 2008).

[15] Jenny Odell, *How to do nothing: Resisting the attention economy* (Melville House, 2020).

[16] Jean-Luc Nancy, *The Pleasure in Drawing*. (Fordham University Press, 2013), 39.

[17] Herman Melville and Karlernst Ziem. *Bartleby the scrivener* (Perfection Learning Corporation, 1980).

[18] Marcel Proust, *In Search of lost time: finding time again* (Penguin UK, 2003); Byung-Chul Han, *The scent of time: A philosophical essay on the art of lingering* (John Wiley & Sons, 2017).

[19] Momoyo Kaijima, Laurent Stalder, and Yu Iseki. *Architectural ethnography* (Toto Publishing, 2018).

[20] Karen O'Rourke. *Walking and mapping: Artists as cartographers.* (MIT press, 2013).

[21] Roland Barthes,. *Writing degree zero* (Macmillan, 1977).

[22] Maurice Blanchot, *The Space of Literature* (U of Nebraska Press, 2015), 81.

[23] Paul Simpson, *Non-representational theory* (Routledge, 2020), 43.

[24] Francisco Javier Seguí de la Riva, *Ser dibujo* (Mairea, 2010), 21 .

[25] Han Byung-Chul Han, *The Burnout Society*. (Stanford University Press, 2015); Byung-Chul Han, *The Transparency Society*. (Stanford University Press, 2015); Byung-Chul Han, *Topology of violence*. (MIT Press, 2018).

[26] Humberto R. Maturana, and Francisco J. Varela. *Autopoiesis and cognition: The realization of the living*. Vol. 42 (Springer Science & Business Media, 2012), 35.

[27] Jacques Rancière, *The ignorant schoolmaster* (Stanford: Stanford University Press, 1991), 8.

[28] Francisco Mora, *Neuroeducación: solo se puede aprender aquello que se ama*. (Alianza editorial, 2021), 229.

BIBLIOGRAPHY

Agamben, Giorgio. Infancy and history: the destruction of experience. London: Verso, 1993.

Barthes, Roland. Writing degree zero. London: Macmillan, 1977.

Blanchot, Maurice. The Space of Literature. Lincoln: University of Nebraska Press, 2015.

Deleuze, Gilles and Bacon Francis. Francis Bacon: The logic of sensation. Minneapolis: University of Minnesota Press, 2003.

Derrida, Jacques and Musée du Louvre. Memoirs of the blind: The self-portrait and other ruins. Chicago: University of Chicago Press, 1993.

Derrida, Jacques. On Touching, Jean-Luc Nancy. Stanford: Stanford University Press, 2005.

Dewey, John. Art as experience. London: Penguin, 2005.

Han, Byung-Chul. The burnout society. Redwood City: Stanford University Press, 2015.

Han, Byung-Chul. Topology of violence. Cambridge: MIT Press, 2018.

Han, Byung-Chul. The Transparency Society. Redwood City: Stanford University Press, 2015.

Han, Byung-Chul. The scent of time: A philosophical essay on the art of lingering. New York: John Wiley & Sons, 2017.

Jay, Martin. Downcast Eyes. Berkeley: University of California Press, 1993.

Javier Seguí de la Riva, Francisco. Ser dibujo. Madrid: Mairea, 2010.

Jullien, Francois. La gran imagen no tiene forma o del no-objeto por la pintura: ensayo de des-ontología. Barcelona: Alpha Decay, 2008.

Kaijima, Momoyo, Stalder, Laurent and Iseki Yu. Architectural ethnography. Toto Publishing, 2018.

Kennedy, Monica, Stephen Billett, Silvia Gherardi, and Laurie Grealish. "Practice-based learning in higher education: Jostling cultures." In Practice-based learning in higher education, pp. 1-13. Springer, Dordrecht, 2015.

Maturana, Humberto and Varela, Francisco. Autopoiesis and cognition: The realization of the living. Boston: Springer Science & Business Media, 2012.

Melville, Herman. Bartleby the scrivener: A Story of Wall Street. Perfection Learning Corporation, 1980.

Mora, Francisco. Neuroeducación: solo se puede aprender aquello que se ama. Madrid: Alianza editorial, 2021.

Nancy, Jean-Luc. Corpus. New York: Fordham Univ Press, 2008.

Nancy, Jean-Luc. "Art today" in Journal of Visual Culture 9, no. 1 (2010): 91-99.

Nancy, Jean-Luc. The Pleasure in Drawing. New York: Fordham University Press, 2013.

O'Rourke, Karen. Walking and mapping: Artists as cartographers. Cambridge: MIT press, 2013.

Odell, Jenny. How to do nothing: Resisting the attention economy. New York: Melville House, 2020.

Proust, Marcel. In Search of lost time: finding time again. London: Penguin UK, 2003.

Rancière, Jacques. The ignorant schoolmaster. Stanford: Stanford University Press, 1991.

Rancière, Jacques. Aisthesis: Scenes from the aesthetic regime of art. London: Verso Books, 2013.

Rancière, Jacques. The emancipated spectator. London: Verso Books, 2009.

Reifenstein, Tilo. "The sense of the line between drawing and writing." Tracey 15, no. 1 (2021): 1-10.

Seel, Martin. Aesthetics of appearing. Stanford: Stanford University Press, 2005.

Silverman, Kaja. The threshold of the visible world. London: Routledge, 2013.

Simpson, Paul. Non-representational theory. New York: Routledge, 2020.

TEACHING AND LEARNING LANDSCAPE ECOLOGY TO LANDSCAPE ARCHITECTS IN ITALY. TOWARDS PROTECTIVE, ADAPTATIVE, REDUNDANT LANDSCAPE DESIGN

Author:
ADRIANA GHERSI[1], ILDA VAGGE[2]

Affiliation:
[1]UNIVERSITY OF GENOA, ITALY, [2]UNIVERSITY OF MILAN, ITALY

INTRODUCTION
Motivation
Landscape Ecology is a discipline that integrates concepts of general and animal ecology, science of vegetation, socio-economic and geographical disciplines through its own consolidated paradigms and models. Thanks to the holistic vision of the Landscape Ecology, which integrates the anthropic and the natural components, complex systems such as ecological ones can be studied and evaluated, also through appropriate qualitative and quantitative indicators. [1]

In a present and future reality in which the anthropic pressure on the planet will be increasingly high, with consequent further alterations on the landscape and the environment, the figure of the landscape ecologist becomes decisive: the one who, as "a physician of environmental systems", [2] has the right tools to deal with issues such as nature conservation, fragmentation and disturbance of ecosystems, the study of biodiversity, the assessment of environmental quality, climate change, ecological design and territorial planning. Having healthy ecological systems ultimately means protecting human health. [3]

The fragmentation and alteration of ecosystems (and in many cases their disappearance) and the invasion of fragile natural ecological systems, creates dangerous mixes between man and nature. The worldwide health emergency linked to the SARS-CoV-2 coronavirus has made us reflect on the spillover phenomenon of viruses from animal to man, at the basis of many pandemics. Most of the potentially lethal viruses for humans remain unknown, living within host species in stable ecosystems, with high biodiversity and little or no anthropization. The alteration of the balance of these ecosystems can bring out the viruses that infect humans, causing pandemic zoonoses. [4]

Scientific researches [5] consider air pollution as a co-factor for the spread and aggravation of viral diseases. In particular, pollution makes us more vulnerable to the occurrence of the most serious outcomes of the pandemic, as it compromises the body's defensive first line, hence the importance of the beneficial effects of ecological systems in the urban areas.

The teaching of Landscape Ecology in Landscape Architecture Degree courses plays a crucial role in the training of students who will become tomorrow's designers and planners.

Facing the challenges of contemporary society, it is more and more necessary to educate the students to the project of urban protection systems, for the quality of life and health of citizens.

Goals of the study

This paper provides a complete picture of the teachings related to the Landscape Ecology in the master's degree courses of Landscape Architecture, in the Italian Universities, highlighting any absences and inadequacies. Only master's degree courses have been considered, because they are actually the only educational training to the full profession of the Landscape Architect in Italy.

Landscape Ecology is a fundamental discipline to understand the multi-dimensional complexity and the evolutionary trends of landscape, necessary to guide and to enrich the projecting process, adding quality control elements in landscape planning or design.

THE ITALIAN SITUATION

The Landscape Architecture master degree courses

In Italy, there are currently 5 master's degree courses in Landscape Architecture, one of which involves 4 universities (Table 1). The oldest are the degree course of Florence (2008) and the inter-university degree course of Genova, Milan, Turin (2010) that were born as a continuation and extension of the historic Florence and Genoese Landscape Architecture School. Then follow Rome (2018), Milan (2017) and Palermo (2020).

Master Degree Course	University
Landscape Architecture	Florence University
Green Areas and Landscape Design	Genoa, Milan, Turin Universities, Turin Politecnico
Landscape Architecture	Rome La Sapienza University
Landscape Architecture. Land Landscape Heritage	Milan Politecnico
Landscape Architecture	Palermo University

Table 1. The Landscape Architecture Master Degree courses in Italy.

The master's degree courses are biennial. Graduates can practice the profession of Landscape Architect, after passing an appropriate qualifying state exam. The data relating to the employment of graduates in Green Areas and Landscape Design (Tab. 2) are rather encouraging.

	Employment rate	Not working graduates who are engaged in traineeship	Use of acquired skills
Graduates in 2017 after 1 year (n° 58)	75,8 %	6,1%	58,8 %
Graduates in 2015 after 3 years (n° 73)	74,3 %	2,9%	42,3 %
Graduates in 2013 after 5 years (n° 58)	86,3 %	-	52,0 %

Table 2. Occupation of Graduates in Green Areas and Landscape Design (Alma Laurea, 2019 [6]).

In fact, 75.8% of graduates, after 1 year, have a job, and the percentage increases to 86.2% after 5 years from graduation. In addition, almost 60% of graduates say they use the skills acquired during the degree.

The teaching of Landscape Ecology

Teachings of Landscape Ecology are present, in different ways, in all the 5 master's degree courses (Table 3). In a more powerful way from the Degree course in Green Areas and Landscape Design (140 hours), which deals with topics of Landscape Ecology also with seminars, intensive workshops and theses.

Master Degree Course	University	Teaching	CFU / hours	Teaching Organization
Green Areas and Landscape Design	Genoa, Milan, Turin Universities Turin Politecnico	Landscape Ecology	6 / 60	Lessons and practical exercises
		Applied Landscape Ecology	6 / 60	Lessons and practical exercises
		Ecological quality of the urban environment (mod. of Urban Environmental Design Studio)	2 / 20	Lessons, practical exercises, project
Landscape Architecture. Land Landscape Heritage	Milan Politecnico	Ecological Landscape Planning	8 / 80	Lessons, practical exercises, project
Landscape Architecture	Florence University	Fundamentals of urban and landscape Ecology	6 / 48	Lessons and practical exercises
Landscape Architecture	Palermo University	Landscape Ecology	6 / 48	Lessons and practical exercises
Landscape Architecture	Rome La Sapienza University	Landscape Ecology (mod. of Planning and Landscape Infrastructures Studio)	3 / 24	Lessons, practical exercises, project

Table 3. The teaching of Landscape Ecology in the Landscape Architecture Master Degree courses.

DISCUSSION

The data, relating to the previously exposed teachings of Landscape Ecology, show that the inter-university degree course dedicates a good share of hours to this discipline.

A motivation of this is to be found in the Genoese Landscape Architecture School tradition, were the theoric teaching by Almo Farina and Vittorio Ingegnoli (belonging to the "second wave generation" of landscape ecologists) focused on the importance to understand the fundamental dynamic concepts of landscape dimension. [7]

Moreover, the applicative courses and experimental design of landscapes, at different dimensions, relied on the discipline of Landscape Ecology as a clear guide to the understanding of landscape configuration, and of its critical actual aspects.

In the construction of the educational path of the inter-university master's degree, the role of Landscape Ecology has remained basic, with a first theoretical course, a second more applicative one, completed by the insertion of a module in a Design Studio and in assuming the point of view of the discipline during visits and to guide the elaboration of thesis.

In particular, the course of Landscape Ecology is carried out in the first semester of the first year, and is followed by all enrolled students, as a fundamental basis educational course to prepare the landscape architects. The course includes theoretical lessons, seminars and a practical exercise. In the exercise, the students work in groups and can analyze a portion of the territory, identifying the environmental mosaic, mapping different patterns in landscape heterogeneity, experimenting the tools by applying the "patch, corridor and matrix model" (Fig. 1). They can learn to quantitatively analyze the margins between the different patches, highlighting the different levels of ecological criticality (fragmentation, disconnections, fragility). Finally, for each type of patch, they identify the current ecosystem services and indicate which ones could be enhanced, or created, through an appropriate landscape project.

In the second semester of the first year, the students can deepen the concepts studied in the precedent course in the course of Applied Landscape Ecology. The students learn to study the structure of a landscape and evaluate its state of balance. They can also use quantitative and qualitative indicators to understand the characters of a study area, at different spatio/temporal scales, by specific parameters such as spatial arrangement and landscape memory, to guide a project. The applied exercises lead the students to landscape analysis, planning and design through applied landscape ecology, deepening the discipline with case studies applied to EIA (Environmental Impact Assessment), VAS (Strategic Environmental Assessment), Landscape studies and Landscape Relations.

In the second year the students can choose the Urban Environmental Design Studio, have the possibility to apply the principles of Landscape Ecology to urban environment, facing a significant study-case, on which to develop a landscape plan or design, thanks to the module on Ecological quality of the urban environment.

To complete the education of the students, study visits with a team of teachers are proposed, to immerse in the landscape and see it under different points of view and with the tools of Landscape Ecology to interpret it.

At the end of the two years some students can choose to develop Landscape Ecology in their final thesis. These are moments for the deepening of the discipline, in which the students can apply Landscape Ecology principles and tools to diagnose the landscapes in question and to be able to define suitable contents in the landscape planning and/or design interventions.
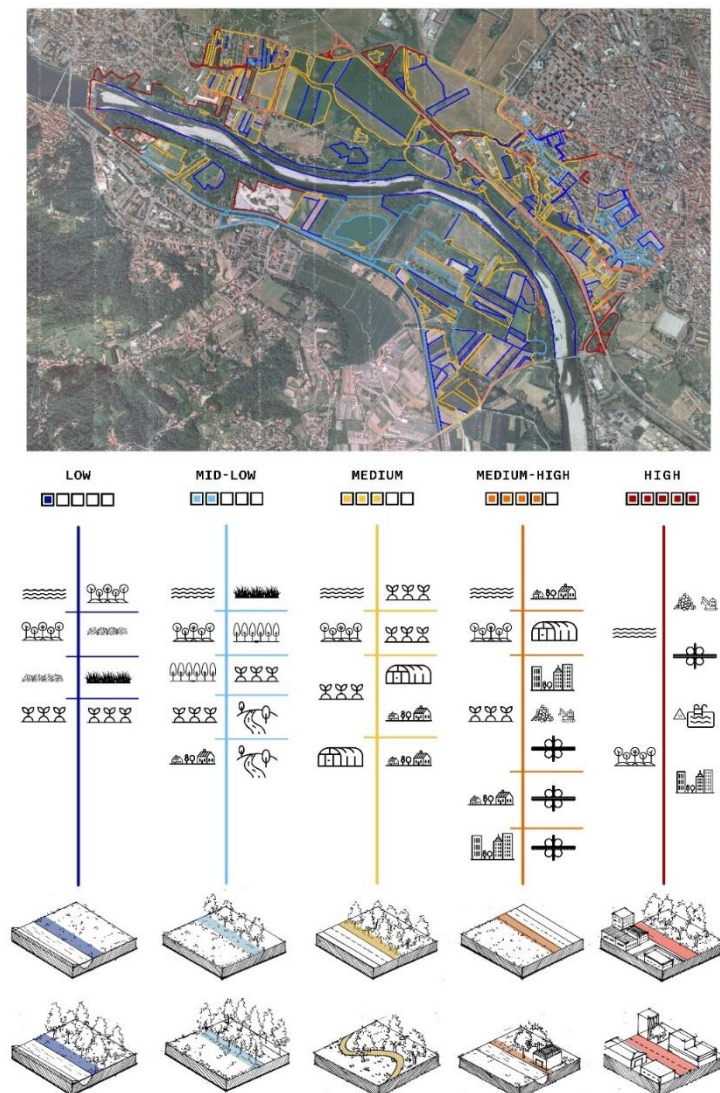
Figure 1. Master's Degree on Green Areas and Landscape Design (Genoa, Milan, Turin), "Landscape Ecology" Course 2019-2020 (Prof. Ilda Vagge), Students: Sergio De Pra, Lijun Li, Anna Sarzetto, Nicolò Tonin, Marco Toniolo, Exercise on the Ecological Quality of the Margins of Patches.

CONCLUSION

Although the importance of this discipline for Landscape Architecture was theorized since the birth of Landscape Ecology [8], still in most Italian Universities too little space is devoted to this teaching, especially dedicated to Landscape Architecture students. An increase in discipline would be appropriate, both as a single course and within design studios, to integrate other disciplines. In a historical moment in which the work of the landscape architect is increasingly challenging, since it is conditioned by planetary problems (climate change, water scarcity, deforestation, loss in biodiversity

...), the knowledge of Landscape Ecology can help him to plan implementing rich territorial ecosystem services and lowering its projects in harmony with the ecological-environmental context.

The living system of our planet has strongly been affected, in recent time, because of different stresses and disturbances caused by human actions. The capability to read the evolution of the ecological mosaics, to grasp an interpretation of the ecological complexity leading to foresee future sceneries, becomes relevant to propose durable solutions, connecting sustainability, biodiversity and landscape ethics.

In the developing of Landscape Planning and Design, there is clear evidence of a need of new competences, to be able to face the continuous transformation of urban spaces and urban green systems, considering the changes of the physical conditions and of the mutation of social needs. It is also necessary to know how to involve and make citizens and stakeholders aware of the real needs of our living environment, with a project that is able to communicate the importance of ecosystem services and the resources of natural heritage, changing people perception of landscape.

An adaptive quality of landscape design is linked to the knowledge coming from Landscape Ecology discipline, to manage these changing characters of landscape, in order to guarantee sufficient standards to protect people from degradation and discontinuities.

NOTES

[1] Chowdhury and Turner, "Parallel trajectories and increasing integration of landscape ecology," 2019; Li, 2000; Musacchio *et al.,* "Changing landscapes, changing disciplines," 2005; Naveh, Interactions of landscapes and cultures, 1995; Naveh, "What is holistic landscape ecology?," 2000; Naveh, "Ten major premises," 2001; Palang et al., "Holistic landscape ecology in action," 2000; Tagliaferro et al., "Cultivating deep care," 2013; Tress et al., "Clarifying Integrative Research Concepts," 2005; Wu, "Landscape ecology, cross-disciplinarity, and sustainability science," 2006.

[2] Ingegnoli and Giglio, *Ecologia del paesaggio,* 2005; Ingegnoli, *Landscape Bionomics,* 2015.

[3] Farina, "Cultural Landscape as a Model for the Integration," 2000; Frazier *et al.,* "Ecological civilization," 2019; Frazier *et al.,* "Linking landscape ecology and land system architecture," 2019; Lindenmayer *et al.,* "Experimental evidence of the effects of a changed matrix, 2019; Musacchio, "The ecology and culture of landscape sustainability," 2009; Musacchio, *"*Cultivating deep care," 2013; Naveh, "Landscape ecology and sustainability," 2007; Opdam *et al.,* "How can landscape ecology contribute to sustainability science?" 2019; Wiens, "Landscape ecology as a foundation for sustainable conservation," 2019; Wu, "Integrating Nature and Culture," 2011.

[4] Quammen, *Spillover*, 2012; Kreuder Johnson *et al.,* "Spillover and pandemic properties," 2015.

[5] Conticini *et al.,* "Can atmospheric pollution be considered a co-factor," 2020.

[6] Alma Laurea Interuniversity Consortium (2019) Single Annual Report, Satisfaction and employment conditions for graduates, http://statistiche.almalaurea.it/universita/statistiche/_trasparenza?codicione=0100107300400001 [Accessed 3 May 2020].

[7] Farina, *Ecology, Cognition and Landscape*, 2009; Antrop and Van Eetvelde, *Landscape Perspectives*, 2017.

[8] Naveh, "Landscape Ecology as a Scientific and Educational Tool" 1980; Wenche *et al., Landscape ecology principles,* 1996.

BIBLIOGRAPHY

Antrop, Marc and Veerle Van Eetvelde. *Landscape Perspectives.* Dordrecht: Springer Science+Business Media B.V., Landscape Series 23, 2017.

Chowdhury, Rinku Roy and Billie Turner. "The parallel trajectories and increasing integration of landscape ecology and land system science." *Journal of Land Use Science* 14, no. 2 (2019): 135-154. https://doi.org /10.1080/1747423X.2019.1597934.

Conticini, Edoardo, Bruno Frediani, Dario Caro. "Can atmospheric pollution be considered a co-factor in extremely high level of SARS-CoV-2 lethality in Northern Italy?" *Environmental Pollution* (2020). https://doi.org/10.1016/j.envpol.2020.114465.

Dramstad, Wrenche, James Olson, Richard Forman. *Landscape ecology principles in landscape architecture and land-use planning.* Harvard University Graduate School of Design, Washington: Island Press, 1996.

Farina, Almo. "The Cultural Landscape as a Model for the Integration of Ecology and Economics." *BioScience* 50, no. 4 (2000): 313-320. https://doi.org /10.1641/0006-3568(2000)050 [0313:TCLAAM] 2.3.CO;2.

Farina, Almo. *Ecology, Cognition and Landscape. Linking Natural and Social Systems*. Dordrecht: Springer, 2009.

Frazier, Amy, Brett Bryan, Alexander Buyantuev, Liding Chen, Christian Echeverria, Peng Jia, Lumeng Liu, *et al.* "Ecological civilization: perspectives from landscape ecology and landscape sustainability science." *Landscape Ecology* 34, no.1 (2019): 1-8. https://doi.org /10.1007/s10980-019-00772-4.

Frazier, Amy, Jacqueline Vadjunec, Peter Kedron, Todd Fagin. "Linking landscape ecology and land system architecture for land system science: an introduction to the special issue." *Journal of Land Use Science* 14, no. 2 (2019): 123-134. https://doi.org /10.1080/1747423X.2019.1660728.

Kreuder Johnson, Christine, Peta Hitchens, Tierra Smiley Evans, Tracey Goldstein, Kate Thomas, Andrew Clements, Damien Joly, *et al.* "Spillover and pandemic properties of zoonotic viruses with high host plasticity." *Sci Rep* 5, 14830 (2015). https://doi.org /10.1038/srep14830.

Ingegnoli, Vittorio and Elena Giglio. *Ecologia del paesaggio. Manuale per conservare, gestire e pianificare l'ambiente* [Landscape ecology. Manual to conserve, manage and plan the environment]. Napoli: Simone Edizioni, Esse Libri, 2005.

Ingegnoli, Vittorio. *Landscape Bionomics. Biological-Integrated Landscape Ecology.* Heidelberg, Milano, New York: Springer, 2015.

Li, Bai-Lian. "Why is the holistic approach becoming so important in landscape ecology?" *Landscape and Urban Planning* 50, (2000): 27–41. 2000. https://doi.org /10.1016/S0169-2046(00)00078-5.

Lindenmayer, David, Jeff Wood, Ross Cunningham, Mason Crane, Christopher Jan MacGregor, Damian Michael, Rebecca Montague-Drake. "Experimental evidence of the effects of a changed matrix on conserving biodiversity within patches of native forest in an industrial plantation landscape." *Landscape Ecology* 24, (2009): 1091–1103. https://doi.org /10.1007/s10980-008-9244-5.

Musacchio, Laura, Esra Ozdenerol, Margaret Bryant, Tom Evans. "Changing landscapes, changing disciplines: seeking to understand interdisciplinarity in landscape ecological change research." *Landscape and Urban Planning* 73, no.4 (2005): 326-338. https://doi.org /10.1016/j.landurbplan.2004.08.003.

Musacchio, Laura. "The ecology and culture of landscape sustainability: emerging knowledge and innovation in landscape research and practice." *Landscape Ecology* 24, (2009): 989–992. https://doi.org /10.1007/s10980-009-9393-1.

Musacchio, Laura. "Cultivating deep care: integrating landscape ecological research into the cultural dimension of ecosystem services." *Landscape Ecology* 28, (2013): 1025–1038. https://doi.org /10.1007/s10980-013-9907-8.

Naveh, Zev. "Landscape Ecology as a Scientific and Educational Tool for Teaching the Total Human Ecosystem." In: Bakshi Trilochan S., Naveh Zev (eds) *Environmental Education. Environmental Science Research*, vol 18. Boston, MA: Springer, 1980. https://doi.org /10.1007/978-1-4684-3713-3_14.

Naveh, Zev. "Interactions of landscapes and cultures." *Landscape and Urban Planning* 32, (1995): 43-54. https://doi.org /10.1016/0169-2046(94)00183-4.

Naveh, Zev. "What is holistic landscape ecology? A conceptual introduction." *Landscape and Urban Planning* 50, no.1-3 (2000): 7-26. https://doi.org /10.1016/S0169-2046(00)00077-3.

Naveh, Zev. "Ten major premises for a holistic conception of multifunctional landscapes." *Landscape and Urban Planning* 57 (2001): 269–284. https://doi.org /10.1016/S0169-2046(01)00209-2.

Naveh, Zev. "Landscape ecology and sustainability." *Landscape Ecology* 22, (2007): 1437–1440. https://doi.org /10.1007/s10980-007-9171-x.

Norton, Briony, Karl Evans, Philip Warren. "Urban Biodiversity and Landscape Ecology: Patterns, Processes and Planning." *Curr. Landscape Ecol. Rep.* 1, (2016): 178–192. https://doi.org /10.1007/s40823-016-0018-5.

Opdam, Paul, Sandra Luque, Joan Nassauer, Peter Verbug, Jianguo Jingle Wu. "How can landscape ecology contribute to sustainability science?" *Landscape Ecology* 33, 1–7. 2018. https://doi.org /10.1007/s10980-018-0610-7.

Palang, Hannes, Ülo Mander, Zev Naveh. "Holistic landscape ecology in action." *Landscape and Urban Planning* 50, (2000): 1–6. https://doi.org /10.1016/S0169-2046(00)00076-1.

Quammen, David. *Spillover: Animal Infections and the Next Human Pandemic.* W.W. Norton & Company, Inc., New York: W.W. Norton & Company, Inc., 2012.

Tagliafierro, Carolina, Alberto Longo, Veerle Van Eetvelde, Marc Antrop, George Hutchinson. "Landscape economic valuation by integrating landscape ecology into landscape economics." *Environmental Science & Policy* 32, (2013): 26-36. https://doi.org /10.1016/j.envsci.2012.12.001.

Tress, Gunther, Barbel Tress, Gary Fry. "Clarifying Integrative Research Concepts in Landscape Ecology." *Landscape Ecology* 20, (2005): 479–493. https://doi.org /10.1007/s10980-004-3290-4.

Wenche, Dramstad *et al. Landscape ecology principles in landscape architecture and land-use planning.* Harvard University Graduate School of Design, Washington: Island Press,. 1996.

Wiens, John. "Landscape ecology as a foundation for sustainable conservation." *Landscape Ecology* 24, (2009):1053–1065. https://doi.org /10.1007/s10980-008-9284-x.

Wu, Jianguo Jingle. "Landscape ecology, cross-disciplinarity, and sustainability science." *Landscape Ecology* 21 (2006): 1-4. https://doi.org /10.1007/s10980-006-7195-2.

Wu, Jianguo Jingle. "Integrating Nature and Culture in Landscape Ecology." In: Hong, Sun-Kee, Kim, Jae-Eun, Jianguo Jingle Wu, Nobukazu Nakagoshi (eds) *Landscape Ecology in Asian Cultures.* Ecological Research Monographs. Tokyo: Springer, 2011 https://doi.org /10.1007/978-4-431-87799-8_20.

CRITICAL REFLECTIONS ON MY ARCHITECTURAL TEACHING PRACTICE

Author:
MÁRCIA PEREIRA

Affiliation:
INDEPENDENT RESEARCHER, SWITZERLAND

INTRODUCTION

There is a concrete and urgent need for new teaching practices which can prepare architects to fulfil the present society's demands. Having researched the relationship between architecture and urban design with online learning and virtual learning spaces as well as having developed my teaching practice in these areas, face-to-face and online, I saw the need for online teaching & learning in 2020 with a renewed interest.

This paper seeks to present action research into my practice, utilising a pedagogical model for online learning I proposed as a basis for the reflective process. It argues that Internet-based educational technologies provide a vast array of possibilities, however, they do not guarantee the quality of the learning process. Amongst other issues, the socio-economic and cultural context plays an extremely important role, affecting both learners and teachers. In so doing, the work also validates the proposed pedagogical model.

ARCHITECTURAL EDUCATION

Architectural education and the concept of architecture itself have developed over time[1], however, *pluralism* is one of architecture's most robust characteristics, encompassing *art* and *social function*, *theory* and *practice*, *science* and *technology*. Architectural practice and education need a holistic approach, synthesising these apparently contradictory characteristics.[2]

Beyond the specific challenges faced by architectural education due to its nature, the constant development of new technologies and techniques, climate change and, more recently, the pandemic reality bring new ones.

The choices we make when designing buildings and cities strongly impact people's lives, affecting the sustainability of their habits and generating carbon emissions[3] related to buildings construction and operation.[4] Moreover, climate change allied to other global trends such as population growth, changes in land use and urbanisation, human migration and rapid global travel increase the risk of pandemics like Covid-19.[5] Therefore, social issues, sustainability and regeneration as well as prevention and preparedness for pandemics are highly relevant learning content in architectural education, having also an impact on teaching and learning methodologies.

PEDAGOGICAL MODEL

Considering the need for architectural education to face a complex and changeable reality, research was developed and a *critical socio-constructivist pedagogical model*[6] was proposed.

From a constructivist premise of *knowledge* as actively constructed by the knower, *reflective practice,*[7] the *socio-cultural theories,*[8] and *critical pedagogy*[9] incorporate new dimensions to the educational process: emphasising the importance of metacognition, the social character of learning, and a critical approach. These combined principles allow the development of Higher Education towards forming reflective practitioners and critical lifelong learners better prepared to deal with uncertainty.

The proposed pedagogical model (Figure 1) is composed of: (a) a learner-oriented approach; (b) the development of individual cognition, with emphasis on active and independent learning; (c) the development of systems of cognitive activity, critical & collaborative reflection; (d) the construction of flexibly structured learning environments, allowing different learning experiences – within learning organisations; and (e) the development of learning as situated in real context, developing consciousness of the social and political context where the learning experience takes place.
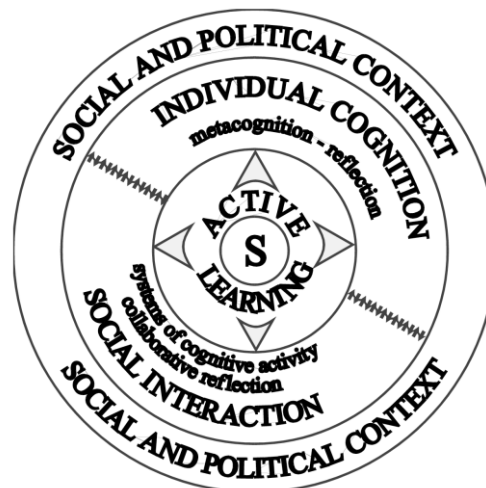

Figure 1. Critical Socio-Constructivist Pedagogical Model (Pereira 2000).

ON THE ROAD

This work presents findings from *action research*[10] in my practice, using *reflective practice*[11] (Figure 2) as methodology. Looking back at my own teaching and research experience, a *reflection-on-action*[12] is shown next.
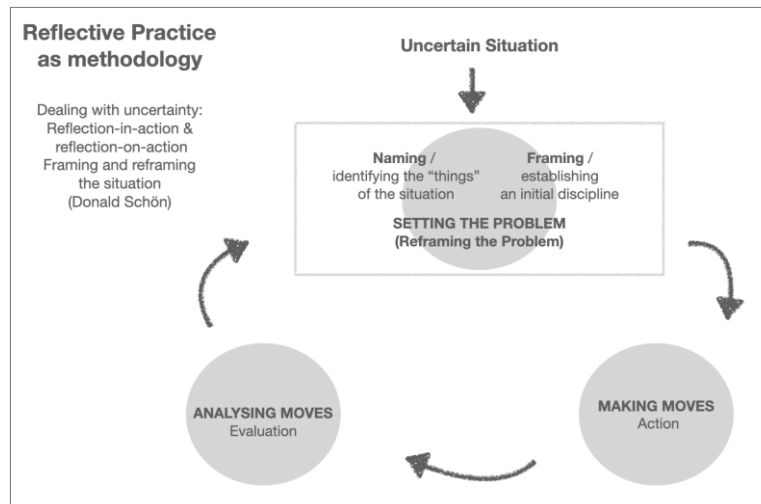
Figure2. The Reflective Practice Process (after Pereira 1999).

Forming years

Since 1993 I am involved with teaching and research in Higher Education. Being a researcher in the first graphic laboratory at the School of Architecture of the Federal University of Minas Gerais (Belo Horizonte, Brazil), I had the opportunity to teach students and lecturers about the use of computers. Maria Lúcia Mallard, the lab founder, and Edward Ng, who came from Sheffield for an introductory course, shared a holistic view of computers' application in architecture, emphasising their importance as means to achieve an aim. This, added to my teaching experience, helped me to better understand the concept of computers as "mediational tools". Observing the learning processes of students and lecturers I taught, I also began to gain a better insight into the different types of learners and their motivations. However, I was still not very conscious of the reflective process as a methodology to improve my practice and my reactions were more intuitive.

Learning to be a Reflective Practitioner

Moving to Sheffield (England) in 1994, I started investigating the use of computer and information technologies in architecture (MArch) and later in architectural education (PhD) at the University of Sheffield. In parallel to my PhD, I attended a Postgraduate Course in Higher Education (PCHE) at the same university.

The MArch and the PhD were great opportunities to dive into interesting subjects. Both, Bryan Lawson, my PhD supervisor, and Tony Harland, my PCHE tutor, were inspiring. During this period I could investigate various theories and authors, relating them to the design and learning processes. The PCHE in special gave me a better understanding of the educational theories I had been investigating for the PhD and was a safe collaborative space for reflecting on my teaching practice, through several instruments such as mentorship and peer evaluation.

Particularly rich was the experience of designing my lectures, exploring multimedia material and interactive methodologies to encourage individual and collaborative reflection. I felt better at small group teaching and one-to-one tutoring, where the process could be more learner-centred. The communication could flow better and students felt more comfortable to make questions and I felt more comfortable being able to ask questions back and give more specific feedback, relating it to their background.

Expressing myself clearly in English was a challenge at first as I had to develop a new vocabulary on subjects I already knew. Cultural differences also needed to be addressed and reflected upon. Coming

from a Latin culture, I had to reflect upon the local cultural habits and try to adapt myself to them, but at the same time keeping my own identity. This allowed me to have an experience I could, later on, relate to that of my international students. However, despite the initial difficulties, this experience also allowed me to explore a new culture, and a vast array of information, make new friends, develop resilience in dealing with cultural differences, learn from my mistakes, and above all learn to learn.

Designing learning spaces & learning experiences

From 1998, I worked on the design and teaching of courses face-to-face and online, as well as on the design of virtual learning environments in Scotland and Switzerland, using the pedagogical model and framework developed during my PhD.[13]

Firstly, I tutored face-to-face at the design studio at the University of Dundee and Robert Gordon University (RGU) in Aberdeen. Scottish students showed to be direct and spontaneous, allowing for flowing tutoring conversations, in an effective "reflection-in-action" process. Tutoring international students, I experienced how gender issues can affect the process. Some male international students had difficulties in accepting my feedback, while they seemed to be much more open to receiving feedback from my male colleagues. At this time I also started to reflect on the architectural crit and its role as a form of assessment, when a female student burst into tears when I asked why she opted for a specific design solution. This generated a conversation among us teachers but should have involved students as well. Assessment should have a formative character, helping to evaluate individual development and architectural crits in special could benefit from a wider and more collaborative discussion about its role in architectural education.

At RGU Center for Open and Distance Learning, I applied the proposed model and framework to the design of a VLS for staff development - it was a positive experience, where I could witness the university transition process towards becoming a learning organisation.

Moving to Switzerland in 2001, I worked at the Swiss Federal Institute of Technology in Zürich (ETHZ), in the architecture department (research on the application of innovative technologies to learning in multidisciplinary contexts via collaboration), at the Centre for Product Development (developing a VLE for ecological engineers worldwide,[14] co-designing and tutoring courses within this environment, in collaboration with armadillo gmbh; designing a VLS to integrate formal and informal knowledge[15]); at the University of Lucerne (development of a business plan concept for an international Masters Program on E-Learning and Knowledge Management), and at the Institute for Spatial and Landscape Development, researching the integration of a Spatial Development course into an online environment.

Adaptation to a new context was necessary. Although English is widely spoken and was my main working language, German is the main language in Zurich. The organisational culture is also quite distinct: highly technological, with a strong focus on the development of innovative technologies, and highly efficient and up-to-date working environments. As the study of proxemics shows culture affects personal space and distancing. In German-speaking cultures, this distance is very explicit in the use of pronouns too. As the language, people's relationships seem to be more structured.

Back in Scotland in 2007, working at Edinburgh College of Art and HWU, I developed research and teaching in architecture and urban studies, looking at the participative process and transnational learning, investigating issues related to local socio-economic context and also European-related issues, in an EU-funded project. I was involved in diverse teaching activities, from lecturing and tutoring in small groups, student trips to cities like London and Barcelona, site visits, and student research supervision. It was a rich learning process, in an environment I was much more used to and, therefore, the integration into the social and cultural context was much easier. Especially important is the way HE institutions in the UK embed collaborative reflection in their functioning structure, with highly efficient

staff development initiatives, teaching courses for lecturers, and the mentoring system, amongst others. However, care needs to be taken to avoid this being transformed into bureaucratic procedures, generating stress and pressure within a competitive environment. Ideally, these attempts would generate conditions for cooperation and peer evaluation of practice, promoting collaborative research and publications.

At home?

In 2012, I was back in Brazil after 18 years. Going back to academic activities in Brazil, however, did not happen without a cultural shock. I was used to students who would be quiet while I was speaking and never used a mobile phone in the classroom. In Brazil, students were much more talkative and demanding, but not willing to be active co-producers of knowledge during lectures. There was a need for more action.

Lecturing and tutoring Architecture and Urban Design in a variety of disciplines from project development to architectural theory and urban mobility allowed me to explore different strategies. I designed learning activities away from classrooms, such as using university buildings for analysis, asking students to carry out user interviews, and organising city explorations (walking and using public transport, visiting socially contrasting areas, to develop a more critical view). In an attempt to generate collaborative reflection, on-site specialist presentations were organised, debates, and meetings with local stakeholders. Students were also encouraged to explore on their own, being asked to register their experiences via croquis, photos and videos. Having students from different social backgrounds, it was fundamental to listen and try to understand them, improving their motivation and my ability to design more adequate learning experiences. I also made sure to speak to every class at the beginning of the semester about the learning process and how responsible for their learning students were expected to be. Until then online environments were mostly used as repositories of lecture presentations and references, but very few students used them, other than for work submission.

Learning with Covid-19

In 2020 came the Covid-crisis. At the Newton Paiva University Centre, after one week of preparation, all lectures and tutoring began to take place online in real-time, synchronously, using the Canvas VLE associated with Zoom.

To support lectures, I used the forum for individual and group activities on specific themes, exploring individual and collaborative reflection, asking students to search the internet, finding resources and sharing on forums within the VLE. Synchronous and asynchronous discussions based on their findings were promoted, however, the synchronous discussions were more effective and had more participation. In the tutoring process, we attempted to 'transfer' the design studio to the online environment using zoom. Students would open their projects on their computers, sharing the screen with all, tutors and colleagues, showing their work in different formats (PowerPoint presentations, CAD drawings, 2-D and 3-D croquis). My colleague and I opted for tutoring together instead of using Zoom shared rooms. As a result, we had very rich and complementary tutoring experiences, which were seen as positive by the students, achieving good quality results. In the beginning, students were shy in sharing their projects on the screen as most of them weren't used to accompanying the tutoring process of others. We needed to emphasise the benefits of this process. The initial barrier was successfully broken and we saw a higher participation rate of those usually shy students, which is an effect of the use of educational technologies researchers previously observed.[16]

Inviting guests to online conversations was also a good resource and easy to implement. External tours were not allowed and were substituted by virtual tours using Google Earth, combined with videos and images of the area. Videos can transmit a better feeling of the place, with movement and sound. Students

who had already experienced the spaces being virtually visited were invited to share their experiences. However, we all agreed that real experience is undoubtedly better.

Brazil was heavily affected by Covid-19. The socio-economic and political crisis aggravated the health crisis and vice-versa, causing numerous deaths and job losses. Students, mainly those from the lowest socio-economic groups, needed much support to avoid dropouts, needing space to express their feelings. Several of my colleagues found it difficult to promote students 'participation and complained about teaching to dark screens. Providing a supportive environment and promoting online activities in the inverted classroom model were very useful in avoiding this. But it was easier to develop a rapport with those students I had previously taught face-to-face than with those I have never met before. Undoubtedly, the social divide increased as not all students had access to good technological devices and internet access - some students could only access lectures via mobile phones or had very unstable internet access. To promote quality in individual and collaborative online interactions, teachers needed to invest more time preparing learning activities, dealing with a blurred limit between work and private life. On the positive side, there was more participation from shy students, more peer learning, and less time was spent on travelling.

REFRAMING & FURTHER REFLECTIONS

This paper presented action research into my practice as an educator and researcher - a snapshot of my continuous reflective process, utilising a *critical socio-constructivist pedagogical model* proposed as a basis to help architectural education form reflective professionals able to deal with unpredictability and change.

The components of the model proved to apply to the design of virtual learning environments and teaching activities, online and face-to-face. A *learner-oriented approach* is fundamental and students should be conscious that the quality of their learning process depends on how proactive they are in constructing knowledge themselves. Educators and institutions need to be conscious of their responsibility in providing conditions for this to take place, catering for different learning types, and creating conditions for the *development of individual cognition*, with emphasis on active and independent learning, combined with the *development of systems of cognitive activity*, allowing for critical and collaborative reflection. Tutoring in the design studio and the crits should also be part of a collaborative reflective learning process. Architectural crits and assessments should be learning opportunities.[17] This aspect is relevant not only for students but also to teachers' learning in action.

Having *flexibly structured learning environments*, be it face-to-face or online, promotes interaction and flexibility also on the use of educational technologies. This, within Higher Education institutions which assume the challenge of becoming *learning organisations* themselves - providing opportunities for staff development, access to new technologies and training, and incentive to innovation and creativity, can encourage teaching staff to be continuous learners.

The *development of learning as situated in real context*, developing the learner's consciousness of the social and political context where the learning experience takes place is paramount. Having lived and worked in different countries emphasised the need for the learning to be situated, taking into consideration not only local legislation but also local culture, language and all the subtleties one needs to get used to.

As educators, we should form independent and critical learners, conscious of their responsibilities not only towards their specific clients but also towards environmental and social issues, such as diversity, gender and inclusion. Climate change and the pandemic reality allowed for an opportunity for reflection on these issues within schools and in the media.

The application of adequate educational technologies, which provide various learning possibilities, in special the internet-based ones definitely proved its usefulness, mainly in times of quarantine, reducing

the amount of travelling and air pollution, facilitating aspects of the learning process, despite weakening some. Their application alone, however, does not guarantee the quality of the educational process. There are other important aspects to consider, mainly the socio-economic context. There seems to be a case for blended learning in architecture and urban design education. This and other themes such as the role of language and culture in the learning process deserve further reflection. And the process goes on.

Finally, it seems that more than ever there is a need for an education that prepares reflective practitioners for lifelong learning, within a critical perspective, able to deal with uncertainty with artistry, through a critical socio-constructivist approach, as proposed.

As Freire himself highlights: 'As active participants and real subjects, we can make history only when we are continually critical of our very lives'. [18]

NOTES

[1] Marcia A. Pereira, "Architectural Education," in *ArchCAL: a conceptual basis for the application of information technology into learning and teaching technical subjects in architectural education* (PhD Diss., University of Sheffield, 2000), 148-217.

[2] A description of architecture nature as being holistic was already presented by the Roman architect Vitruvius by the end of the first century BCE as well as the broad education expected of an architect. See: Vitruvius, *The Ten Books of Architecture*.

[3] Architecture 2030. "Why the built environment?" Accessed May 27, https://architecture2030.org/why-the-building-sector/

[4] The built environment is accountable for nearly 50% of the annual carbon emissions. See: Paula Melton and AIA Staff, "Four ways architects can fight climate change" AIA, accessed May 28, 2022,

https://www.aia.org/articles/6074306-four-ways-architects-can-fight-climate-cha.

[5] Gavi Staff, "The Future of Global Pandemic Security: Navigating shifting landscapes – a Gavi White Paper," Gavi, November 26, 2021, accessed May 28, 2022, https://www.gavi.org/vaccineswork/future-global-pandemic-security-navigating-shifting-landscapes-gavi-white-paper.

[6] Marcia Pereira, "ArchCAL: a conceptual basis for the application of information technology into learning and teaching technical subjects in architectural education" (PhD Diss., University of Sheffield, 2000).

[7] Based on the work of the American educator and philosopher Donald Schön.

[8] Based on the work of the Russian psychologist Lev Vygotsky.

[9] Based on the work of the Brazilian educator and philosopher Paulo Freire.

[10] Action Research is the professional reflective practice processed via a more systematic enquiry method, where the practitioner investigates her own practice, aiming to increase knowledge and generate professional development. See Marcia A. Pereira (1999), Stephen Kemmis and Robin McTaggart (1982), Stephen Kemmis, Robin McTaggart, Ronda Nixon (2013), and Jean McNiff (2016).

[11] Reflective practice, within the epistemology of practice defined by Donald Schön - inspired by John Dewey and observations of the design studio - involves' reflection-in-action and 'reflection-on-action'. The process can be described as having three main parts: problem setting (*naming* and *framing* the situation), making moves, analysing the results of moves, and reframing. It implies the processes of "reflection-in-action" and "reflection-on-action" informing each other, in an 'expanding spiral' and developmental character. See Marcia A. Pereira (1999) and Donald Schön (1983 & 1987).

[12] Reflecting-on-action makes more evident the experience of reflection-in-action, enabling the practitioner to become more conscious of her actions and therefore giving her the opportunity to master these actions. This process has a developmental character, being more than cyclical. It is an 'expanding spiral', where the experience acquired today will support the reflective practice of tomorrow. See Marcia A. Pereira (1999:353).

[13] Marcia A. Pereira, "Designing Collaboration," *ECER 2001 European Conference on Educational Research*, Lille, (2001), accessed May 2008, 2022, https://archive.arch.ethz.ch/caad/info/pdf/PereiraECER2001.pdf .

[14] Marcia A. Pereira and Andreas Schönborn," myNetWorks: Strategies to promote worldwide continuous professional education for ecological engineers," 6*th International Conference on New Educational Environments*, (2004).

[15] Marcia A. Pereira and Effie Law, "Learning Choices: generating and integrating informal knowledge," *Information and Security International Journal* 14, special issue on *Advanced Distributed Learning,* (2004): 100-109.

[16] William R. Klemm, "Benefits of collaboration software for on-site classes," *TCC-J Teaching in the Community Colleges (Electronic) Journal* 2 (Spring 1997): https://files.eric.ed.gov/fulltext/ED411908.pdf.

[17] Others have more recently explored this subject, providing interesting accounts. See: Rachel Sara and Rosie Parnell, "Fear and Learning in the Architectural Crit," *field* 5, no.1 (November 2013), accessed May 28, 2022, http://field-journal.org/wp-content/uploads/2016/07/Field-51-Sara-Parnell.pdf .

[18] Paulo Freire (1985:199)

BIBLIOGRAPHY

Dewey, John. *Logic: the theory of inquiry.* New York: Holt, Rinehart and Winston, 1938.

Freire, Paulo. *Pedagogy of the Oppressed.* New York: Continuum, 1970.

Freire, Paulo. *The politics of education: culture, power and liberation.* Granby, Mass: Bergin & Garvey Publishers, 1985.

Freire, Paulo and Donaldo Macedo. *Literacy: Reading the Word and the World.* New York: Bergin and Garvey, 1987.

Gavi. "The Future of Global Pandemic Security: Navigating shifting landscapes – a Gavi White Paper." November 26, 2021. Accessed May 28, 2022. https://www.gavi.org/vaccineswork/future-global-pandemic-security-navigating-shifting-landscapes-gavi-white-paper.

Kemmis, Stephen and Robin McTaggart. *The action research planner.* Victoria: Deakin University Press, 1982.

Kemmis, Stephen, Robin McTaggart and Ronda Nixon. *The Action Research Planner: Doing Critical Participatory Action Research.* Singapore: Springer Verlag, 2013.

Klemm, William R. "Benefits of collaboration software for on-site classes." *TCC-J Teaching in the Community Colleges (Electronic) Journal* 2 (Spring 1997). Accessed May 28, 2022.
https://files.eric.ed.gov/fulltext/ED411908.pdf .

McNiff, Jean. *You and your action research project.* London, New York: Taylor and Francis, 2016.

Melton, Paula and AIA Staff, "Four ways architects can fight climate change." Accessed May 28, 2022, https://www.aia.org/articles/6074306-four-ways-architects-can-fight-climate-cha.

Pereira, M.A. and Andreas Schönborn. "myNetWorks: Strategies to promote worldwide continuous professional education for ecological engineers". 6th International Conference on New Educational Environments", Neuchâtel, Switzerland, September 27 – 30, 2004.

Pereira, M.A. and Effie Law. "Learning choices: generating and integrating informal knowledge". Information and Security International Journal, Vol.14: special issue on *Advanced Distributed Learning*, edited by Kateryna Synytsya. Sofia: ProCon, (2004): 100-109.

Pereira, Marcia A. "Designing collaboration." In *ECER 2001 European Conference on Educational Research*, Lille, 2001.

Pereira, Marcia A. "ArchCAL: a conceptual basis for the application of information technology into learning and teaching technical subjects in architectural education." PhD thesis, University of Sheffield, 2000.

Pereira, Marcia A. "Building a virtual learning space for C&IT staff development". In *European Conference on Educational Research*. Edinburgh: University of Edinburgh, September 20-23, 2000.

Pereira, Marcia A., Rachel Harris, Duncan Davidson, and Jane Niven. "Building a virtual learning space for C&IT staff development." In *European Conference on Educational Research*, Edinburgh, September 19 - 24, 2000.

Pereira, Marcia A. "My Reflective Practice as Research." *Teaching in Higher Education* 4, no.3 (1999): 339-354.

Sara, Rachel and Rosie Parnell, "Fear and Learning in the Architectural Crit." *field* 5, no.1 (November 2013), Accessed May 28, 2022. http://field-journal.org/wp-content/uploads/2016/07/Field-51-Sara-Parnell.pdf.

Schön, Donald A. *Educating the reflective practitioner: toward a new design for teaching and learning in the professions.* San Francisco: Jossey-Bass, 1987.

Schön, Donald A. *The reflective practitioner: how professionals think in action.* London, Temple-Smith, 1983.

Schönborn, A. and Marcia A. Pereira. "mynetworks.org - an online environment for sustainable environmental technology merging community processes and course development". 33rd International Symposium IGIP/IEEE/ASEE "Local Identity - Global Awareness". Fribourg, Switzerland, September 27 – October 1, 2004.

Vygotsky, Lev S. *Thought and Language.* Cambridge, Mass: The MIT Press, 1962

INTERCULTURAL PEDAGOGY AND TECHNOLOGY FOR A NEW HUMANISM

Author:
ANNA TATARANNI

Affiliation:
DEPARTMENT OF MEDITERRANEAN RIGHTS, ECONOMICS AND CULTURES, BARI UNIVERSITY, ITALY

INTRODUCTION

Planetary interdependence, intercultural pedagogy and integrated human development

The time of complexity is the time of interdependence.

In the age of networks, the planetary interdependence of actions is to be conceived on planes of material and immaterial actions where the immediate or deferred interrelationships in time and space, which are part of this great global space, are irreversibly linked to the human species, in that determination and sharing of opportunities, dangers, possible developments, involutions. Space, be it physical or virtual, becomes a place where itineraries are drawn, paths and life trajectories are traced, actions are performed, histories, relations, connections and interdependencies are interwoven; it is a complex living organism, where symbols, meanings, signs are present;[1] is a generative place of experience and knowledge, of narration and memory, it depends on the hermeneutic gaze one adopts; it is in it that often irremediable conflicts or hostilities can also arise.

Every territory presents itself as a peculiar cultural and social sediment, locally connoted, with its own 'maps' and 'paths' and takes shape according to the attributions of meaning as a function of subjective relations, languages, cultures, signs and words.[2]

The territory is not a "container without content";[3] Rather, it builds, structures and deconstructs itself continuously, in relation to the growth and change of the people who live there. Every territory is a histoire à soi,[4] lived space,[5] represented, interpreted, subjectivised within a common history.

In this context, the new configuration of world culture given by migrations, by the media, could set the preliminary conditions for the development of a planetary humanism where it would be possible to understand the "global embrace" that McLuhan attributed to the extension of the senses realised by the senses, as an extension of our own central nervous system.[6]

How can the global embrace be developed in the perspective of a planetary humanism?

How can education in this society open to all but isolating support democracy to finally become the political system, the guarantor of the development of individual and collective identity?

How can we all move in this direction?

A model to be re-read for this purpose may be the one expressed by Dewey[7] in 1916 in Democracy and Education, where the author establishes an organic connection between democracy, education, the scientific method and industrialism. The relationship established between these aspects could be the cure for the crises of contemporary society. This relationship can provide suggestions for ensuring

progress that is not only limited to ethical and religious reasons, but also extends to education, where education must not only guide the individual to adapt, but must also continually adapt and re-adapt to the specificities of the environment.

It is precisely here that pedagogical planning can intervene with transformative praxis. We are faced with a repositioning in relation to the territory that is increasingly taken as the key to orienting educational processes[8] and promote processes of co-evolution between actors to grow in community.

In particular, posing the question of the territory today, in the sign of a renewed pedagogical reflexivity, responds to a cogent tension and intention to correspond to the innumerable formative instances emerging from local subjectivities and worlds.

Education, therefore, as a natural process that is linked to the democratic process where the centrality of the community can only be realised through a great educational process from below, involving not only individuals, but also the entire social community.[9]

"Operating inclusion instead of exclusion means considering the needs and rights of coexistence of every human being, of the closest and the farthest away, considering as inescapable for an open society the direction towards cohabitation and not towards division. The vertical relationship with the State, typical of an institutional type of civic education, must be flanked by a horizontal relationship of recognition of others, a relationship from citizen to citizen, from person to person, rooted in the fact of recognising each person a place and a role in the community, because dignified participation constitutes a fundamental objective of citizenship education".[10]

According to Paparella, "it is not a question of educating diversity as if to find ways for it not to cause annoyance; it is not a question of educating to diversity, as if to equip the person for a confrontation he could do without; it is rather a question of educating with diversity, to free the person from his stereotypes [...] the conscience from its everyday dress [...] belonging from the temptation of mimicry and gregariousness, freeing it from the risk of denial of the past and the danger of mystification, to the advantage of a belonging that restores to the person freedom, criticality and a great capacity for dialogue".[11]

We should, according to Antinori, educate to a space where the lived dialogue of the encounter (theorised by Buber to Guardini from Danilo Dolci to Freire to Don Milani) that shakes us to the core, forces us to a change of life, to a reciprocal integration, from the I-Thou that are constituted from the we so, of exchange, reciprocity and solidarity, in which human dignity becomes the universal moral value of the person.

As Milena Santerini suggests, "To educate about is to limit oneself to providing knowledge and understanding of the workings of society from a social, civic and political point of view; to educate through citizenship and above all education for citizenship means, on the other hand, to promote the learning and skills necessary to participate in the life of the school and the local community in order to constructively take on the relevant responsibilities".[12]

Already Kant, in a very significant passage of the "Metaphysics of morals", considered it "a duty towards oneself and towards others not to isolate oneself, not to forget that the circle of ethical perfections that one draws around oneself is to be considered as part of a larger circle that embraces everything, namely the circle of cosmopolitan sentiments"[13] where coexistence and mutual tolerance are the only possible choice suggested by nature and reason imposed by the very sphericity of the world as an ontological condition of "world citizenship" and as the foundation of a cosmopolitan dimension for perpetual peace.

The "community of destiny",[14] effective expression with which Edgar Morin defined the effects of interdependence on the lives of individuals and humanity as a whole, is to be seen as the product of globalisation.

In order for this new consciousness to develop, he indicates the need for an ethical, cultural, political and social metamorphosis, starting from the regeneration of different forms and traditions of universalism, in the evolution of a planetary humanism that is no longer abstract and ideal, as in the past, but rooted in the concrete conditions posed by globalisation in the recognition and valorisation of diversity in the unity of the human.[15]

On the other hand Ulrich Beck[16] considers that the dominant individualistic tendency of our time eludes any sense of social responsibility, opposing self-referential, particularistic answers and personal gratifications to issues or conditions shared by the entire society-world. Wim Wenders[17] argues instead that the common denominator of all people is living, living in peace.

Against this backdrop, education and schooling on the one hand and democracy on the other are an expression of each other; by building subjectivity, schooling also re-constructs society.

In this context, multicultural education is not only about the development of capacities, skills in an intercultural and transcultural perspective, but is also about ethical co-responsibility [18] on the part of each, exemplarity, educational testimony, in order to adhere to a humanising project lived and thought out from below, for that reason very often silent, daily, arduous, of a world at the service of the human person where pedagogy, to use an expression of Giuseppe Acone, must continually aim at that projective beacon[19] to restore light to shadowy areas where human life is in danger of being annihilated and, against the hypertrophy of the ego, cultivate humanity.[20]

This is the educational challenge: the challenge of an education in complexity where politics must set itself the task of regenerating itself into a politics of planetary civilisation, with the aim of "globalising solidarity".[21]

Cultural and technological challenges for new humanism

Why talk about digital humanism today? Can digital technology bring different cultures closer together according to a pedagogy of proximity?

The spread of ICT, the use over the last two years in schools, universities of distance learning and integrated teaching, has represented, and still represents, the possibility of unifying and building bridges between places, different cultures, between souls. Through technology, teachers have been able to take care of students, of their educational, relational as well as cognitive needs. Technology, in the context of the Covid19 pandemic, brought students closer to other students, to teachers, to the school; it shortened distances between friends, between workers and the world of work, between parents and children when they lived in different cities; it has united the whole of humanity, albeit with peaks, moments of discouragement, of alienation in front of the machine, rather than of not fully mastering it/not owning it, of using the net, but all of us, indiscriminately, have tried to stay united, to meet each other, to exchange opinions, thoughts, shares/notes, albeit virtually.

In view of this, technology, the Internet could potentially represent the multicultural, intercultural, transcultural platform par excellence where we can learn to build the world of tomorrow; a united world, where there is no overpowering between different cultures, races, ethnicities, where everything can be shared and reinterpreted in a communion of intentions.

Why not continue to use it as a flywheel for a new humanism oriented towards sharing, towards an understanding capable of affecting the social mechanisms of trust and cooperation?

As early as 1963, the Toronto School, led by the Canadian economist Harold Innis, in elaborating the paradigm of technological determinism, had pointed out the risk that technologies would not merely accompany social changes, but determine them.

In order to fully understand the impact of digital technologies, it is appropriate to take an evolutionist analytical perspective, according to which the digital revolution is not only technological, but above all socio-anthropological.

For a long time, technical knowledge and the consequent activity of production were considered subordinate to a 'high' culture in which resided the reflection on the direction of this know-how, on the intrinsic values of practical-productive action. Plato and Aristotle, while recognising the importance of farmers, artisans and merchants, excluded them from the status of citizens, of free men who, to be truly such, must be able to enjoy sufficient time for the exercise of virtue.

Bacon, in full controversy with Aristotle, in the Novum Organum, believes that man's purpose lies in generating and introducing into a given body a new nature or several different natures in order to direct it towards the effective satisfaction of human needs by operating through a method of an experimental nature in the modern sense of the term. According to Popitz[22] does not give rise to a condition of biological deficiency, but rather to the possession of specific capacities, of which the hand is the focal point. Man is not a deficient being in need of compensation, technique does not balance an organic deficiency but, on the contrary, exploits a specific organic capacity in that "'the capacity to act technologically is already present in man's fundamental organic construction".[23] For Popitz as well as for Gehlen, the history of technology is the history of man himself and his culture, as well as the expression of an innate predisposition to act, pursuing the aim of rationalising the world and his own position in it, even producing what is not given in nature: the artefact.

It therefore seems plausible to affirm that the nature-culture opposition finds in technological action the channel of communication, exchange and reciprocal influence.

Despite the central value of technological action, this is not subject to deterministic correspondences between cause and effect, because technology may be the reason for human development, but it is certainly also an effect of it, since processes influence products and products influence processes.

Anthropology of technology and culture of technology are not, therefore, alternatives to each other, but rather complementary: man is anthropologically determined in his being in the world through technical action and this entails a progressive construction of a technological culture, meaning a complexity of aspects that make it progressively coincide with a culture of technology. Not dualism but reciprocal functionality capable of healing even the rift, which has been shown to be insubstantial, between pure knowledge and technical knowledge. The distinction between téchne and epistéme finds no valid arguments for its perpetuation today.

How, then, can we address the role of technologies within educational processes if not from this complexity? Technology, social networks and, more generally, the digital revolution, although having brought about a paradigm shift, creating the structural conditions for the interdependence (and efficiency) of systems and organisations and intensifying the intangible flows between social actors, are still unable to guarantee that the interaction networks created generate communicative relations, based on symmetrical relationships and real sharing. In other words, the Net creates a new ecosystem of communication but, while redefining the space of knowledge, it cannot guarantee, in and of itself, horizontality or more symmetrical relationships. The difference is in the people and the uses to which technology is put, beyond the many interests at stake.[24]

Is it therefore possible to develop the global embrace in the perspective of a planetary humanism? In the condition determined by the current arrangement of the global image, according to Zygmunt Bauman, the spectator no longer has any extenuating circumstances for his inaction: "seeing means knowing: we can no longer shield ourselves from our ignorance".[25] However, it is necessary to reiterate, paraphrasing Edgar Morin, that the information society, the knowledge society and the communication society have not yet become societies of planetary responsibility and conscience, despite the 'immediacy' of the global image that pervades them.

A first step in transforming the spectator into a global actor could be to recognise that 'seeing' does not always equate to 'knowing', or at least to complex knowledge adapted to the needs of humanity in the

age of globalisation, as this type of knowledge demands a balance between logical-rational knowledge and analogical-sensible understanding.

A further step in the acquisition of a consciousness and responsibility suited to the global image could consist in recognising that the spectator's innocence on the world stage is entirely illusory and that the freedom he or she enjoys is by no means absolute, i.e. free of any sort of limitation, restriction or condition, since, as is well known, all freedom is a function of certain conditions and is always complementary to a certain responsibility. The solitude, independence and autonomy of the global spectator are only apparent and therefore not without consequences on a global scale. Education plays a crucial role in the acquisition of awareness of the primary medium functions that the global image plays in determining knowledge and awareness of the world.

Whatever the relationship of individuals with technologies, they are citizens, who must participate as actively and consciously as possible in the choices of their community, as well as persons who need, in order to develop their cultural potential, to understand all relevant aspects of the world around them. This is why, in addition to a strong awareness of context and values, everyone should know the basic principles of technologies and develop a desire to discover how technical objects work.

In this sense, the recomposition of an increasingly fragmented global context is up to communication, understood as a social process of knowledge sharing, conflict mediation, a synonym for sociality, a complex "tool" for overcoming individualism, a platform for connection, cooperation and social production of knowledge.

A strategic goal for innovation to achieve more open and inclusive social systems. It is primarily a cognitive challenge, with theory and research/action feeding off each other: a challenge that brings with it an assumption of responsibility, both individually and collectively: innovation and inclusion cannot be 'for the few'. Otherwise, terms such as identity, rights, citizenship, freedom, inclusion, meritocracy, access, participation, democracy... will turn out to be 'empty' words, functional only to certain narratives on innovation and digital and to a certain public discourse that is all too conformist and standardising.

It is up to the school and the family to educate in democratic citizenship, to prepare young people and adults for active participation in democratic society, strengthening democratic culture. This can contribute to the fight against violence, xenophobia, racism, aggressive nationalism, intolerance; contribute to the consolidation of cohesion, social justice, the common good; strengthen civil society by helping citizens to build the skills and knowledge necessary for democratic life across national, social, cultural and historical boundaries.

NOTES

[1] Antonio Canovi. "*Il territorio e i suoi segni. Memoria di tre recenti esperienze condotte tra riflessione culturale e concrete proposte di ricerca storica. Ricerche Storiche"*, XXVI, 70, 5-16 (1992). Antonio Canovi. "*Il territorio abitato dalla memoria. Ricerche Storiche", 79, 88* (1996).

[2] Giuseppe Dematteis. "*Le metafore della Terra"*. Feltrinelli (1991).

[3] Henri Lefebvre. "*La produzione dello spazio, la critica alla vita quotidiana e il diritto alla città"*. Università Ca' Foscari (2019).

[4] Alban Bensa, Daniel Fabre. "*Une histoire à soi, Éditions de la Maison des sciences de l'homme, Ministère de la Culture"*. Paris (2015).

[5] Vanna Iori. "*Lo spazio vissuto. Luoghi educativi e soggettività"*. La Nuova Italia (1999).

[6] Marshall McLuhan. "*Understanding Media"*. Taylor & Francis Ltd, Abingdon (2001).

[7] John Dewey. "*Democracy and Education"*. Anicia (2018).

[8] Emiliana Mannese. "*Apprendimento e formazione. Nuove prospettive di ricerca"*. Pensa Editore (2012).

[9] Giuseppe Spadafora. "*L'educazione per la democrazia. Studi su John Dewey"*. Anicia (2015).

[10] Claudio De Luca. "*Per una pedagogia della cittadinanza"*. Anicia (2014). Giuseppe Spadafora. "*Verso l'emancipazione. Una pedagogia critica per la democrazia"*. Carocci Editore (2010).

[11] Nicola Paparella. "*Appartenenza culturale ed educazione alla scelta"*. in AA. VV., "*Razzismo e frantumazione etnica. Politiche sociali e interventi educativi*". Quaderni dei Nuovi annali dell'Università di Messina, Herder (1995). Velleda Bolognari, Cettina Sirna. "*Razzismo e frantumazione etnica: politiche sociali e interventi educativi*". Atti del Convegno tenuto a Messina nei giorni 25-27 marzo (1993).

[12] Milena Santerini. "*La scuola della cittadinanza". Editori Laterza* (2010).

[13] Immanuel Kant. "*Die Methaphysik der Sitten* (La metafisica dei costumi)". Testo tedesco a fronte, a cura di G. Landolfi Petrone. Bompiani (2006).

[14] Edgar Morin, Anne Brigitte Kern. "*Terra-Patria"*. Raffaello Cortina Editore (1994). Edgar Morin. "*La Voie. Pour l'avenir de l'humanité*". Hachette Pluriel Reference (2012).

[15] Edgar Morin. "*Pour un umanisme régénéré"*. In https://www.ouest-france.fr/reflexion/editorial/pour-un-humanisme-regenere-4034479, consultato il 16/11/2022. Edgar Morin. "*Culture et barbarie européennes*", Bayard (2009). Edgar Morin "*La Méthode V: Identité humaine*". Essais (2003). Edgar Morin. "*La Méthode VI: Ethiqu".* Essais (2004). Edgar Morin. "*La Tete Bien Faite"*. Volumen (2017). Edgar Morin. "*Les sept savoirs nécessaires à l'éducation du futur*". Essais (2015). Edgar Morin, Mauro Ceruti. "*La nostra Europa. Cosa possiamo sperare? Cosa dobbiamo fare?".* Raffaello Cortina Editore (2013). Gianluca Bocchi, Mario Ceruti, Edgar Morin. *"L'Europa nell'era planetaria".* Sperling & Kupfer Editori (1991). Gianluca Bocchi, Mauro Ceruti. "*Educazione e globalizzazione*" Raffaello Cortina Editore (2004). Mario Ceruti. "*Il tempo della complessità*". Raffaello Cortina Editore (2018). Edgar Morin, Chiara Simonigh. "*Pensare la complessità per un umanesimo planetario*". Mimesis Editore (2012).

[16] Ulrich Beck. "*La società del rischio. verso una seconda umanità*". Carocci Editore (2013).

[17] Wim Wenders, Mary Zournazi. "*Inventare la pace. Dialogo sulla percezione".* Bompiani (2014).

[18] Karl Otto Apel. "*Verità e comunicazione".* In https://www.filosofico.net/apel.htm, consultato il 17/11/2022.

[19] Giuseppe Acone. "*La famiglia educante in Occidente tra crisi e insuperabilità*". Vita e Pensiero Editore (2003).

[20] Martha C. Nussbaum. "*Coltivare l'umanità. I classici, il multiculturalismo, l'educazione contemporanea*". Carocci Editore (2006).

[21] Mario Ceruti, Francesco Bellusci. "*Abitare la complessità. La sfida di un destino comune"*. Mimesis (2020).

[22] Heinrich Popitz. "*Verso una società artificiale?".* In https://www.lindipendente.online/2021/10/02/verso-una-societa-artificiale/, consultato il 17/11/2022.

[23] Arnold Gehlen. "*L'uomo nell'era della tecnica*" Armando Editore (2003).

[24] Piero Dominici. "*Dentro la società interconnessa. La cultura della complessità per abitare i confini e le tensioni della civiltà ipertecnologica*". Franco Angeli Editore (2019. As for the concept of "*Hypercomplex Society,*" with its operational definition, it was proposed by me in the mid-1990s and subsequently developed* in Piero Dominici. "*La comunicazione nella società ipercomplessa. Istanze per l'agire comunicativo e la condivisione della conoscenza nella Network Society*". Aracne (2005). And in "*La comunicazione nella società ipercomplessa. Condividere la conoscenza per governare il mutamento"* Franco Angeli (2011).

[25] Zygmunt Bauman. "*Noi e i media: spettatori o protagonisti*". In http://www.scienzepostmoderne.org, consultato il 17/11/2022*;* AA.VV. "*Il luogo dello spettatore*". Antonio Somaini (a cura di). Economia dei beni culturali (2005). Zygmunt Bauman. "*Il secolo degli spettatori, Il dilemma globale della sofferenza umana".* EDB (2015); Peppino Ortoleva. "*Il secolo dei media. Stili, dinamiche, paradossi*". Il Saggiatore (2022).

BIBLIOGRAPHY

AA.VV., *Il luogo dello spettatore*, Antonio Somaini (a cura di), Economia dei beni culturali, 2005.

Giuseppe, Acone, *La famiglia educante in Occidente tra crisi e insuperabilità*, Vita e Pensiero Editore, Milano 2003.

Karl, Otto Apel, *Verità e comunicazione, in* https://www.filosofico.net/apel.htm, consultato il 17/11/2022.

Zygmunt, Bauman, *Il secolo degli spettatori*, *Il dilemma globale della sofferenza umana*, EDB, Bologna 2015.

Zygmunt, Bauman, *Noi e i media: spettatori o protagonisti*, in http://www.scienzepostmoderne.org, consultato il 17/11/2022.

Ulrich, Beck, *La società del rischio. verso una seconda umanità*, Carocci Editore, Roma 2013.

Alban, Bensa, Fabre Daniel, *Une histoire à soi,* Éditions de la Maison des sciences de l'homme, Ministère de la Culture, Paris 2015.

Gianluca, Bocchi, Mario Ceruti, e Edgar Morin, *L'Europa nell'era planetaria*, Sperling & Kupfer Editori 1991.

Velleda, Bolognari, Cettina, Sirna, *Razzismo e frantumazione etnica: politiche sociali e interventi educativi*, atti del Convegno tenuto a Messina nei giorni 25-27 marzo 1993

Antoni, Canovi (1992), *Il territorio e i suoi segni. Memoria di tre recenti esperienze condotte tra riflessione culturale e concrete proposte di ricerca storica,* Ricerche Storiche, XXVI, 70, 5-16.

Antonio, Canovi (1996), *Il territorio abitato dalla memoria. Ricerche Storiche.*

Mario, Ceruti, Francesco, Bellusci, *Abitare la complessità. La sfida di un destino comune,* Mimesis, Milano 2020.

Ceruti, Mario, *Il tempo della complessità*, Raffaello Cortina Editore, Milano 2018.

Claudio, De Luca, *Per una pedagogia della cittadinanza*, Anicia, Roma 2014.

Giuseppe, Dematteis, *Le metafore della Terra*, Feltrinelli, Milano 1991.

John, Dewey, *Democracy and Education*, Anicia, Roma 2018.

Piero, Dominici, *Dentro la società interconnessa. La cultura della complessità per abitare i confini e le tensioni della civiltà ipertecnologica*, Franco Angeli Editore, Milano 2019.

Piero, Dominici, *La comunicazione nella società ipercomplessa. Condividere la conoscenza per governare il mutamento* Franco Angeli, Milano 2011.

Piero, Dominici, *La comunicazione nella società ipercomplessa. Istanze per l'agire comunicativo e la condivisione della conoscenza nella Network Society*, Aracne, Roma 2005

Arnold, Gehlen, *L'uomo nell'era della tecnica*, Armando Editore, Roma 2003.

Vanna, Iori, *Lo spazio vissuto. Luoghi educativi e soggettività*, La Nuova Italia, Firenze 1999.

Immanuel, Kant, *Die Methaphysik der Sitten* (La metafisica dei costumi), 1797.

Henri, Lefebvre, *La produzione dello spazio, la critica alla vita quotidiana e il diritto alla città*, Università Ca' Foscari, Venezia 2019.

Emiliana, Mannese, *Apprendimento e formazione. Nuove prospettive di ricerca*, Pensa Editore, San Cesario di Lecce 2012

Marshall, McLuhan, *Understanding Media*, Taylor & Francis Ltd, Abingdon 2001.

Edgar, Morin, *La Tete Bien Faite*, Volumen, Roma 2017.

Edgar, Morin, *Les sept savoirs nécessaires à l'éducation du futur*, Essais, Paris 2015.

Edgar, Morin, Mauro Ceruti, *La nostra Europa. Cosa possiamo sperare? Cosa dobbiamo fare?,* Raffaello Cortina Editore, Milano 2013.

Edgar, Morin, Chiara Simonigh, *Pensare la complessità per un umanesimo planetario*, Mimesis Editore, Milano 2012.

Edgar, Morin,, *La Voie. Pour l'avenir de l'humanité*, Hachette Pluriel Reference, Paris 2012.

Edgar, Morin, *Culture et barbarie européennes*, Bayard, Paris 2009.

Edgar Morin, *La Méthode VI: Ethique*, Essais, Paris 2004.

Edgar, Morin, *La Méthode V*: *Identité humaine*, Essais, Paris 2003.

Edgar, Morin, Anne Brigitte Kern, *Terra-Patria*, Raffaello Cortina Editore, Milano 1994.

Edgar, Morin, *Pour un umanisme régénéré*, in https://www.ouest-france.fr/reflexion/editorial/pour-un-humanisme-regenere-4034479, consultato il 16/11/2022.

Martha, Craven, Nussbaum, *Coltivare l'umanità. I classici, il multiculturalismo, l'educazione contemporanea*, Carocci Editore, Roma 2006.

Peppino, Ortoleva, *Il secolo dei media. Stili, dinamiche, paradossi*, Il Saggiatore, Milano 2022.

Nicola, Paparella, *Appartenenza culturale ed educazione alla scelta,* in AA. VV., Razzismo e frantumazione etnica. Politiche sociali e interventi educativi, Quaderni dei Nuovi annali dell'Università di Messina, Herder, Roma 1995.

Heinrich Popitz, *Verso una società artificiale?,* in https://www.lindipendente.online/2021/10/02/verso-una-societa-artificiale/, consultato il 17/11/2022.

Milena, Santerini, *La scuola della cittadinanza, Editori Laterza*, Roma-Bari 2010.

Giuseppe, Spadafora, *L'educazione per la democrazia. Studi su John Dewey*, Anicia, Roma 2015.

Giuseppe, Spadafora, *Verso l'emancipazione. Una pedagogia critica per la democrazia*, Carocci Editore, Roma 2010.

Wim, Wenders, Mary, Zournazi, *Inventare la pace. Dialogo sulla percezione,* Bompiani, Milano 2014.

AN INTANGIBLE THREAD: IN SEARCH OF CREATIVITY THROUGH TEACHING AND LEARNING LIBERAL ARTS IN INTERACTIVE DESIGN

Author:
JING ZHOU

Affiliation:
MONMOUTH UNIVERSITY, USA

INTRODUCTION

College students in recent decades have been shunning liberal arts and the decreasing number of undergraduates pursuing bachelor's degrees in liberal studies has led to the weakening of liberal arts in the undergraduate general education curriculum. For centuries, a strong liberal-arts component to teach deeper understanding, critical thinking, and writing has been at the heart of higher education. Yet, a number of anomalies are becoming increasingly ubiquitous today, e.g., the downsizing and shrinking budgets of liberal arts and humanities programs and departments, college rankings by alumni salary potential,[1] the demand for strategic work-based curriculum development and learning opportunities with employers, et al. Each of these phenomena is plausible in their own right, however, many experts— such as Thorstein Veblen,[2] Allan Bloom,[3] and Frank Furedi[4]—have criticized the commercialization of higher education during the last century, and some have suggested solutions. Nonetheless, this downward shift still persists today since more modern universities have given up, if not entirely, "academic autonomy and artistic integrity" to embrace "licensing new inventions, consulting with corporations, and spinning out high-tech companies."[5] In this institutional climate accompanied by rapid growing technologies, what would be the pedagogical tools and mindset necessary to teach interactive design—a field of study driven by evolving technology and a raising job market[6]—but at the same time, reinforce the core mission of higher education which emphasizes on lifelong learning and leads students to meaningful lives rather than merely training for their careers?

This essay presents a fifteen-year exploration of implementing a liberal arts approach to interactive design pedagogy supported by student project samples, although academic prioritization continuously promotes more job-oriented disciplines. The practice of integrating liberal arts component and soft skills[7] into graphic design courses is well known but often neglected in technology-focused design courses such as web design and programming. Furthermore, it was in this teaching experience that I— a design educator—also was a learner motivated by great thinkers and a thirst for wisdom. Not only did this gradual intellectual transformation help my students to achieve better learning outcomes, but also inspired myself to embark on an unexpected journey of creating two internationally recognized award- winning[8] interactive design projects—*Jiang Jian* and *Cradlr*. Completed in 2020, the two interconnected projects now serve as samples for my students.

Background Information

Liberal Arts Education Synopsis

Whether it is the medieval European university or modern higher education, liberal arts studies aim at imparting general knowledge and developing general intellectual capacities[9] in contrast to a professional, vocational, or technical curriculum.[10] For over 2,000 years, universities offered degrees in Liberal Arts which combined humanities, social and natural science, and the fine arts all centered around a philosophical outlook[11] not restricted by the professional boundaries. In essence, liberal arts education fosters a passion for wisdom and teaches critical self-examination[12] which will help pupils to discover meaning and possibly vocation in life.

The Weakening of Liberal Arts

The decline of liberal arts education in the 20th century was echoed in these truthful words written by Saul Bellow, a Nobel laureate and former professor, in a short text called *An Interview with Myself* (1975), "If professors of humanities were moved by the sublimity of the poets and philosophers they teach, they would be the most powerful men in the university and the most fervent. But they are at the lower end of the hierarchy, at the bottom of the pile."[13] On the other hand, one recent study by American Enterprise Institute found that the number of undergraduates earning bachelor's degrees in liberal arts subjects such as Philosophy, English, and History, fell by 4-25% between 2008 and 2016, although the total number of bachelor's degrees rose 31% during the same time—as shown in Figure 1.[14]

Field of Study	Change in Number of Completions (2007–16)	Number of Completions (2016)
Philosophy and Religious Studies	−15%	10,147
Liberal Arts and Humanities	**−4%**	**43,641**
English Language, Literature, and Composition	−22%	42,728
History	−25%	25,464
Area, Ethnic, and Civilization Studies	−4%	7,834
Biology and Life Sciences	55%	113,665
Mathematics and Statistics	54%	22,727
Social Sciences	6%	135,048
Business	24%	370,000
Engineering Technologies	704%	16,512
Computer and Information Sciences	85%	64,267
All Majors	**31%**	**—** *

Note: * Total completions are not listed for all majors to not confuse the reader because several fields of study are omitted in the table for brevity. Number of completions represents total first-major bachelor's degrees conferred by Title-IV participating, four-year institutions during the 2007–08 and 2015–16 academic years.
Source: Authors' calculations using Integrated Postsecondary Data System, 2007–08 and 2015–16.

Figure 1. Percentage change in Bachelor's degrees conferred by selected field of study.

Soft Skills

The PBS NewsHour article *How colleges are adapting to the decline in liberal arts majors* (2018) argued the necessity of soft skills that one learns from a liberal arts education to better understand the world, think critically, express oneself more clearly, and consider the moral implications of actions.[15] Soft Skills can be summarized as skills, abilities, and traits that pertain to personality, attitude, and behavior rather than to formal or technical knowledge,[16] e.g., communication, teamwork, and critical thinking.[17] This definition suggests that soft skills are less tangible than hard technical skills, therefore, difficult to be measured accurately. The article also pointed out that soft skills were indeed some of the hardest things that faculty members would ever teach, which I will later elaborate in this essay.

Interactive Design, Interaction Design, UX, UI, Web Design, and Web Programming

While some categorized interactive design as designing for screen-based experiences,[18] others regarded it as a user-oriented field of study to create interactive products and services[19] (e.g., websites, video games, augmented reality experiences, et al) through meaningful arrangements of media and technology[20] to communicate effectively. It is easy to be confused with interaction design (IxD)—the design of interactive products and services in which a designer's focus goes beyond the item in development to include the way users will interact with it.[21] Both fields have established close ties with the user, but for different purposes. Interactive design emphasizes the creation and building of interactive products and services for the users, while IxD focuses on customized design to precisely suit the users' needs, limitations, contexts, and more.[22]

IxD is an important component within the giant umbrella of user experience (UX) design,[23] which encompasses all aspects of the end-user's interaction with the company, its services, and its products.[24] Highly related to UX, user interface (UI) design is the process designers use to build interfaces in software or computerized devices, focusing on looks or style.[25]

Web design is the design of websites that are displayed on the internet; it usually refers to the user experience aspects of website development rather than software development.[26] On the other hand, web programming (coding) means writing the necessary source code to create a website.[27]

The Author's Institution

Pressured by enrollment decline, many colleges and universities were compelled to change their marketing strategy and demonstrate the value of their programs. One way is to match liberal arts coursework with career-enhancing skills. For instance, the Department of Art and Design at Monmouth University (MU) established the Bachelor of Fine Arts (BFA) in Design and Animation with a Concentration in Graphic and Interactive Design program in the late 1990s to meet the career demand. Within this program, interactive design is one of the fast-growing fields driven by a tech-hungry economy, which I started teaching in the early 2000s.

TEACHING AND LEARNING LIBERAL ARTS IN INTERACTIVE DESIGN

The BFA curriculum of Graphic and Interactive Design at MU seamlessly integrates IxD/UI/UX into its existing courses over the past decade. The two undergraduate courses that I teach—Web Design/Interactive I and II—are centered around web design and web programming along with IxD, UI, and the UX principles.

Common Practices and Challenges

The pedagogical focus of web and interactive design in undergraduate study is primarily based on technological, visual, and problem-solving skills to produce digital products. A significant amount of time and attention is dedicated to technical trainings, which evolve quickly; the project-based syllabi are predominantly driven by industry trends and user needs, which leave little room for intellectual growth and deeper understanding. Based on my study, the classroom projects in web and interactive design related courses often serve practical and commercial purposes, such as product landing pages, existing app or website redesigns, augmented reality experiences for events, video games, web banners, online advertising campaigns, coding exercises, and portfolio websites. Here are my student project samples of website redesign—as shown in Figure 2.
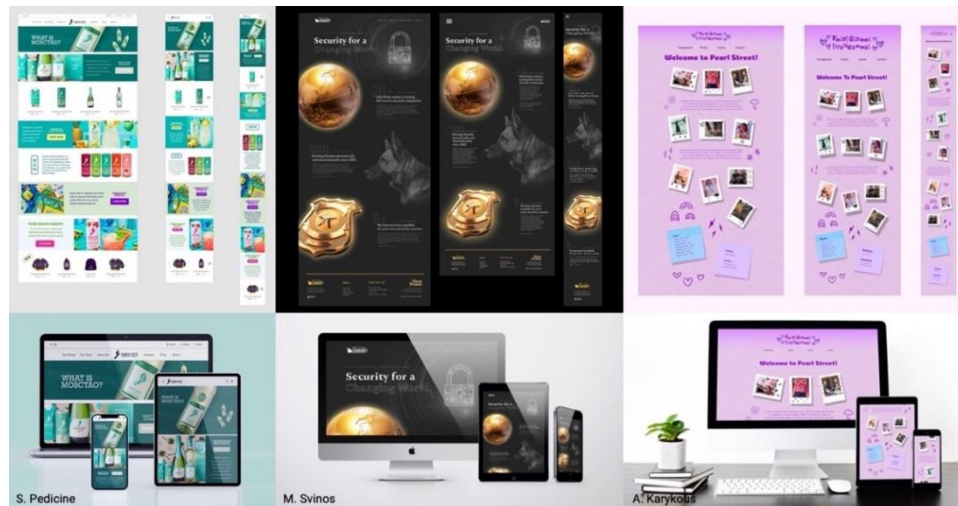
Figure 2. Three website redesign samples by my students.

The powerful impact of technology has inundated nearly every corner of society. The history of web design goes back to the early 1990s.[28] The rise and fall of web design software, frequent updates on web programming and frameworks, the evolution of social media, browser wars, device domination, and related social and ethical issues swiped through the past three decades. The complexity of web technology surged in the past ten years, and the tech industry grew so exponentially that gaining web programming skills has become particularly popular and necessary for any design students who wanted to enter a lucrative career in the web industry. Nevertheless, in a 2019 Awwwards Conference[29] talk, the expansion of web technology was considered as "overwhelming" even for people who created this industry.[30] A recent study found that more people worried the pace of technology was moving too fast.[31] Furthermore, many scholars have warned the public in statements such as "one of the reasons why our society is in such a state of unbalance is because technical achievements are disproportionately great in comparison with human achievements."[32]

This is just one of the many serious challenges in our society. How can I contribute my share, even though it is utterly insignificant, to perhaps ameliorate this state of unbalance?

A Liberal Arts Approach to Interactive Design Pedagogy

In arts, to create means to produce something new. One of the quintessential characters of a creative person is originality fostered by independent thinking and courage. In his wise words, Sydney J. Harris advised us, "the whole purpose of education is to turn mirrors into windows." The goal of liberal arts education is to give students intellectual and creative freedom to think critically and broaden their perspectives. Modelled after the practice of integrating liberal arts component into graphic design courses, this approach of bringing liberal arts into technology-focused design syllabi serves a higher learning purpose—to prepare students for life, in addition to training marketable skills.

In my two undergraduate courses on web and interactive design, students have the opportunity to practice the five major steps of design workflow—research and goals, content creation and structure, wireframing and design mock-ups, production and development, and launch and assessment. In accordance with current professional design processes,[33] these steps are customized to accommodate my students' learning process and goals without client influences. The liberal arts approach occurs in the first two steps, which establish the conceptual framework of each project. It offers two directions: the intellectual track offered in Web Design/Interactive I which I started in 2007 and social awareness track in Web Design/Interactive II started in 2015; one points to the past, the other the present.

Intellectual Track

I encourage students to look beyond the expectations of their own disciplines and challenge the norms. On the intellectual track, each student designs a biography website of a remarkable person selected from a list of names carefully chosen by me every semester. (Figure 3) People on this diverse list have made significant contributions in history including some lesser-known in popular culture, i.e., Simone Weil, Albert Schweitzer, Nadine Gordimer, Mahatma Gandhi, Marie Curie, Laozi, Hypatia, Martin Luther King Jr., Anna Akhmatova, Jorge Luis Borges, and many more.[34]
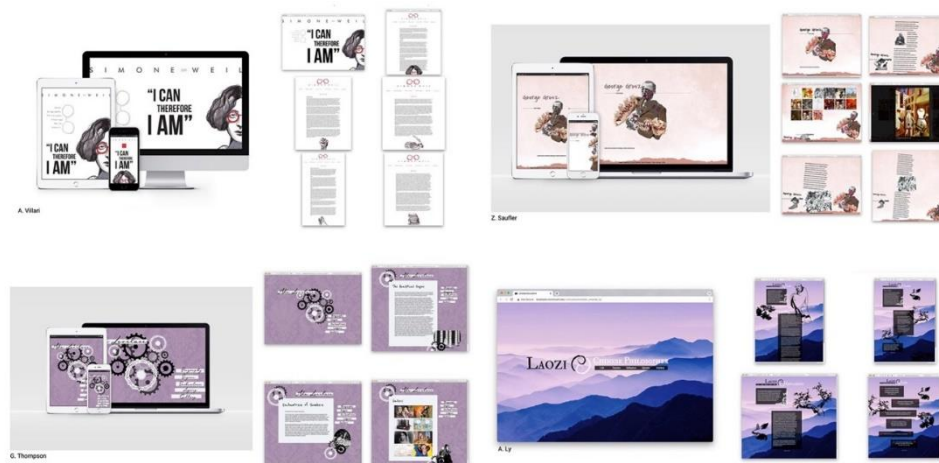
Figure 3. Four biography website samples by my students.

Biographies offer students access to role models who have made notable contributions to humanity and whom we are less likely to meet in real life. Biography studies is related to reading and writing in response to research. Before I decided on the biography website project, I experimented with other project ideas (e.g., websites for cultural events and research institutions), but none of them worked as well as creating biography websites that fulfills the learning outcomes of web design and programming along with intellectual empowerment all in a limited period.

This project instructs students to explore the historical background and life experiences of extraordinary individuals. In addition to celebrating and appreciating a distinguished person, this project offers students an opportunity to examine their own lives while practicing design and technical skills. To help students understand the lives of these marvelous thinkers, I used various media aids to introduce them in class before they made their choices. In recent years, I developed techniques to conduct classroom discussions on social and moral issues associated with their outstanding achievements. Through research and content writing—part of the content creation step, students edit and compose the biography of the selected individual. By trial and error, this seemingly common project has challenged both my students and myself. As an artist and designer, leading intellectual discussions in the classroom required me to continuously broaden my reading list of original and important books bringing the light of Virtue, Truth, and Beauty. During this teaching practice, my intellectual growth was gradually noticeable over a long period. Therefore, I believe that the impact that I have made on my students through this project would take a much longer time to be recognized after they graduate, and the soft skills that they developed could be potentially applicable elsewhere. At this point, I would like to remind you of the statement in one of the previous sections of this essay that "soft skills are indeed some of the hardest things that faculty members will ever teach."[35]

Social Design Track

Design expanded from its traditional territories in recent decades utilizing collaborative process to solve social and political challenges. The research and practice of social sustainable design brought positive outlooks to ongoing social and environmental issues. This application of design methodologies confronting complex human issues helps designers to better understand and define social problems, which stimulates new ideas on effective social change.

On the social design track, each student conducts research and investigates a contemporary social problem, then creates a website and/or mobile app prototype for this issue and related non-profit organizations. (Figure 4) Depending on the scope of the research, this project is often given in collaboration with other courses, such as our Senior Thesis capstone course—in this course, each student writes a paper tackling a social problem which serves as the conceptual framework for the graphic design thesis project. This teaching practice was inspired by colleagues in the design education community. Many of them have conducted extensive work and scholarly research on social design. This project motivates students to become social observers, problem solvers, being mindful of their responsibility in society, and contemplate ongoing issues in the world, such as climate change, human rights, sustainability, education, poverty, and many more.
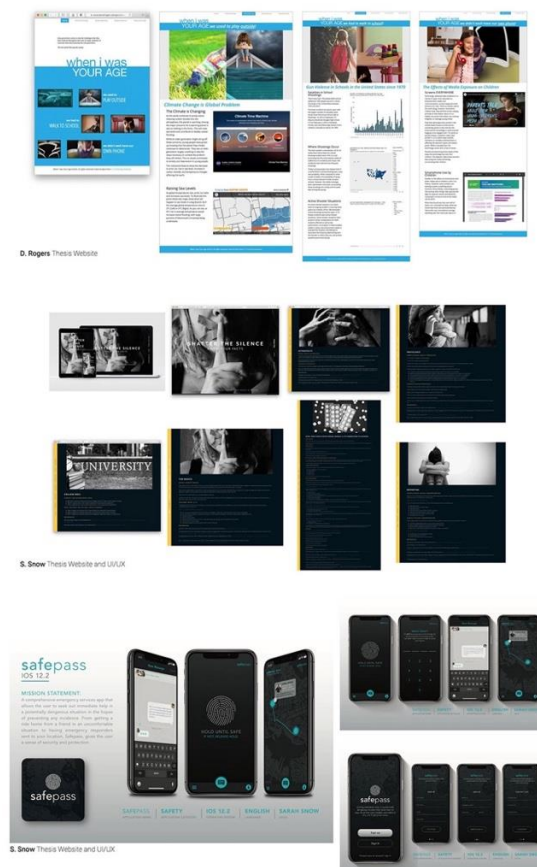

Figure 4. Three thesis website/mobile app design samples by my students.

TWO CREATIVE PROJECTS

This section summarizes the rationale, implementation, social and cultural influences, and historical background of *Cradlr: An Interaction Design for Refugee Children*, a human-centered digital network concept designed to keep displaced children—a vulnerable population without cell phones—connected

with their families, resources, and heritage. The seed of the *Cradlr* project was sown in 2018 when I launched the *Jiang Jian* project—a research and web design initiative that sheds light upon the forgotten stories of Jiang Jian (蒋鉴) and the Mothers' Movement[36] in China which rescued and educated 30,000 refugee children—during the Second Sino-Japanese War (1937-1945). Inspired by the Mothers' Movement and European countries during World War II, such as the Women's Voluntary Service (WVS) and the large-scale evacuations of children in the United Kingdom, *Cradlr* goes beyond the realm of digital product design in an attempt to find a humanitarian solution for a complex social challenge that transcends political boundaries. It envisions a global network connecting various parties and preserving a collective memory, which might help displaced children to overcome many adversities and receive more love and brighter futures. (Figure 5)

Figure 5. The English version of Jiang Jian website (homepage) and the Cradlr project (cover image).

Closely associated with my teaching practice, the two internationally recognized award-winning[37] design projects were completed in 2020 during the COVID-19 pandemic when millions of displaced people struggled to survive. According to the United Nations, the growing global refugee crisis in the recent decade has reached a staggering height and over half of this population are under the age of 18.[38] Hence, it is an urgent task to rescue and nurture young lives collectively on a global scale.

Looking back, the women who participated in the Mothers' Movement and Women's Volunteering Service have devoted good deeds to humanity. Not only are studying and honoring their contributions imperative to advance our common knowledge, but more importantly, transforming the lessons that we have learned from them into actions and new ideas is a necessary step. The *Cradlr* project is the fruit of this humble attempt.

The *Jiang Jian* Project

I heard Jiang's story in my childhood through my grandparents who knew Jiang personally. Little did I know that I would later spend two years engaging in the research necessary to design the *Jiang Jian* website that tells the forgotten story of this extraordinary woman—the "Chinese Nightingale", "Mother of Wounded Warriors," and "Mother of Refugee Children" who passed away as a nonpartisan at age 38 during the Second Sino-Japanese War.

After three months of exploration in 2018, I realized that the information about Jiang Jian scattered in various media was not only extensive but often misleading. Without an accurate and complete story, it would be unethical to launch her website. Inspired by Jiang's compassion and love, I undertook the challenge—research and writing Jiang's story in both Chinese and English. From that point on, I was both a designer and a biographer of this project, which led to unexpected adventures. In 2019, I published Jiang Jian's biographical article written in Chinese in Cradle—the official magazine of the Chinese Wartime Refugee Children's Relief and Education Association (中国战时儿童保育会). This article and its English translation became the core content of the *Jiang Jian* website—and

http://www.jiangjianz.com/eng (Figure 6) and http://www.jiangjianz.com (Figure 7). While the Chinese version of this website powered by WordPress aims at achieving an effective information architecture with visual clarity to carry heavier content, the English version built in HTML, CSS, JavaScript, and an open-source web framework focuses on bringing a compelling aesthetic experience to the audience. Celebrating the 80th anniversary of Jiang Jian's death, this website was launched in 2020 and dedicated one page to the Chinese Mothers' Movement in hopes of deepening our understanding of common human experiences and stimulating social change for generations to come.
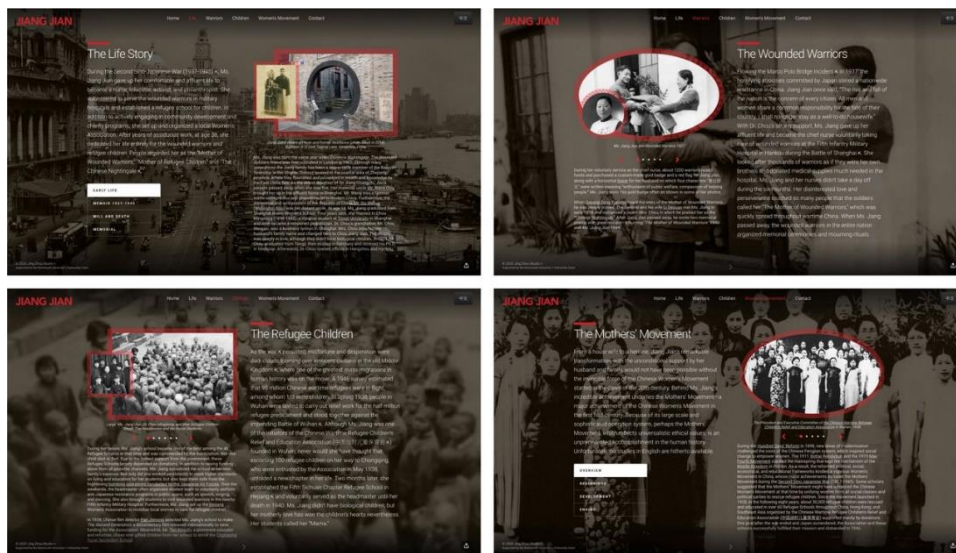

Figure 6. The English version of Jiang Jian website (sub-pages).

Figure 7. The Chinese version of Jiang Jian website (homepage).

The *Cradlr* Project

Enlightened by Jiang Jian's story and the Mothers' Movement, I was curious about how European countries rescued and protected displaced children in World War II. What would people do to mitigate catastrophic situations, if digital aids were available then? Through research and studying countries such as the United Kingdom and its Women's Voluntary Service (WVS), some social patterns were gradually unveiled and the ideation of *Cradlr* came to fruition in mid-2020. After examining digital tools produced for refugees in recent decades, I discovered that no digital platforms have been built for displaced children. Not only do they need opportunities to grow and receive education, but also have

connections to their families, resources, and heritage. For this very reason, it is crucial to weave a tapestry of collective memories for displaced children by their guardians. Therefore, I recognized that creating this project was a meaningful and feasible approach in search of new ways to help this vulnerable population who doesn't own mobile devices.

I spent over two months during the pandemic lockdowns to complete the preliminary case study and the designs, from mission statement to brand illustration, from user analysis to interface design, and finally the project presentation and a three-minute video introduction (https://vimeo.com/465617976). While developing *Cradlr*, I served as a member of the Institute for Global Understanding (IGU) Faculty Advisory Council at Monmouth University and a university representative to the United Nations Academic Impact (UNAI) in 2020-2021. *Cradlr* later became a UNAI Project at MU.

Due to page length limit, the detailed information of this project—i.e., the research, user analysis, design process, branding, and the final design—are not included in this essay, but can be found in my research article "From the Mothers' Movement to *Cradlr: An Interaction Design for Refugee Children*" in the ACM Digital Library[39] and the *Cradlr* document on the 2020 Design Incubation's Creative Works Award web page.[40] Here are eight selected pages of this project—as shown in Figure 8.
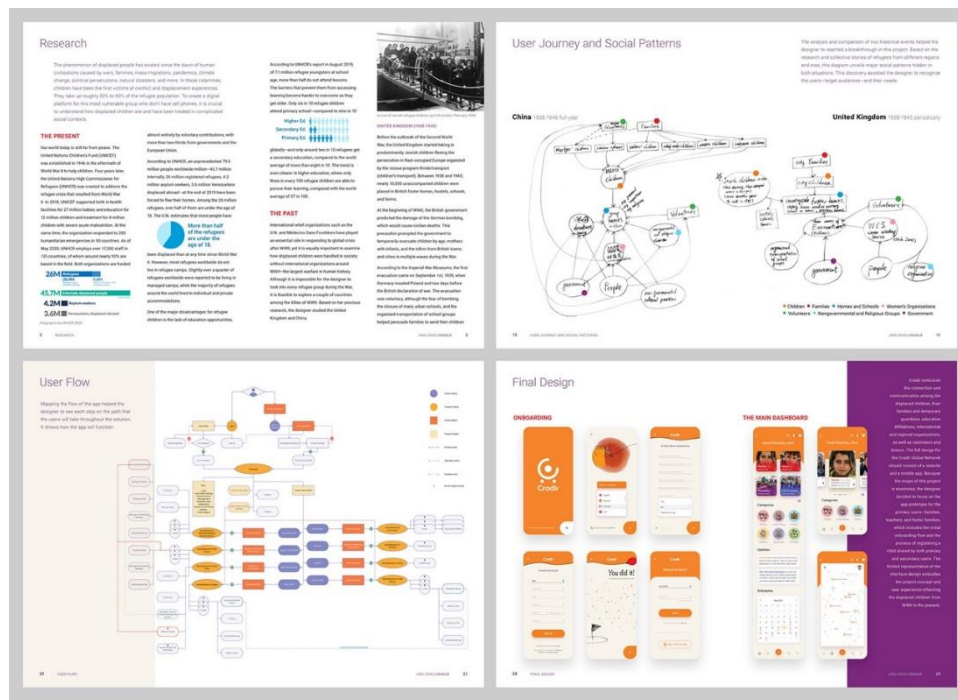

Figure 8. Eight selected pages of Cradlr.

CONCLUSION

Teaching and learning come hand-in-hand evolving and nurturing each other to pave a creative pathway for both students and educators. A passionate teacher is a lifelong learner. Together with my student work samples, my two creative projects presented here are also the outcomes of teaching and learning liberal arts in interactive design in one and half decades.

Students in the BFA Graphic and Interactive Design program at Monmouth University are developing soft skills in critical thinking, creativity, communication, teamwork, and a better understanding of the world, as well as design thinking and technological expertise related to their future careers. These soft skills, although more difficult to be measured than hard technical skills, could be potentially applicable in a broad range of fields. The pedagogical tools and processes introduced in this essay are a small part

of our curriculum; they are ongoing and frequently adjusted to meet specific demands. Both the intellectual track and social design track share the same mission—to bring positive impact at personal and social levels by advancing students' creative and intellectual capacities. These methods can be adapted to other types of interactive design projects besides web design, web programming, and mobile app design.

The creative journey and design process involved in the *Jiang Jian* and *Cradlr* projects were influenced by many stories from both the past and present. The renowned scholar Abraham Joshua Heschel pointed out that the authentic individual is neither an end nor a beginning but a link between ages, both memory and expectation.[41] On the one hand, through the *Jiang Jian* project, I inquired, inherited, and examined the history, but on the other hand, learning from my findings, I questioned, explored, and envisioned a solution for an ongoing social challenge in the *Cradlr* project. What stands behind the first project is the unwavering passion and compassion fused by the Mothers' Movement; what emerges from the second one is a meaningful transformation of that energy using digital means. As design and technology continuously evolve and reshape our culture, the two projects were created using different digital media, yet linked by one single thread—the universal love and reverence for life shared by many. This intangible thread is the key to wisdom and inner freedom obtainable through liberal arts education to cultivate a whole individual capable of facing various challenges in life with a mindset of independent thinking and lifelong learning.

NOTES

[1] Abigail Johnson Hess, "The Top 50 Us Colleges That Pay off the Most," CNBC, July 16, 2019, https://www.cnbc.com/2019/07/16/cnbc-make-it-the-top-50-us-colleges-that-pay-off-the-most-2019.html.

[2] Thorstein Veblen, *The Higher Learning in America* (New York: B. W. Huebsch, 1918).

[3] Allan Bloom, *The Closing of the American Mind* (New York: Simon & Schuster, 1987).

[4] Frank Furedi, *Where Have All the Intellectuals Gone?* (London • New York: Continuum, 2004).

[5] Furedi, 108.

[6] "AIGA Design Futures Trends: Introduction to Design Futures," American Institute of Graphic Arts (AIGA), accessed May 26, 2022, https://www.aiga.org/sites/default/files/2021-02/introduction-to-design-futures.pdf, 3.

[7] Philip Moss and Chris Tilly, "'Soft' Skills and Race: An Investigation of Black Men's Employment Problems," Work and Occupations 23(3) (1996): 252.

[8] International awards and exhibition: The *Jiang Jian* website received the Silver Award of IDEA Design at the 2021 United Design Alliance (UDA) Annual International Design Competition and was exhibited at the 2020 International Juried Virtual Exhibition Digital Power: Activism, Advocacy, and the Influence of Women Online organized by SIGGRAPH Digital Arts Community. *Cradlr* received the UX Design Award at 2021 Peru Design Biennial (Profile: 65,980 applicants, 14 categories, 14 award winners; 1 award winner in UX Design) and the Creative Work Award of the 2020 Design Incubation Communication Design Educators Awards.

[9] "Liberal Arts," Merriam-Webster, Inc., accessed May 31, 2022, https://www.merriam-webster.com/dictionary/liberal%20arts.

[10] "Liberal Arts," Encyclopædia Britannica, Inc., accessed May 31, 2022, https://www.britannica.com/topic/liberal-arts.

[11] "What Is Liberal Arts?," Liberal Arts Online, accessed May 26, 2022, https://liberalarts.online/what-is-liberal-arts.

[12] "Socrates—The Unexamined Life Is Not Worth Living," Liberal Arts • Thinking Now and Then, accessed May 31, 2022, https://liberalarts.org.uk/socrates-the-unexamined-life-is-not-worth-living.

[13] Saul Bellow, *It All Adds Up* (New York: Viking Press, 1994), 83.

[14] "Saving the Liberal Arts," American Enterprise Institute, accessed May 24, 2022, https://www.aei.org/wp-content/uploads/2018/02/Saving-the-Liberal-Arts.pdf, 5.

[15] Ben Felder, "How Colleges Are Adapting to the Decline in Liberal Arts Majors," PBS NewsHour, November 30, 2018, https://www.pbs.org/newshour/education/how-colleges-are-adapting-to-the-decline-in-liberal-arts-majors.

[16] Moss and Tilly, 252.

[17] "Soft Skills to Pay the Bills," U.S. Department of Labor, accessed May 31, 2022, https://www.dol.gov/agencies/odep/program-areas/individuals/youth/transition/soft-skills.

[18] Andy Pratt and Jason Nunes, *Interactive Design: An Introduction to the Theory and Application of User-Centered Design* (Beverly: Rockport Publishers, 2012), 6.

[19] Nicholas Luppa, *Interactive Design for New Media and the Web* (Woburn: Focal Press, 2001), 59.

[20] Lisa Graham, *Principles of Interactive Design* (Albany: Delmar Publishers, 1999), 4.

[21] "Interaction Design," Interaction Design Foundation, accessed May 31, 2022, https://www.interaction-design.org/literature/topics/interaction-design.

[22] "Interaction Design," Interaction Design Foundation, accessed May 31, 2022, https://www.interaction-design.org/literature/topics/interaction-design.

[23] "What Is Interaction Design?," Interaction Design Foundation, accessed May 31, 2022, https://www.interaction-design.org/literature/article/what-is-interaction-design.

[24] "The Definition of User Experience (UX)," Nielsen Norman Group, accessed May 31, 2022, https://www.nngroup.com/articles/definition-user-experience.

[25] "User Interface Design," Interaction Design Foundation, accessed May 31, 2022, https://www.interaction-design.org/literature/topics/ui-design.

[26] "Web Design," Interaction Design Foundation, accessed May 31, 2022, https://www.interaction-design.org/literature/topics/web-design.

[27] "Web Programming," The Free Dictionary by Farlex, accessed May 31, 2022, https://encyclopedia2.thefreedictionary.com/Web+programming.

[28] Lounge Lizard, "The History of Web Design: The Past and Present," PR Newswire, January 5, 2018, https://www.prweb.com/releases/the_history_of_web_design_the_past_and_present/prweb15933632.htm.

[29] Awwwards is a prominent online platform for web design and development competition. Every year it holds conferences (https://conference.awwwards.com) in iconic cities across the globe.

[30] "Who Will Build the Next Billion Websites? | Webflow CEO Vlad Magdalin | Awwwards Conference San Fran," YouTube, accessed September 2, 2019, https://youtu.be/_5OFgYBTuc0, 9:20.

[31] Rae Hodge, "60% Of People Worry That Tech Is Moving Too Fast, Study Finds," CNET, February 25, 2020, https://www.cnet.com/tech/tech-industry/global-trust-in-technology-declining-report-says.

[32] Sergio Caldarella, *The Empty Campus* (Princeton: Dark Age Publishing House, 2016), 113.

[33] Rahul Varshneya, "5-Step Web Design Process to Create Winning Websites," Business.com, May 27, 2019, https://www.business.com/articles/5-step-web-design-process. Rikke Friis Dam, "5 Stages in the Design Thinking Process," Interaction Design Foundation, 2021, https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process. Matt Meazey, "7 Simple Steps to the Web Design Process," Webflow, Inc., February 12, 2020, https://webflow.com/blog/the-web-design-process-in-7-simple-steps.

[34] According to Encyclopædia Britannica https://www.britannica.com, Simone Weil was a French philosopher; Albert Schweitzer was an Alsatian-German theologian and physician; Nadine Gordimer was a South African author; Mahatma Gandhi was an Indian leader; Marie Curie was a Polish-born French physicist; Laozi was a Chinese Daoist philosopher; Hypatia was a mathematician and astronomer lived in Alexandria, Egypt; Martin Luther King Jr. was an American religious leader and civil-rights activist; Anna Akhmatova was a Russian poet; and Jorge Luis Borges was an Argentine author.

[35] Felder.

[36] Unfortunately, no studies in English on the Chinese Mothers' Movement are hitherto available.

[37] International awards and exhibition.

[38] "Figures at a Glance," United Nations High Commissioner for Refugees (UNHCR), accessed May 30, 2022, https://www.unhcr.org/en-us/figures-at-a-glance.html.

[39] Jing Zhou, "From the Mothers' Movement to *Cradlr: An Interaction Design for Refugee Children*" (paper presented at the ARTECH 2021: 10th International Conference on Digital and Interactive Arts for the Association for Computing Machinery (ACM), Aveiro, Portugal, October 13–15, 2021) doi: 10.1145/3483529.3483677.

[40] "Cradlr: A Design Project for Refugee Children—Scholarship: Creative Works Award Winner," Design Incubation, accessed June 1, 2022, https://designincubation.com/publications/abstracts/cradlr-a-design-project-for-refugee-children, https://designincubation.com/wp-content/uploads/2020/11/JingZhou_Cradlr-Evidence-1.pdf.

[41] Abraham J. Heschel, *Who Is Man* (Redwood City: Stanford University Press, 1981), 99.

BIBLIOGRAPHY

American Enterprise Institute. "Saving the Liberal Arts." Accessed May 24, 2022. https://www.aei.org/wp-content/uploads/2018/02/Saving-the-Liberal-Arts.pdf.

American Institute of Graphic Arts (AIGA). "AIGA Design Futures Trends: Introduction to Design Futures." Accessed May 26, 2022. https://www.aiga.org/sites/default/files/2021-02/introduction-to-design-futures.pdf.

Bellow, Saul. *It All Adds Up.* New York: Viking Press, 1994.

Benda, Julien. *The Betrayal of the Intellectuals.* Boston: Beacon Press, 1955.

Bloom, Allan. *The Closing of the American Mind.* New York: Simon & Schuster, 1987.

Bok, Derek. *Universities in the Marketplace.* Princeton: Princeton University Press, 2003.

Caldarella, Sergio. *The Empty Campus.* Princeton: Dark Age Publishing House, 2016.

Dam, Rikke Friis. "5 Stages in the Design Thinking Process." Interaction Design Foundation, 2021. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process.

Design Incubation. "Cradlr: A Design Project for Refugee Children—Scholarship: Creative Works Award Winner." Accessed June 1, 2022. https://designincubation.com/publications/abstracts/cradlr-a-design-project-for-refugee-children, https://designincubation.com/wp-content/uploads/2020/11/JingZhou_Cradlr-Evidence-1.pdf.

Dutt-Ballerstadt, Reshmi. "Academic Prioritization or Killing the Liberal Arts?." Inside Higher Ed, March 1, 2019. https://www.insidehighered.com/advice/2019/03/01/shrinking-liberal-arts-programs-raise-alarm-bells-among-faculty.

Encyclopædia Britannica, Inc. "Liberal Arts." Accessed May 31, 2022. https://www.britannica.com/topic/liberal-arts.

Felder, Ben. "How Colleges Are Adapting to the Decline in Liberal Arts Majors." PBS NewsHour, November 30, 2018. https://www.pbs.org/newshour/education/how-colleges-are-adapting-to-the-decline-in-liberal-arts-majors.

Furedi, Frank. *Where Have All the Intellectuals Gone?.* London • New York: Continuum, 2004.

Graham, Lisa. *Principles of Interactive Design.* Albany: Delmar Publishers, 1999.

Heschel, Abraham J. *Who Is Man.* Redwood City: Stanford University Press, 1981.

Hess, Abigail Johnson. "The Top 50 Us Colleges That Pay off the Most." CNBC, July 16, 2019. https://www.cnbc.com/2019/07/16/cnbc-make-it-the-top-50-us-colleges-that-pay-off-the-most-2019.html.

Hodge, Rae. "60% Of People Worry That Tech Is Moving Too Fast, Study Finds." CNET, February 25, 2020. https://www.cnet.com/tech/tech-industry/global-trust-in-technology-declining-report-says.

Interaction Design Foundation. "Interaction Design." Accessed May 31, 2022. https://www.interaction-design.org/literature/topics/interaction-design.

Interaction Design Foundation. "User Interface Design." Accessed May 31, 2022. https://www.interaction-design.org/literature/topics/ui-design.

Interaction Design Foundation. "Web Design." Accessed May 31, 2022. https://www.interaction-design.org/literature/topics/web-design.

Interaction Design Foundation. "What Is Interaction Design?." Accessed May 31, 2022. https://www.interaction-design.org/literature/article/what-is-interaction-design.

Liberal Arts Online. "What Is Liberal Arts?." Accessed May 26, 2022. https://liberalarts.online/what-is-liberal-arts.

Liberal Arts • Thinking Now and Then. "Socrates—The Unexamined Life Is Not Worth Living." Accessed May 31, 2022. https://liberalarts.org.uk/socrates-the-unexamined-life-is-not-worth-living.

Lizard, Lounge. "The History of Web Design: The Past and Present." PR Newswire, January 5, 2018. https://www.prweb.com/releases/the_history_of_web_design_the_past_and_present/prweb15933632.htm.

Luppa, Nicholas. *Interactive Design for New Media and the Web*. Woburn: Focal Press, 2001.

Meazey, Matt. "7 Simple Steps to the Web Design Process." Webflow, Inc., February 12, 2020. https://webflow.com/blog/the-web-design-process-in-7-simple-steps.

Merriam-Webster, Inc. "Liberal Arts." Accessed May 31, 2022. https://www.merriam-webster.com/dictionary/liberal%20arts.

Moss, Philip, and Chris Tilly. "'Soft' Skills and Race: An Investigation of Black Men's Employment Problems." Work and Occupations 23(3) (1996): 252-76.

Nielsen Norman Group. "The Definition of User Experience (UX)." Accessed May 31, 2022. https://www.nngroup.com/articles/definition-user-experience.

Pratt, Andy, and Jason Nunes. *Interactive Design: An Introduction to the Theory and Application of User-Centered Design*. Beverly: Rockport Publishers, 2012.

The Free Dictionary by Farlex. "Web Programming." Accessed May 31, 2022. https://encyclopedia2.thefreedictionary.com/Web+programming.

Touraine, Alain. *The Academic System in American Society*. New Brunswick: Transaction Publishers, 1997.

United Nations High Commissioner for Refugees (UNHCR). "Figures at a Glance." Accessed May 30, 2022. https://www.unhcr.org/en-us/figures-at-a-glance.html.

U.S. Department of Labor. "Soft Skills to Pay the Bills." Accessed May 31, 2022. https://www.dol.gov/agencies/odep/program-areas/individuals/youth/transition/soft-skills.

YouTube. "Who Will Build the Next Billion Websites? | Webflow CEO Vlad Magdalin | Awwwards Conference San Fran." Accessed September 2, 2019. https://youtu.be/_5OFgYBTuc0, 9:20.

Varshneya, Rahul. "5-Step Web Design Process to Create Winning Websites." Business.com, May 27, 2019. https://www.business.com/articles/5-step-web-design-process.

Veblen, Thorstein. *The Higher Learning in America*. New York: B. W. Huebsch, 1918.

Washburn, Jennifer. *University Inc.* New York: Basic Books, 2006.

Zhou, Jing. "From the Mothers' Movement to *Cradlr: An Interaction Design for Refugee Children*." Paper presented at the ARTECH 2021: 10th International Conference on Digital and Interactive Arts for the Association for Computing Machinery (ACM), Aveiro, Portugal, October 13–15, 2021. doi: 10.1145/3483529.3483677.

INTERDISCIPLINARITY IN EDUCATION; TEACHING, LEARNING AND RESEARCH IN THE MODERN ACADEMY

Author:
SYEDA ROHMA AFZAL

Affiliation:
INDUS VALLEY SCHOOL OF ART AND ARCHITECTURE, PAKISTAN

INTRODUCTION

Interdisciplinary learning is categorized by integrating multidisciplinary knowledge through a focus or theme. With a repetition in exposing to the interdisciplinary thoughts, the learners grow an advanced metacognitive skill, enhanced critical thinking ability, epistemological beliefs and an understanding of how various perspectives can be derived from varying disciplines.

This paper addresses the related questions of why is it important to educate students today about the nature and landscape of interdisciplinary. It is essential that students understand the difference between interdisciplinarity and disciplines. Having an understanding can then further make you understand the advantages of interdisciplinarity.

PERSPECTIVE ON INTERDISCIPLINARITY

The last decade has resulted in an eruption of newer educational programs which have integrated and promoted methodologies of interdisciplinarity and design thinking across the board of curriculum. This drive has shed a welcoming light on the supremacy of creative processes and has facilitated in bringing innovative and inventive solutions across various disciplines. Students and faculty from various fields today now have resources which assist in exploring newer avenues as stated by Lou & Ma, 2015, "Design thinking, combined with scientific and technological thinking, allows us to explore the new frontier of design and innovation and to link design to the future through achieving the balance of desirability, possibility, and feasibility."

While majority of the art and design educators today are widely concerned only with the elements of principles of design and studio techniques in their curriculum, on the other hand the modern day advocates of the critical thinking repute art as a medium to express one's thoughts and ideas. If we expect a student artist to be able to express a certain concept, then that students' mind should also be simultaneously developed along with their technical expertise. The recent issue of the National Art Education Association journal quoted, "A really intelligent artist is a scholar first, perhaps a poet or writer second, and an artist third or fourth." Developing cognitive skills should be an essential part of the classrooms in an art institution. [1]

How can art educators create a connection between the art process and the intellect? If the educators are neglecting on "Big Ideas" they could be then missing out on some of the most vital connections to help abridge art and design students with the real world.

Art and design is relevant to the daily life and creating a connection with other subjects can help give it a meaning and purpose to why the students are creating art in the first place. Many educationalists are certain that art can be the core of our learning system and also that the teaching strategies related to art can be truly essential to develop the student engagement ability. By using collaborative methods, key concepts, constructivist approaches, content mapping and critical question inquiry the teachers make it conceivable to bond disciplines within each other and develop the critical thinking skills.[2]

Even though we have progressed over time, scholars still believe that the existing state of education is not being able to prepare students to be collaborative problem solvers and creative. Introducing students to interdisciplinary learning gives them the chance to observe cross curricular connections which will lead them to an additional meaningful knowledge experience. Interdisciplinarity assists students to have a better understanding of the world around them since the world is designed of many individual subjects which are not in isolation to each other. Researchers have now suggested that there is a need for radical changes in the existing education system. This will enable the students to be prepared for ever changing and uncertain future ahead. One solution suggested was to initiate classes which are co-taught interdisciplinary courses that integrate numerous content ranges into the real world unique opportunities which can be learnt in one class. Through this, teachers will be able to bring various disciplines so that students can have many projections for one essential theme or question.[3]

Figure 1.. A cross sectional diagram for the interdisciplinary strategy

RELATED TERMS USED IN THE FIELD OF INTERDISCIPLINARITY

Big Terms: Ideas which will apprehend the needs and interests of the students, this will help in entail a more holistic approach. At an overall level, they signify the aspects of life, for example social codes of conduct or identity which also reflect the intricacies of our culture. They also entail the abstract and concrete elements. An artist's theme or concept – the essential and broad human concerns which are characterized by multiplicity, complexity, contradiction and ambiguity.

Concept: A construct that highlights the examples that have similar attributes. They can be one word or detailed concepts which are broad, timeless, abstract and universal.

Conceptual Theme: A topic which includes a concept within a title, over which a study is based.

Curriculum Mapping: A process for data collection regarding the operative curriculum in an educational institute. Any instruction which is received by the student is a part of this.

Multi-Disciplinary Design: This form of design collectively brings the connected disciplines in more formal structure based around a common theme. The faculty members initially meet and choose a theme, then they amend the presentations to fit in the theme.[4]

Interdisciplinary Design: This is a deliberate planning to bring all the disciplines together in the curriculum. The agenda is to evaluate, meet, monitor and modify the common theme. The modules can range from single discipline to various ones which involves everyone in the framework.[5]
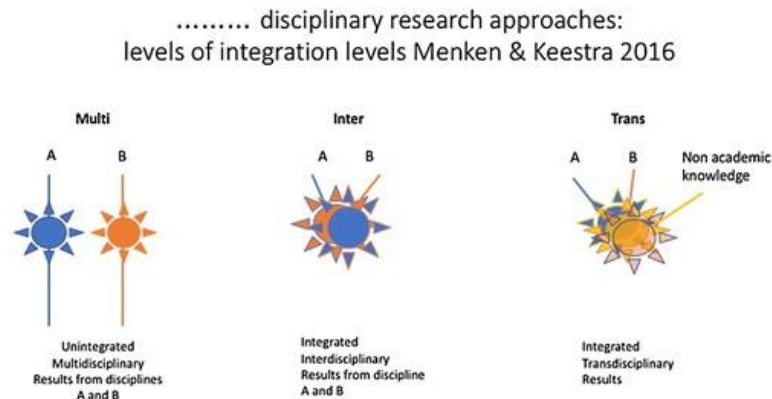

Figure 2.. A diagrammatic depiction of multi, inter and trans disciplinary study[6]

WHY TEACH INTERDISCIPLINARITY?

Mostly, discipline based course leans towards communicating the core of the underlying discipline which entails the methods, matter and its theories. To be certain, the discipline based programs can be more categorical regarding why the material is useful and essential for the students in their lives to come. The purpose of interdisciplinary program should be able to interconnect similar elements and ideas of interdisciplinary research, but if they fail to do so, then it is technically not serving its purpose. This may create the wrong impression that interdisciplinary learning does not serve the coherent summary of the interdisciplinary originality.[7]

In institutions today, where we keep a look out for interdisciplinary program, a course on interdisciplinary enterprise would assist in providing an interactive link among the disciplinary courses. The course outline in such a course should be able to cover the following:

1.The course should enable students to develop an understanding of their own program and at the same time be able to facilitate the Students to create linkages the courses among the program. This is applicable for both, studio courses and their theory courses since they should be able to understand, appreciate and discuss why they deal with a certain theme or issue in their relative course. Also, this would give them an understanding of how they can create a connection with the upcoming courses.

2.As Gerald Graff has been quoted in several publications, the students should be able to compartmentalize the knowledge which is embarked upon them. They should be able to realize and figure out how their professors probably are discussing the same idea or subject (with the help of using jargons in differing disciplines) and even then are reaching two diverse conclusions. The idea that Graff advised that we should "teach the conflicts" means, that we should teach the students to distinguish the various insights which flow from different disciplinary viewpoints and then be able to deliver the resolving capabilities. This of course is the most integral part of why interdisciplinary education is important.[8]

3.Teaching students interdisciplinarity with the assistance of topical or thematic focus enables the students to go through various exercises in combination to themes or topics which are in relevance. It is usually expected that the students will learn why and how do they have to integrate in the years to

come. This preparation is quite varied from the disciplinary programs where the student is usually more method based which is again poorly motivated for the students. Whenever, interdisciplinary programs are disapproved for the lack of precision, the critics usually have such courses on the top of the list. Since interdisciplinary programs are used in drawing various methods, their programs should not be containing the usual methodological material such as the disciplinary programs. Instead of teaching students one or two theories, the students should have an essence of various details where they should know how they can be integrated. The thoroughness and objectivity in the interdisciplinarity can only come from having the understanding of what, how and why to integrate. The goals of the disciplines can be achieved by making them explicit.[9]

4.The course offered to the students should be able to teach students to interconnect the nature of research practices to other nonacademic audiences as well. They should be able to explain and justify their majors with their prospective employers and as well as their parents and friends. The idea of art and design should be interdisciplinary in such a manner that they should be able to novel other programs within their own context. They should have the expertise to answer queries without struggling with any circular content.

THEORY OF ARTS INTEGRATION

The theory of art integration was discovered as early as the 4th century B.C. This was in the ancient Greece where it was argued by Plato that the art forms should be used as a ground work of the educational methods. He stated that the students learn with the help of expressive, social, investigative and constructive methods.

A theory was formed on the subject of art mediation by Jean Gagnepain. This theory was latter expressed and explained by Ewens in his paper where it was called the Theory of Mediatio. He stated that the humans make sense of their environment through the following:

- signs
- tools
- society and history
- norms.

Another theory which was published by Gardner in 1983, Frames of Mind, introduced a multi-cultural view of intelligence which entailed a set of skills which enabled the individual to be able to create products, solve problems and be able to come up with new issues. His definition of intelligence included the following:

1) linguistic,
2) logical/ mathematical,
3) spatial,
4) bodily/kinesthetic,
5) musical,
6) interpersonal,
7) intrapersonal, and
8) naturalistic.

Gagnepain's theory deals with the humans arbitrating the natural environment to integrate to their own experiences from the scientific approaches rather than focusing on the cultural approach. Although he had a background in linguistics, he had studied how to deconstruct the language. He concluded that the humans have the ability to mediate through art. As Ewens noted, "the rational capacity to technically mediate our activity". The foundation lied in the fact that art is an integral form of the human's rationality.[10]

INTEGRATED LEARNING AND ARTS

In the coming time ahead, the faculty/teachers should possess a more powerful and commanding knowledge bases for class room management skills and the subject matter. This will assist them in addressing the student needs, enlarging learning capacity and the ability for critical pedagogy. In the previous years, art education research was not considered to be consistent. The studies have usually been replicated and there wasn't much diversity in the methodology. The focus of the studies which were carried out did not have a practical approach to assist the teachers rather, they have been theory based. The theory was categorized as sociological, philosophical and psychological, and by theme methodology, matter and pedagogical practices. The hypothetical theory makes stress the critical explanation of the art educators.[11]

When art faculty was surveyed in 1900's and early 2000's, the research revealed that the teachers usually focused on the studio activities in their courses. The American educator, Laura H. Chapman (1982) suggested the art education should focus on reflective thinking, creativity, reflective thinking and imagination about art. She also recommended that the interpretation of the child, as a naïve natural artist, should be able to produce art rather that thinking about it. This is generally the problem which hinders the art education in institutes.

In 1982, Chapman suggested that the study of art and cultural philosophies should be integrated in the education since it helps facilitate the students in applying and understanding knowledge beyond the borders of classroom. Also, in 1991, Gardener, discussed the "education for understanding". He advocated that the students should master the learning through skills rather than rote, which might help them in applying for the upcoming contexts.[12]

The insinuation for the art educators should be to be aware of the dichotomy in the curriculum itself and the need for the students to be engaging. The educators should not just focus on their instructions and to what students can produce at work. Rather, they should be focusing on creating a curriculum which is stimulating and encourages creative expressions and lifelong outcomes. It should be a goal that critical pedagogy should be a part of the education. The idea of natural learning can be impulse to be inspired in an encouraging and safe environment which helps you solve problems in real life situations. The art itself is an essential subject to be taught therefore it should be tested with the critical pedagogy to advocate the outcomes.[13]

OBSTACLES IN TEACHING INTEGRATED DISCIPLINES

As much as there is a desirability of teaching interdisciplinary courses, there are several obstacles which fall in the teaching process. Some of the most common issues which are faced include community involvement and support, insufficient planning time, curriculum mapping, inaccessibility to national and state artisans, ongoing professional development and lack of resources. The educational systems today have become so stringent that it makes it difficult to in cooperate interdisciplinary involvement. To be true, there is no legitimate reason because of which the subjects should be separated rather they should support each other. The prevailing subjects though make it extremely difficult to teach subjects in an interdisciplinary way.[14]

The prevalent obstacle in the implementation of the interdisciplinary curriculum is that the teachers attempt to fill in too much at one time. The trick is to understand the overlaps between the subjects which are being taught to the students. For example; when studying about Renaissance, the teachers should be including music, literature, visual art and social studies. There are times when a certain part of the course is being over taught in various courses and the faculty is not aware of it. When the teachers take a look at what they are teaching collaboratively, they come to realize the commonalities in their courses. Being able to highlight the overlap, will require sharing of bit and pieces from every teacher and resource available .[15]

In a research conducted by Roucher and Jessie Lovano-Kerr (1995), they outlined the hindrances and obstacles which are faced by the educational institutes whilst teaching integrated learning. "Can the Arts Maintain Integrity in Interdisciplinary Learning?", examined the idea and question of art. The focus was to understand if art was being taught for the sake of a course or rather an integrating bridge which serves as an aid to assist other courses. Moreover, there was a debate if high standard of art education was being disseminated in institutes where the integrity of art itself wasn't being compromised (McNamara 2016). The Ad Hoc Consortium of National Arts Education Associations suggested that the teachers should give lesser instructions to be able to deliver arts via integrated learning.[16]

DISCUSSION OF FUTURE PATTERNS

Various kinds of interesting ideas and phenomena have been observed which have been quite relevant to inter or transdisciplinary education. Usually in higher education, we can observe a merger of various existing disciplines which become a specialist, which moves from mono- to multi- to inter- and back to monodisciplinary studies which form their own foundational theory, approaches and methods (Kidron 2015). This in turn focuses on issues from one discipline, which might not have answers to it but the other discipline might have.[17]

Contrary to such an approach, there are parts of a course which might entail and enlighten the real world complex issues which cannot be solved without having an interdisciplinary approach. Students should be motivated to create services and products by identifying certain patterns and realizing an issue which creates an outcome for various parties involved. Now this, can only be successfully carried out, if the students have an interdisciplinary approach in their academia.[18]

Students exposed to the interdisciplinary education always tend to be more open, self-aware, good at their personal development, are more capable of dealing with uncertainty, have good leadership skills and are able to synthesize large information into relevant and coherent solutions. Although students from the foundation years can also be polished so that they evolve at a quicker pace and are more open to their surroundings.[19]

CONCLUSION

The interdisciplinary education majorly focuses on the language, methodologies and interpretive tools from various disciplines and then focusing on a central theme or problem. As result, students from the interdisciplinary program are more inclined towards integrated perspectives and strategies which are solution based rather than acquiring content based knowledge which is derived from a single discipline. It ensures, that the students have a more comprehensive and holistic approach of courses and concepts. The learning outcomes of interdisciplinarity counts in advancement towards personal epistemology, metacognitive skills and critical thinking. When put together, the learning outcomes create a contribution to the assimilation of knowledge which is transferrable and can be integrated to other contexts and problems.[20]

Since academic maturation and cognitive development are one of the most essential outcomes of the interdisciplinary program therefore, assessing the student progress towards the milestones should be as vital the traditional assessment of any procedural or discipline specific. The process of assessing the cognitive results of the interdisciplinary learning can really deliver the educationists with the student's development and how they can be used in improving the foundation program.[21] As described by Field and Lee (1994),), "while the lack of a standard curriculum in interdisciplinary programs is usually thought of as a major disadvantage for the assessment of interdisciplinary education, it may be a major advantage in that it requires us to focus on the development of intellectual capability in the student rather than on a fixed body of information".[22]

NOTES

[1] Hye-Jin Nae. "An interdisciplinary design education framework." The design journal 20, no. sup1 (2017): S835-S847.

[2] Rick Szostak. "How and why to teach interdisciplinary research practice." Journal of Research Practice 3, no. 2 (2007): M17-M17.

[3] Maura Borrego and Lynita K. Newswander, "Definitions of Interdisciplinary Research: Toward Graduate-Level Interdisciplinary Learning Outcomes," 2010,
https://vtechworks.lib.vt.edu/bitstream/handle/10919/25471/34.1.borrego.pdf.

[4] Antonietta Di Giulio, and Rico Defila. "Enabling university educators to equip students with inter-and transdisciplinary competencies." International Journal of Sustainability in Higher Education (2017).

[5] Helen Cooper et al., "Developing an Evidence Base for Interdisciplinary Learning: A Systematic Review," Journal of Advanced Nursing 35, no. 2 (2001): pp. 228-237, https://doi.org/10.1046/j.1365-2648.2001.01840.x.

[6] Antonietta Di Giulio and Rico Defila, "Enabling University Educators to Equip Students with Inter- and Transdisciplinary Competencies," International Journal of Sustainability in Higher Education 18, no. 5 (March 2017): pp. 630-647, https://doi.org/10.1108/ijshe-02-2016-0030.

[7] Saija Hollmén. "The pedagogical challenge of interdisciplinary university programs." Research in Arts and Education 2015, no. 2 (2015): 1-14.

[8] Michael Field, Russell Lee, and Mary Lee Field, "Assessing Interdisciplinary Learning," New Directions for Teaching and Learning 1994, no. 58 (1994): pp. 69-84, https://doi.org/10.1002/tl.37219945806.

[9] Elisabeth JH Spelt, Harm JA Biemans, Hilde Tobi, Pieternel A. Luning, and Martin Mulder. "Teaching and learning in interdisciplinary higher education: A systematic review." Educational Psychology Review 21, no. 4 (2009): 365-378.

[10] Carrie Hubert. "Interdisciplinary Learning and the Effects on Students." (2021).

[11] Helen Cooper, Caroline Carlisle, Trevor Gibbs, and Caroline Watkins. "Developing an evidence base for interdisciplinary learning: a systematic review." Journal of advanced nursing 35, no. 2 (2001): 228-237.

[12] Michael Field. "Assessing Interdisciplinary Learning." New directions for teaching and learning 58 (1994): 69-84.

[13] Mark Meacham et al., "Teacher Leader Reflections: Teacher Leader Preparation and Development," Teacher Leadership in Professional Development Schools, 2018, pp. 269-276, https://doi.org/10.1108/978-1-78743-403-520181020.

[14] Terri Lynn Suraco, "An Interdisciplinary Approach in the Art Education Curriculum," Thesis, Georgia State University, 2006, https://doi.org/https://doi.org/10.57709/1062139.

[15] Maura Borrego, and Lynita K. Newswander. "Definitions of interdisciplinary research: Toward graduate-level interdisciplinary learning outcomes." The Review of Higher Education 34, no. 1 (2010): 61-84.

[16] Bhagwan Aryal, "Interdisciplinary Issues in Education," *Interdisciplinary Research in Education* 6, no. 2 (2021), https://doi.org/10.3126/ire.v6i2.43644.

[17] Renate G. Klaassen, "Interdisciplinary Education: A Case Study," European Journal of Engineering Education 43, no. 6 (July 2018): pp. 842-859, https://doi.org/10.1080/03043797.2018.1442417.

[18] Diana Stentoft,. "From saying to doing interdisciplinary learning: Is problem-based learning the answer?." Active Learning in Higher Education 18, no. 1 (2017): 51-61.

[19] Susan M. Drake and Joanne L. Reid, "21st Century Competencies in Light of the History of Integrated Curriculum," Frontiers in Education 5 (2020), https://doi.org/10.3389/feduc.2020.00122.

[20] Lana Ivanitskaya et al., "Interdisciplinary Learning: Process and Outcomes. Innovative Higher Education ," Innovative Higher Education 27 (2002): pp. 95-111, https://doi.org/https://doi.org/10.1023/A:1021105309984.

[21] Michael W. Meyer and Don Norman, "Changing Design Education for the 21st Century," She Ji: The Journal of Design, Economics, and Innovation 6, no. 1 (2020): pp. 13-49, https://doi.org/10.1016/j.sheji.2019.12.002.

[22] Martin Weller, "What Are the Benefits of Interdisciplinary Study?," What are the benefits of interdisciplinary study?, October 14, 2021, https://www.open.edu/openlearn/education-development/what-are-the-benefits-interdisciplinary-study.

BIBLIOGRAPHY

Borrego, Maura, and Lynita K. Newswander. "Definitions of interdisciplinary research: Toward graduate-level interdisciplinary learning outcomes." The Review of Higher Education 34, no. 1 (2010): 61-84.

Cooper, Helen, Caroline Carlisle, Trevor Gibbs, and Caroline Watkins. "Developing an evidence base for interdisciplinary learning: a systematic review." Journal of advanced nursing 35, no. 2 (2001): 228-237.

Di Giulio, Antonietta, and Rico Defila. "Enabling university educators to equip students with inter-and transdisciplinary competencies." International Journal of Sustainability in Higher Education (2017).

Field, Michael. "Assessing Interdisciplinary Learning." New directions for teaching and learning 58 (1994): 69-84.

Hollmén, Saija. "The pedagogical challenge of interdisciplinary university programs." *Synnyt/Origins* (2015):1-14.

Hubert, Carrie.. "Interdisciplinary Learning and the Effects on Students." *Master Thesis and Capstone Project, Northwestern College - Orange City* (2021):1-30.

Kidron, Adi, and Yael Kali. "Boundary breaking for interdisciplinary learning." *Research in Learning Technology* (2015):23: 1-17.

McNamara, Deborah A., Paul Rafferty, and Fidelma Fitzpatrick. "An improvement model to optimise hospital interdisciplinary learning." *International journal of health care quality assurance (*2016)*: 550-558.*

Nae, Hye-Jin. ""An interdisciplinary design education framework." The design journal 20, no. sup1 (2017): S835-S847.

Spelt, Elisabeth JH, Harm JA Biemans, Hilde Tobi, Pieternel A. Luning, and Martin Mulder. "Teaching and learning in interdisciplinary higher education: A systematic review." Educational Psychology Review 21, no. 4 (2009): 365-378.

Stentoft, Diana. "From saying to doing interdisciplinary learning: Is problem-based learning the answer?." Active Learning in Higher Education 18, no. 1 (2017): 51-61.

Szostak, Rick. "How and why to teach interdisciplinary research practice." Journal of Research Practice 3, no. 2 (2007): M17-M17

COGNITIVE COMPLEXITY IN DESIGN STUDIO TEACHING AND LEARNING

Author:
MARIANNE CRAMER

Affiliation:
THE UNIVERSITY OF GEORGIA, USA

INTRODUCTION

While the amount of data available and the amount necessary to do our work in the world creatively cannot be conflated, it is true that the information designers are expected to incorporate into decision-making processes continues to expand. In landscape design, this phenomenon is not a product of the digital age. It began in the 1970s with the introduction of Ian McHarg's suitability mapping where information collected from the landscape representing a number of scientific disciplines was layered, analyzed, evaluated and synthesized to identify land suitable for development.[1] Since then the metrics used to substantiate design decisions has grown: the use of technology has expanded with software programs now used to enhance both analytical and visual competencies. Although our brains continue to manage this vast amount of information, there are limits to its capacity.[2] It is here that artificial intelligence (AI) may intersect with design.

Before designers engage with other intelligences, this paper argues that we should better understand and wield our own, and further that it is the cognitive skills that are important to develop rather than continually expanding the amount of information students of landscape architecture and other design disciplines are expected to understand and apply. On the contrary, an increasing amount of environmental problem-solving centers around wicked problems—those that we cannot solve using existing knowledge. This paper speculates how design educators might recalibrate design studio teaching and learning as we move forward into an intelligence-rich future.

Intelligences

We might consider the brain to be the last frontier of the human body.[3] It has only been in the recent past that our understanding of how it functions is being explored more thoroughly. So, what is current research telling us about brain function? First there is ample evidence for Carol Dweck's concept of growth mindset—that if we believe our basic cognitive skills can be developed through grit and dedication to the task, they will be.[4] Growth mindset also rests on the notion of neuroplasticity—that brain function can change and adapt over time because of experience and is not limited by intelligence at birth. In other words, the old adage "You either got it or you don't," describing cognition is not necessarily true.

Even more important is the idea that we have agency over the brain's development.[5] Confabulation or not, human agency is intentional and based on a person's ability to control their actions. In many cases agency comes from the act of thinking about doing beforehand.[6] This is of critical importance in the

design professions as many beginning students are entering our programs with little exposure to many of the cognitive skill sets necessary to explore design possibilities and problem solve creatively. Betty Edwards and others contend that the rational brain is ascendant and that for more intuitive, creative thinking it is important to develop the neural highway between the two. The highway or corpus callosum is developed through use; so, the more we create, the more creative we become.[7]

Another important concept is the idea of embodiment. It is common knowledge that the brain influences and in many cases regulates bodily functions and it is now understood that the opposite interaction is just as powerful.[8] Our bodies mediate between the brain and the environment. Furthermore, it is now understood that the very structure of our reason comes from embodiment. This supports the brain-to-skin connection that Juhani Pallasmaa has advanced.[9] Designers have been aware of the importance of haptics, kinesthetics, and other sensory ways of perceiving the world as critical to their processes. How we experience the world is part of our continually accumulating tacit knowledge base.

The idea of an intelligence quotient, the measurement of a person's reasoning ability, has been under question for some time. During his investigations on intelligence, psychologist J. P. Guilford hypothesized that IQ tests did not measure creativity and that high IQ did not necessarily correlate with equally high creative abilities.[10] Snyder et. al. seem to be the first to coin the term creativity quotient or CQ as another way to measure intelligence in 2004, but even before this development, Howard Gardner had proposed his theory of multiple intelligences or MI.[11] This theory broadens the definition of intelligence and proposes that as humans we have many kinds and are not born with all the intelligences we will ever have. Gardner's theory also challenges the previous idea that there is only one single type of intelligence and that it is fixed from birth. His most recent research points to nine possible kinds of human intelligence.[12]
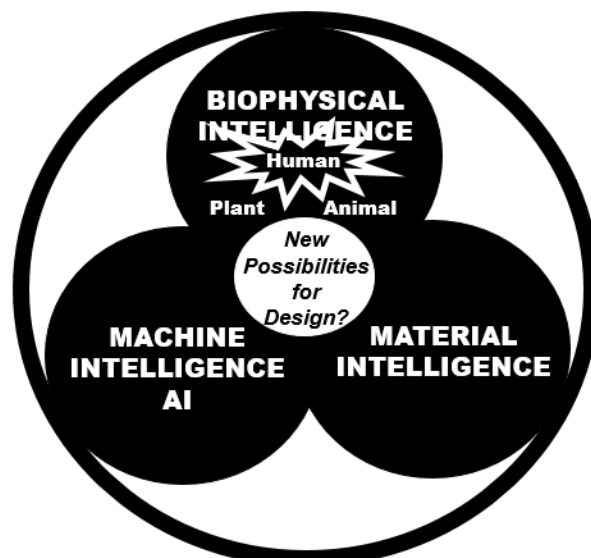

Figure 1. Three types of intelligences within an agent-environment framework

What is universal intelligence?

In looking at the possibilities of other intelligences, Legg and Hutter have proposed a much broader and more universal definition of intelligence measuring an agent's ability to achieve goals in a wide variety of environments.[13] Universal intelligence as defined can include the following 1) All-species intelligence. Western thought has always contended that humans were the only intelligent species on the planet. However, scientists are discovering that not only animals but plants have their own agency and can achieve goals in a wide variety of environments particularly as a community or system. For

landscape architects an understanding of that agency is a critical piece of our work if a carbon neutral world is to be realized. 2) Material intelligence. Although architects may have always considered the performative qualities of both the organic and inorganic materials used in construction, universal intelligence gives materials a new face. For example, consider how corten steel's ability to achieve goals in a wide variety of environments is manifested. 3) Machine Intelligence. Artificial intelligence (AI) continues to prove its ability as an agent achieving goals in a wide variety of situations from winning chess games to autonomous vehicles. AI is now poised to directly impact the design professions.[14] Leach predicts that in the design world it will likely affect processes rather than products although the link between the two is indelible.[15] See Figure 1.

In light of the new possibilities for intelligent interactions, this paper argues that to explore and engage most effectively, designers still have work to do, particularly as a primary agent in the use of cognitive skill sets. How we continue to develop our own cognitive abilities has the potential to affect both content and pedagogy in the academy. The question to explore is whether there may be new opportunities for enhanced cognitive skill development in the design studio?

Procedural Theory and Tacit Knowledge

Of the three categories of knowledge defining design disciplines, this paper's focus is on procedural or 'how to' knowledge. During the last half of the 20th century the emphasis in procedural theory has been in modeling the design process. These staged process models are mostly linear and what the author and others consider heuristics—any approach to problem solving that employs practical but not necessarily perfect or optimal ways of reaching a goal. As with many design disciplines, landscape design has many of these models. Embedded in each of them are at least a few of the actual cognitive skill sets shown in Figure 2. For the most part publications highlight the higher order thinking skills called out in Bloom's revised taxonomy.[16] In the revised model creating has been added to the previously enumerated critical thinking skills—analyzing and evaluating.

Figure 2. Cognitive skills designers use includes Bloom's revised higher order thinking skills.

This paper contends that it is these higher order thinking skills that continue to be privileged in studio teaching and learning even though many other embodied cognitive skills are used. An example of this is Lyle's proposal-disposal model (Figure 3) which describes how designers use these critical and creative thinking to develop a design idea.[17] In Lyle's model it is critical reflection that prepares the designer to make the next creative leap. What the staged process models are in fact grappling with the idea that much of our 'how to' design knowledge resists verbalization and is difficult to transfer, mainly because it is personal and based on personal experience. This type of knowledge is called tacit or implicit and we do not learn it by taking notes and memorization but by doing it.

Figure 3. Constructing tacit knowledge.

The idea of tacit knowledge was developed by Michael Polanyi after the Second World War. When looking more closely at what psychologists and educators visualize within its fuzzy boundaries, some of our cognitive skill sets such as empathic, creative (intuitions and insights), and kinesthetic thinking skill sets are already included, but the author contends that most of those listed in Figure 2 belong here. Although there are other models of how tacit and explicit knowledge relate such as the Dual Processing model of human thought, the author suggests that the relationship might be better described as a gradient where deeply tacit cognitive skills like creating are at one end and highly explicit skills such as analyzing are at the other end. When he posited "We can know more than we can tell," Polanyi could have been speaking directly to the design professions since learning by doing has been a standard pedagogical model in the design studio for more than a century.
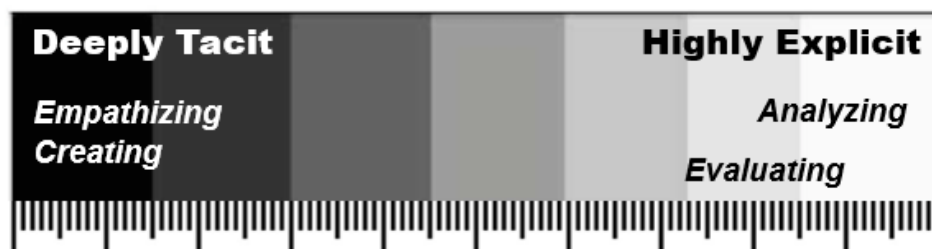

Figure 4. Tacitity gradient with examples of deeply tacit and highly explicit cognitive skills.

Teaching for cognition

In the design studio how we teach for cognition has not been thoroughly explored or understood. The author proposes that there are at least three reasons for this predicament—our preference for product over process, privileging explicit thinking skills, and our overdependence on the learning by doing model.

Product Over Process

Just as we do for creativity, when examining cognitive processes in general we can consider the person, the product, the process and the press or environment. In the academy product has always been emphasized since it is the product that is evaluated. In many cases it is assumed that if the product is

excellent, the methods and procedures are too. Whether procedural learning is favored over more explicit knowledge can be seen from the learning objectives or outcomes listed in a course syllabus or in the list of core competencies of a specific design program.

Privileging Explicit Thinking Skills

Since the 1970Os when the landscape design and environmental planning disciplines adopted a more scientific approach to the design process and more recently developed a series of metrics to quantify and validate design decisions, critical thinking has taken precedence over more tacit skill sets. The more tacit skills less amenable to description and quantification such as creating, experiencing, or empathizing were the bedrock of the discipline's origins in the early 1900s.

Overdependence on Learning by Doing

Studio teaching and learning is based on the medieval master-apprentice system where apprentices learn by watching the master perform a skill hen practicing until mastery is gained. The learning by doing model has been use for over a century in the design professions and continues to be passed down to the next generation of educators without much critique. Studio instructors have assumed that how to design cannot be taught. However, as we learn more about brain function, how this new knowledge can be used to further cognitive transfer of tacit knowledge becomes an important question to consider. We have developed a range of pedagogies that when used with intention can help explicate tacitity.

INTENTIONAL TEACHING

Using a limited literature review and articulating personal pedagogical approaches has generated nine possibilities for student engagement with the complexities of the design process. They are based on the idea that in order to learn anything, the knowledge should be as explicit as possible. Further, they are grounded in the idea of intentional teaching. Intentional teachers act "purposefully" and "can explain why [they] are doing what [they] are doing and finds ways to access progress.[18] These strategies can be used as part of a deliberate plan or more spontaneously as a teachable moment.

Naming

This simple action is one of the most powerful actions we can do as humans. The act of naming cements psychological ownership.[19] Although they are addressing issues of branding, there are similar connections with naming the skill sets we use on a daily basis and doing so explicitly and consistently. In this case naming identifies and then is used to refer to a particular way of thinking whether in conversation or thought. If studio instructors name cognitive skills as they are evidenced instead of using phrases such as "push the envelope" or "think outside the box," explicit associations may more likely be formed.

Thinking Out Loud

Although this strategy has been an occasional part of the author's pedagogical kit of tools, it has only been recently used more strategically. Particularly with beginning students in the studio environment, ways of thinking and habits of mind particular to design have never been encountered before. When instructors explicate their own anecdotes of frustration, failure and backtracking, it helps to normalize what is at first an unfamiliar and totally confusing process. The author uses "what if" questions to show students how they might explore multiple possibilities and thus increase fluency and the possibilities for flexibility and originality.

Modeling

Showing what we mean is another powerful way to explicate a particular way of thinking. The visual aspect of modeling ties the skill more closely to experience and the embodiment of a particular cognitive skill. Again for beginning students in the studio, it helps to normalize ways of thinking and doing and can also help to show that there is more than one way of approaching a particular part of the design process. Furthermore, modeling can more closely connect process to a particular outcome.

Tracking Lessons Learned. Although this is similar to metacognition or going META, tracking lessons learned is a specific strategy that can target process rather than product. Asking the question, what did you learn from this project," might be one of a series of queries in a reflection-on-action event. The strategy is not only enlightening for student self-awareness, but for instructors as well. What is not revealed is as informative as what is particularly what skills may need continued emphasis or strategic re-evaluation.

Presenting Work

A traditional part of studio culture, presenting work gives students the opportunity to think out loud about the products and the processes of design. Advancing beyond the naming of each part of the design, presentations offer opportunities for instructors to guide the conversation using targeted questions aimed at processes. The products of design can be used by students to highlight their own procedures while the instructor can take the opportunity to use some of the previously detailed strategies to emphasize the skills.

Telling Stories

Much like presenting work, telling stories can be graphic, written or spoken word or a combination of all three. Depending on the typology telling stories offers ample opportunities for instructors to further discuss procedural issues.

Team-Based Learning (TBL)

Similar to collaboration, TBL is the process of working together to achieve a common goal and emphasizes preparation outside of the classroom and application of knowledge and skills inside the studio. It is a structured form of small-group learning by doing where cognitive skills can be practiced both individually and in groups. The process is guided by the instructor, but much of the learning comes from the members of the team. Benefits can include, mutual accountability, increased respect for different viewpoints and understandings of the world, active listening and constructive communication skill development, willingness to share ideas and experiences in the exploration of possibilities and solving problems, and more flexibility and consensus-building during decision making.[20]

Guided Experience

All studios are based on some level of guided experience—more guidance in the beginning studios and usually less as student's progress up the studio ladder. Although guided experience is usually thought of as a guarantee of a smooth linear pathway through the design process, guidance can be thought of differently such as offering different ways to approach a particular problem.

Re-inventing

This is another way to structure a studio project that does not transfer knowledge but instead allows students to re-invent tacit knowledge that is already known in the world but not by the students. This is a slower but achievable way to acquire tacit knowledge.[21] Re4-invention lets students re-invent knowledge that is already known in the profession but not necessarily by the students. It is a slower way of knowledge transfer, but achievable particularly in a studio situation structured for longer periods of interaction.

CONCLUSION

The cognitive skills design students are expected to practice successfully in studio are complex and entangled: Many of the skill sets are tacit in nature—difficult to explain or transfer. Because of their tacitity. The author suggests that intentionally be expanded beyond knowing why to include interactions with the student. When cognitive skills are introduced through a particular exercise, students should know what skills they are practicing. Naming begets associations with a particular set of skills; and tracking lessons learned encourages a reflection on action. Introducing thinking strategies like fluency and flexibility could offer an opportunity to discuss creativity and the difficulty of explaining how to do it. Similarly, the embodied skills such as dimensional thinking—developing an idea between two and three dimensional visualizing—may only be successfully transferred through a combination of modeling and thinking aloud. The goal here is to increase the complexity of knowing and doing beyond rote memorization of a process heuristic.

A second type of intentionality lies within program coordination across and between years of schooling. Explicit knowledge transfer is difficult enough between a classroom lecture and the studio. Tacit knowledge transfer across courses and then between years up the studio ladder is even more difficult. Here it is the coordination and consistency of learning objectives that matters. The cognitive skills we are asking out students to practice are complex and tangled: they take years to master. If this is not true, why require many years of practice before licensing. Design students should understand as much as they can about their own cognition and how to wield it as they engage with other intelligences. in readying our students to confront with the wicked problems in emerging in the 21st century—problems that cannot be solved with existing knowledge—our studio teaching and learning should be focusing on "knowing how" rather than only "knowing that."

NOTES

[1] Ian McHarg, *Design with Nature* (New York: Natural History Press, 1969).

[2] Rene Marois and Jason Ivanoff, "Capacity limits of information processing in the brain," Trends in Cognitive Sciences 9, no. 6 (2005): 61-71.

[3] John Hennessy, "The Brain: The Final Frontier?" Stanford Magazine, Nov/Dec 2014. Accessed February 16 2022. https://stanfordmag.org/contents/the-brain-the-final-frontier

[4] Carol Dweck, *Mindset—Updated Edition: Changing the Way You Think to Fulfill Your Potential* (New York: Little, Brown Book Group, 2017), 242.

[5] Albert Bandura, "Toward a Psychology of Human Agency," Perspectives on Psychological Science 1, no. 2 (2006): 164.

[6] Patrick Haggard and Manos Tsakiris, "The Experience of Agency: Feelings, Judgements, and Responsibility." Current Directions in Psychological Science 18, no. 4 (2009): 242. Accessed March 20, 2022. https://doi.org/10.1111%2Fj.1467-8721.2009.01644.x

[7] Betty Edwards, *Drawing on the Right Side of the Brain* (New York: Penguin Random House, 2012), XIV-XXVII.

[8] Samuel McNerney, "A Brief Guide to Embodied Cognition: Why You Are Not Your Brain," Scientific American, November 4 2011. Accessed January 27, 2022. https://blogs.scientificamerican.com/guest-blog/a-brief-guide-to-embodied-cognition-why-you-are-not-your-brain/

[9] Juhani Pallasmaa, *The Eyes of the Skin: Architecture and the Senses* (Massachusetts: Academy Press, 2005).

[10] Joy P. Guilford, "Creativity: Yesterday, Today and Tomorrow," The Journal of Creative Behavior 1, no. 1: 1967.

[11] Howard Gardner, *Frames of Mind: The Theory of Multiple Intelligences* (New York: Basic Books, 1983).

[12] Michele Marenus, "Gardner's Theory of Multiple Intelligences," Simply Psychology June 9, 2020. Accessed February 15, 2022. https://www.simplypsychology.org/multiple-intelligences.html

[13] Shane Legg and Marcus Hutter, "Universal Intelligence: A Definition of Machine Intelligence," *Minds and Machines* 17: 2007. Accessed February 15 2022. https://link.springer.com/article/10.1007/s11023-007-9079-x

[14] Bradley Cantrell and Zihao Zhang, "A Third Intelligence," Landscape Architecture Frontiers 6, no. 2 (2018). Accessed: April 16, 2022. http://dx.doi.org/10.15302/J-LAF-20180205

[15] Neil Leach, Design in the Age of Artificial Intelligence, *Landscape Architecture Frontiers* 6, no. 2 (2018): 5.

[16] Lorin Anderson and David Krathwohl, *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*, (New York: Longman, 2001)

[17] John Tilman Lyle, "The Alternating Current of Design Process," Landscape Journal 1, no. 1 (1985), 7-13.

[18] Ann Epstein, *The Intentional Teacher: Choosing the Strategies for Young Children's Learning* Washington DC: The National Association for the Education of Young Children, (2014), 7.

[19] Kyle Hildebrandt and Ryan Durant, "Why We Name: The Power of Naming to Drive Deep Connections with a Brand," July 24, 2019. Accessed March 5, 2022. https://brandsbyovo.com/why-we-name-drive-connections-with-brand/

[20] Cynthia Brame, "Team-based Learning" Vanderbilt University Center for Teaching (2013). Accessed February 20, 2022. https://cft.vanderbilt.edu/guides-sub-pages/team-based-learning/

[21] Cynthia Malmed, "Strategies for Tacit Knowledge Transfer" The eLearning Coach, (2018). Accessed January 25, 2022. https://cft.vanderbilt.edu/guides-sub-pages/team-based-learning/

BIBLIOGRAPHY

Anderson, Lorin and David Krathwohl. *A taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives.* New York: Longman, 2001.

Bandura, Albert. "Toward a Psychology of Human Agency." Perspectives on Psychological Science. 1, no. 2 (2006): 64.

Brame, Cynthia. "Team-based Learning." Vanderbilt University Center for Teaching (2013). Accessed February 20, 2022. https://cft.vanderbilt.edu/guides-sub-pages/team-based-learning/

Cantrell, Bradley and Zihao Zhang. "A Third Intelligence." *Landscape* Architecture Frontiers. 6, no. 2 (2018).

Dweck, Carol. aMindset – Updated Edition: *Changing the Way You Think to Fulfill Your Potential.* New York: Little, Brown Book Group, 2017.

Edwards, Betty. *Drawing on the Right Side of the Brain.* New York: Penguin Random House, 2012.

Epstein, Ann. *The Intentional Teacher: Choosing the Strategies for Young Children's Learning.* Washington D C: The National Association for the Education of Young Children, 2014.

Gardner, Howard. *Frames of Mind: The Theory of Multiple Intelligences.* New York: Basic Books, 1983.

Guilford, Joy P. "Creativity, Yesterday, Today and Tomorrow." The Journal of Creative Behavior. 1, no. 1 (1967).

Haggard, Patrick and Manos Tsakiris. "The Experience of Agency: Feelings, Judgements, and Responsibility." Current Directions in Psychological Science 28, no. 4 (2009). 242-246. Accessed March 20, 2022. https://doi.org/10.1111%2Fj.1467-8721.2009.01644.x

Hennessey, John. "The Brain: The Final Frontier." Stanford Magazine Nov/Dec 2014. Accessed February 16, 2022. https://stanfordmag.org/contents/the-brain-the-final-frontier.

Hildebrandt, Kyle and Ryan Durant. "Why We Name: The Power of Naming to Drive Deep Connections with a Brand." July 24, 2019. Accessed March 5, 2022. https://brandsbyovo.com/why-we-name-drive-connections-with-brand/

Leach, Neil. "Design in the Age of Artificial Intelligence." Landscape Architecture Frontiers 6, no. 2 (2018).

Legg, Shane and Marcus Hutter. "Universal Intelligence: A Definition of Machine Intelligence." Minds and Machines. 17, (2007). Accessed February 15, 2022. https://link.springer.com/article/10.1007/s11023-007-9079-x

Lyle, John Tillman. "The Alternating Current of Design Process." Landscape Journal. 1, no. 1 (1985). 7-13.

Malmed, Cynthia. "Strategies for Tacit Knowledge Transfer" The eLearning Coach, (2018). Accessed January 25, 2022. https://cft.vanderbilt.edu/guides-sub-pages/team-based-learning/

Marenus, Michele. "Gardner's Theory of Multiple Intelligences." Simply Psychology June 9, 2020. Accessed February 15, 2022. https://www.simplypsychology.org/multiple-intelligences.html

Marois, Rene and Jason Ivanoff. "Capacity Limits of Information Processing in the Brain." Trends in Cognitive Sciences 9, no. 6 (2006): 61-71.

McHarg, Ian. *Design with Nature.* New York: Natural History Press, 1969.

McNerney, Samuel. "A Brief Guide to Embodied Cognition: Why You Are Not Your Brain." Scientific American, November 4 2011. Accessed January 27, 2022. https://blogs.scientificamerican.com/guest-blog/a-brief-guide-to-embodied-cognition-why-you-are-not-your-brain/

Pallasmaa, Juhani. *The Eyes of the Skin: Architecture, and the Senses.* Massachusetts: Academy Press, 2005.

THE BLENDED TEACHING ON POPPPS METHOD, CASE FROM THE COURSE OF HISTORY AND THEORY OF WESTERN LANDSCAPE ARCHITECTURE

Author:
MENGYIXIN LI

Affiliation:
BEIJING UNIVERSITY OF CIVIL ENGINEERING AND ARCHITECTURE, CHINA

INTRODUCTION

Currently, global informatized education has presented various challenges to the teaching of landscape architecture, such as the sharing of educational resource, the application of effective and scientific methods, and the innovation of teaching process. With regard to the instructional process, there is a critical question arising, that is, how to transform passive learning into an active one for students. By reflecting on the weaknesses of traditional teaching methods, this paper is aimed to explore the blended teaching practiced through in-person instruction and digital strategies, for example, a Chaoxing Online Instructional Platform (COIP), a mobile interactive device enabled by Chaoxing Learning App (CLA) and massive open online courses (MOOC) in China.

By exemplifying the course named History and Theory of Western Landscape Architecture at the School of Architecture and Urban Planning, Beijing University of Civil Engineering and Architecture, the classroom instruction is developed with the assistance of BOPPPS which refers to an acronym representing various elements of active learning in six respects, namely bridge-in, objectives, pre-assessment, participatory learning, post-assessment and summary. As a goal-oriented and student-centered method, BOPPPS assists instructors in decomposing and analyzing the teaching process, which is premised on constructivism and communicative approaches in theory. In the context of blended teaching, the course goal is set as a comprehensive system that entails knowledge exploration, capacity building and value-focused thinking. It encourages all participants to identify the artistic characteristics of landscape gardens and parks in different countries, conduct discussion about the evolution of landscape types by applying the analytical methods of circumstances and form, and finally establish the views on natural history, art, and creation, thus boosting cultural self-confidence.

THE BLENDED TEACHING

Over the last three decades, the conceptions of learning and instruction have become the focus of sustained and influential research[1]. Also known as hybrid or technology-mediated instruction[2], blended teaching provides an approach to deliver the education where the online instructional materials and opportunities for virtual interaction are combined with the classroom methods based on traditional place. It routinely requires the physical presence of both instructor and student, with some elements of student control over time, place, or pace[3]. In the 21st century, the practice of blended teaching is mentioned in most cases to describe the social nature of learning as supported by the capacity to

collaborate through digital technologies in learning[4], as well as a set of skills and understandings that make the students fully prepared for a changing and interconnected world[5], requiring the ability to solve problems, strong communication and collaboration skills, technology, innovative and creative thinking skills.

The integrative system of instructional objectives

Through reflection on the weaknesses of traditional teaching methods, the study is purposed to explore the effective approach to blended teaching that may lead to the transformation of a passive instruction into an active one for Chinese students[6]. To be specific, blended teaching is adopted in one of the most significant courses on theoretical landscape, namely History and Theory of Western Landscape Architecture. It is indicated that roughly 20 to 50 percent of the instructional time is allocated for students to engage in independent online learning via an COIP built, as organized by their instructors. Furthermore, the instructional objectives in the context of blended teaching are set accordingly as a comprehensive system consisting of three specific aspects as illustrated in Figure 1.
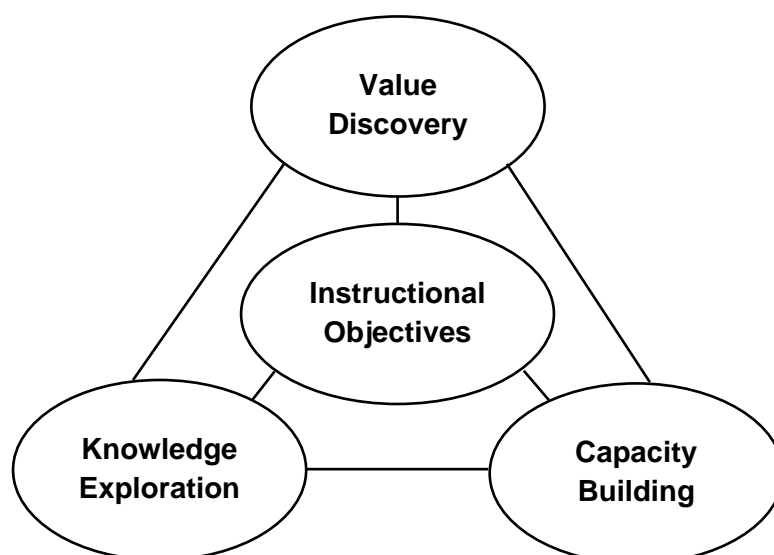

Figure 1. The integrative system of instructional objectives of the course.

Regarding the knowledge exploration of historical changes in landscapes, this course is designed to provide junior undergraduates with a full understanding as to the evolution of gardens and parks around the world in the theory and practice of landscape design. In the meantime, the historical process of landscape changes is retraced chronologically through a combination of situated cognitive learning, case-based learning and flipped classroom[7]. Furthermore, the students will develop the ability to identify the artistic characteristics of gardens and parks in different countries and regions, thus broadening their horizon and expanding their interdisciplinary knowledge about landscape architecture. Ultimately, they can understand the laws of things and comprehend the world through extensive learning.

At the level of capacity building which focuses on participatory learning via CLA[8], the course adopts the method of case-based learning to improve the capability of analysis, interpretation and discussion relating to landscape works. This is based on the resource of MOOC and reading materials introduced into COIP. In this process, students gain perceptual understanding of Western gardens and parks, which

stimulates their enthusiasm for learning landscape theory, thus laying a solid foundation for their future professional studies.

At the level of value discovery focusing on the dialectical and value-based thinking, the course encourages the students to share the Chinese stories of landscape evolution in flipped classroom through a comparative study of Chinese and Western gardens and parks, involving extensive discussion and open debate. The instructors should guide the students to be grounded in the times, to delve into life, and to establish a unique view of art and creation when the positive impact of various natural and historical views on garden art forms can be comprehended. Finally, the course has a potential to improve the aesthetic and humanistic qualities of students in general while boosting their cultural confidence, to a large extent.

The organization of blended teaching

According to the instructional objectives, the course is organized by adopting the strategies of process-orientation, interaction and diversification, all of which are carried out through episodic cognitive learning, case-based teaching and flipped classroom in combination. With technology-mediated instruction as the focal point, the practice of blended teaching is contributed to adjusting the learning methods adopted by participants, expanding high-quality instructional resources, improving learning efficiency and enhancing the communication between instructors and students, as shown in Figure 2.
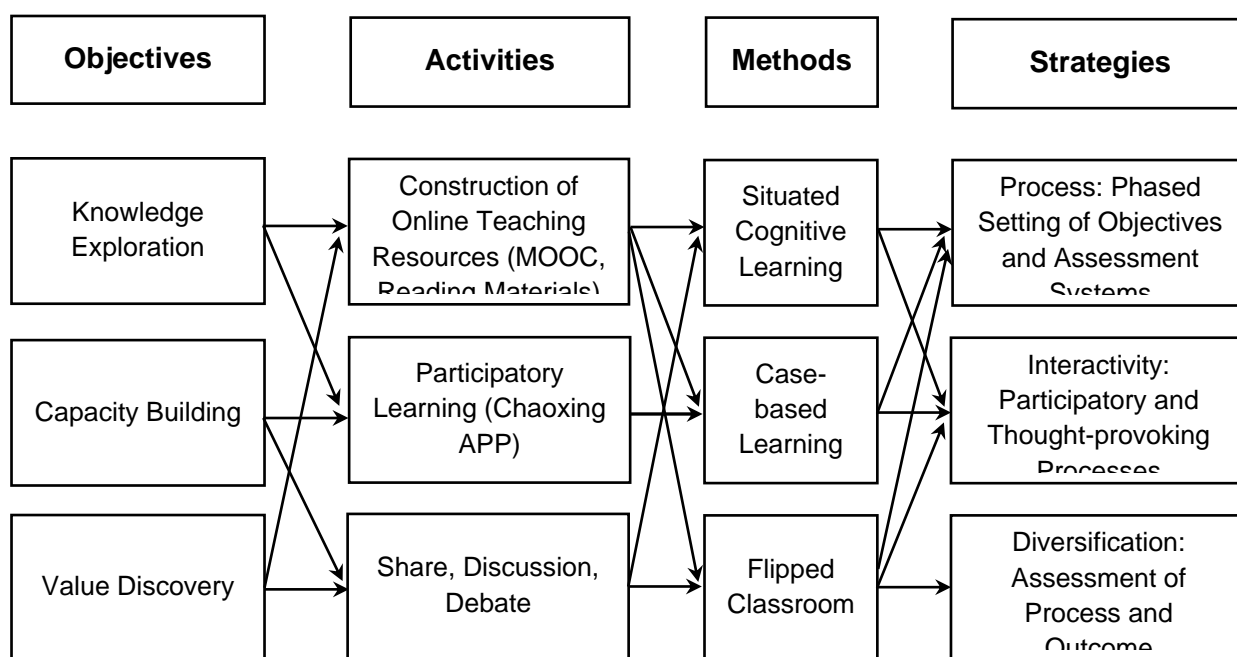

Figure 2. Four layers of blended teaching.

THE ESTABLISHIMENT OF COIP

Regarding the History and Theory of Western Landscape Architecture, it is necessary for junior undergraduates to conceive, absorb and analyze plenty of knowledge about various gardens and parks in regional cultural contexts independently in a positive way, even though the historical landscape system of Western world is detached from their daily life. For them, it is insufficient for instructors to interpret and analyze the professional contents in landscape architecture simply in class. In this context, the online framework of COIP is constructed as one of the online and in-class instructional reform projects, as supported by the university

The online system of COIP

Firstly, the practice of blended teaching is organized through the building of COIP. The Chaoxing open system supported us in organizing the basic structure of the course content. The system interface on the teacher side is composed of various modules, such as instructional activities, interactive statistics, learning materials, assignments, exams, group discussion, data management, questions and answers. In this system, students can access the online learning materials of every part with some task points that must be finished as their assignment after class.

Furthermore, this COIP can serve as a tool of instructional management, through which the specific data of online self-motivated learning can be recorded chronologically, such as watching the MOOC videos and reading professional materials. For example, the students logging data collected from students via computer and mobile phone enable the instructors to observe the curvilinear relationship between the number of studies and date in March, 2021 as shown in Figure 3. In respect of learning progress, the duration, speed and completion of learning can reflect their learning performance. In general, the accumulated independent learning time is totally 400 minutes on average, with the longest one exceeding 800 minutes and the shortest one falling below 200 minutes. The time spent on studying is directly proportional to efficiency and positivity, to some extent.
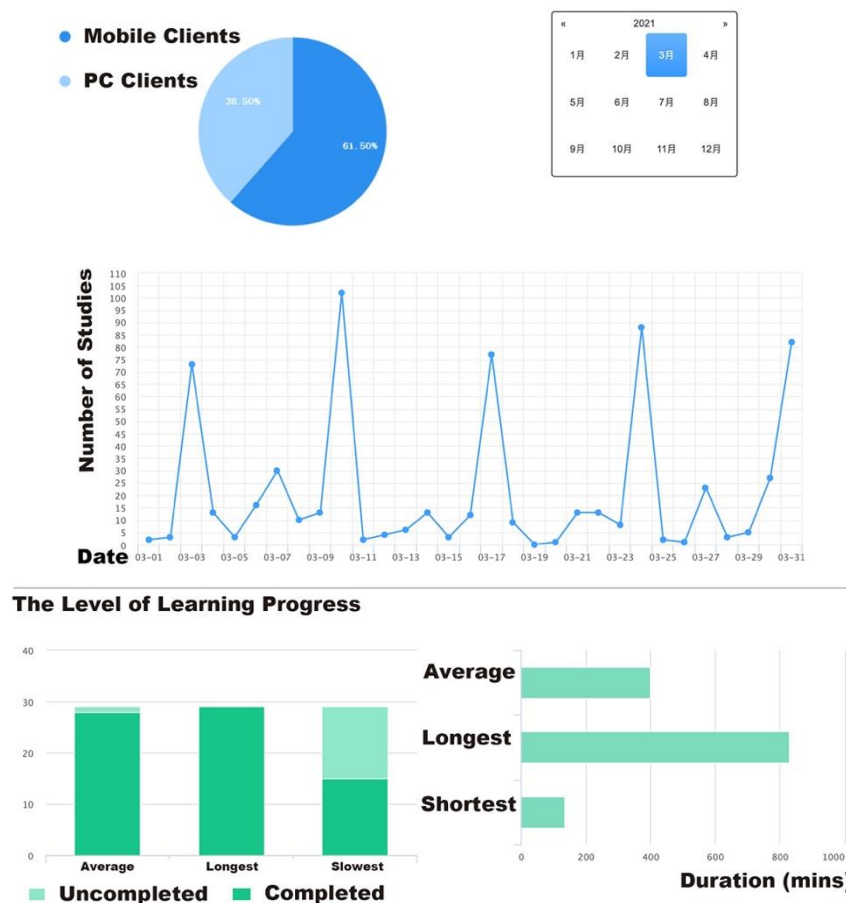

Figure 3. The data showing in the COIP.

With the assistance of COIP, there are a range of MOOC instructional video resources getting connected to this online system in the form of task points for students to learn independently. In general, there are 32 videos from MOOC with totally 370 minutes, and 12 professional documents about garden theories,

techniques, skills and methods from uploaded journals and books. At any time, the students can view them repeatedly, send messages and give like to these resources as a way of online interaction and discussion. Furthermore, the assignment created by teachers for students can be shown at COIP, such as sketching your favorite garden landscape with their own analysis, which can be also submitted via this system. Shared in this system, their work is put on display on the Internet and every student who choose this course is entitled to evaluate the work through anonymously marks and reviews.

THE APPLICATION OF BOPPPS METHOD

Base on the online system of COIP, the in-person or online classroom instruction can be developed by BOPPPS from six aspects, namely bridge-in, objectives, pre-assessment, participatory learning, post-assessment and summary. With constructivism and communicative approaches as the theoretical basis, this educational method is introduced into the landscape course to assist instructors with decomposition and analysis of the teaching process.

Thereby, the lesson of Ancient Greek Gardens exemplified to demonstrate how this method can be applied. Firstly, there are several questions to be raised to attract the attention of students to the bridge-in part. By comparing the high-profile example of acropolis with our familiar Chinese traditional North sea royal garden, how could the similar method of moving at different pace to shape space be achieved in different regions? What's the difference between them? After these questions are raised, some specific learning objectives are set out by instructors, including not only the cognition of types and characteristics of ancient Greek gardens, but also the understanding as to the method of artistic design for varying sceneries with changing view-points through comparison.

In terms of pre- and post-assessment, the students can have the interaction with teachers by means of questionnaire, exercises, questions and answers in CLA. For example, before learning the ancient Greek gardens, the students are encouraged to make multiple choices as a way to answer the question about the differences between Eastern and Western gardens in terms of architecture and spatial shaping. By setting corresponding questions in association with pictures, videos, short texts and hyperlinks, instructors can enhance both readability and visual effects. After learning the whole lesson, the students are expected to share their personal opinions about the influencing factors in the development of Western gardens? Meanwhile, a keyword cloud will be presented to reveal the essential contents as mentioned by the students in their answers. In addition, the essential exercises in the CLA for the pre- and post-assessment can be classified into three different levels: basic - advanced - premium, so as to examine the mastery of knowledge by students in the classroom.

Over the course of participatory learning, some activities are conducted, such as the debate on 'My View of Western and Chinese Gardens' from such perspectives as landscape elements terrain, water, plants and architecture. In flipped classroom, the students are asked to recall their visits to the gardens and parks as well as their spatial perception for interpretation of the garden differences. With a learning environment created by classroom group for mutual debate, group discussions are conducted around the characteristics of Chinese and Western gardens, the features of landscape elements, and the differences in social and cultural environments. Under the guidance of the teacher, there is in-depth analysis carried out regarding the gardens and parks linked to the construction of terrains, water management, architecture and plants under different social and cultural contexts. From the perspective of students, they can learn how to think critically, analyze landscapes in a dialectical thinking pattern and express themselves fluently. Based on objective cognition and subjective expression, the students can better perceive the Chinese and Western garden art, reinforce their confidence in their own garden culture, and elevate their own level of artistic appreciation.

Furthermore, the students can discuss the specific examples of various garden types through the situated cognition and case-based learning methods, which allows the students to find the effective solutions to

theory learning to enhance their learning efficiency. The main challenge facing them is to establish working groups for full presentations and show their full understanding of garden landscape, which requires not only solidarity, support and collaboration within their groups, but also a certain level of responsibility and patience in the process.

The last part for BOPPPS method is a learning way of garden analysis, which enables students to conclude each garden type in a specific way, involving four aspects of garden site selection, layout, gardening features and influencing factors. Embraced by the students, this method ranks top in the questionnaire of the learning assessment, because they consider this analytical method of garden types as beneficial for them to know what the critical contents will be during the learning process and to reflect on what they have learned from the previous lesson.

CONCLUSION

In the blended teaching of History and Theory of Western Landscape Architecture, a specific instructional model for Chinese students and instructors can be concluded as BOPPPS with the open system of COIP with CLA and the learning resources of MOOC. According to the instructional objectives, the course is organized by adopting the strategies of process, interaction and diversification, all of which are implemented through episodic situated cognitive learning, case-based teaching and flipped classroom. Focusing on technology-mediated instruction, blended teaching can contribute to adjusting the learning methods adopted by the participants, expanding high-quality instructional resources, enhancing learning efficiency and promoting the communication between instructors and students.

ACKNOWLEDGEMENT

NOTES

[1] Roger Säljö, "Learning in the Learner's Perspective. I. Some Common-sense Conceptions," Gothenburg University, January 1979, accessed March 20, 2022, https://eric.ed.gov/?id=ED173369.
Paul Ramsden, *Learning to Teach in Higher Education 2nd Edition* (London: Routledge Falmer, 2002), 15.; Robert A. Ellis, Aliya F. Steed and Andrelyn C. Applebee, "Teacher Conceptions of Blended Learning, Blended Teaching and Associations with Approaches to Design," *Australasian Journal of Educational Technology* 22(3) (2006): 312-335.
[2] Linda Harasim, "Shift Happens: Online Education as a New Paradigm in Learning," *The Internet and Higher Education* 3(2000): 41-61.
[3] Choosri Britchenko, "Enhancing Students' Language Skills Through Blended Learning," *Electronic Journal of E-learning* 14(3) (2019): 220-229.; Heather Staker and Michael B. Horn, "Classifying K-12 Blended Learning," Innosight Institute, May 2012, accessed March 20, 2022, https://www.christenseninstitute.org/wp-content/uploads/2013/04/Classifying-K-12-blended-learning.pdf.
[4] D. Randy Garrison and Heather Kanuka, "Blended Learning: Uncovering its Transformative Potential in Higher Education," *The Internet and Higher Education* 7(2) (2004): 95-105.
[5] Cathy Burnett and Guy Merchant, "The Challenge of 21st Century Literacies," *Journal of Adolescent and Adult Literacy* 59(3) (2015): 271-274.
[6] Dianna Laurillard, *Rethinking University Teaching: A Framework for the Effective Use of Educational Technology 2nd Edition* (London: Routledge, 2002).
[7] Gutu Maria, "A New Perspective on Learning: Flipped Classroom and Transmedia Learning," *Electronic Journal of E-learning* 14(3) (2019): 240-245.
[8] Xun Bu, "The Blended Teaching Mode Based on Chaoxing Learning APP," *Advances in Social Science, Education and Humanities Research* 357 (2019): 247-249.

BIBLIOGRAPHY

Britchenko, Choosri. "Enhancing Students' Language Skills Through Blended Learning." *Electronic Journal of E-learning* 14(3) (2019): 220-229.

Bu, Xun. "The Blended Teaching Mode Based on Chaoxing Learning APP." *Advances in Social Science, Education and Humanities Research* 357 (2019): 247-249.

Burnett, Cathy and Merchant, Guy. "The Challenge of 21st Century Literacies." *Journal of Adolescent and Adult Literacy* 59(3) (2015): 271-274.

Ellis, A. Robert, Steed, F. Aliya and Applebee, C. Andrelyn. "Teacher Conceptions of Blended Learning, Blended Teaching and Associations with Approaches to Design." *Australasian Journal of Educational Technology* 22(3) (2006): 312-335.

Garrison, D. Randy and Kanuka, Heather. "Blended Learning: Uncovering its Transformative Potential in Higher Education." *The Internet and Higher Education* 7(2) (2004): 95-105.

Harasim, Linda. "Shift Happens: Online Education as a New Paradigm in Learning." *The Internet and Higher Education* 3(2000): 41-61.

Laurillard, Dianna. *Rethinking University Teaching: A Framework for the Effective Use of Educational Technology 2nd Edition*. London: Routledge, 2002.

Maria, Gutu. "A New Perspective on Learning: Flipped Classroom and Transmedia Learning." *Electronic Journal of E-learning* 14(3) (2019): 240-245.

Ramsden, Paul. *Learning to Teach in Higher Education 2nd Edition*. London: Routledge Falmer, 2002, 15.

Säljö, Roger. "Learning in the Learner's Perspective. I. Some Common-sense Conceptions." Accessed March 20, 2022. https://eric.ed.gov/?id=ED173369.

Staker, Heather and Horn, B. Michael. "Classifying K-12 Blended Learning. Innosight Institute." Accessed March 20, 2022.
https://www.christenseninstitute.org/wp-content/uploads/2013/04/Classifying-K-12-blended-learning.pdf.

FOOD STUDIES AS EXPERIENTIAL LEARNING

Author:
KERA LOVELL, SCOTT MORRIS

Affiliation:
UNIVERSITY OF UTAH'S ASIA CAMPUS, SOUTH KOREA

INTRODUCTION

COVID-19 has shaped how we as educators interact with our students, creating new dynamics with which we negotiate methods of assessment in online and hybrid learning environments. The isolation of social distancing and quarantine magnified the distance many educators like us felt with our students. Now two years into the pandemic, academia is now taking stock of what we have learned through this process, not only in the emotional and social impacts of online learning on student retention and success, but in the challenges and opportunities for online and hybrid learning.[1] Ultimately one of our greatest struggles teaching during the pandemic was how can we maintain experiential learning and student-centered interactive discussions in an online environment for English as a second-language (ESL) learners? In this paper we use our undergraduate humanities course on food studies—HUM 1010, taught online and hybrid at the University of Utah's Asia Campus in Korea—as a case study for answers to this question. In particular, we argue that the interdisciplinary, interactive, and personal study of food became a mechanism with which we could creatively negotiate the restrictive barriers of social distancing during the Covid pandemic in ways that fostered meaningful connections and embodied self-reflection for our ESL students. In this paper we outline how exploratory, creative, and fun experiential learning grounded our pedagogy, including our course goals and methods of assessment. Looking toward future iterations of the course, we conclude by proposing additional strategies for fine-tuning hybrid adaptations of experiential learning for ESL learners.

University of Utah's Asia Campus in Korea

The University of Utah's Asia Campus (UAC) is in Incheon, South Korea, about an hour southwest of Seoul, on the coast of the Yellow Sea. The campus was started in 2014 as part of the Incheon Global Campus, a collective of several international universities operating similar branch campuses in Korea. Students from the UAC are mostly Korean, though every semester has a handful of students from elsewhere, mostly the United States and East Asia. The UAC offers a limited range of majors, which students begin in Korea but finish at the main campus in Salt Lake City (all students are required to attend at least two semesters in the main campus.) The UAC has about fifty non-tenure track faculty members with a wide range of international representation, though the majority are either US or Korean citizens. Curriculum decisions are made in consultation by and only with approval from the home campus, so the UAC's goal is that the classes taught on either campus are equivalent, though the teaching styles at the UAC are specifically tailored to our unique student base.

HUM 1010: FOOD STUDIES

In adapting this main campus course offering to the UAC, we knew we wanted to design the course as a hybrid, first-year-level elective that would appeal to the most amount of enrolled students as possible. We have had the opportunity to teach this course twice during Covid through two different formats: the first as an intensive 2.5 week block scheduled course during the winter 2020-2021 break, and the second as a full semester Tuesday/Thursday course in the fall of 2021. In both formats, we operated the course via Zoom as well as select in-person sessions held in a multipurpose room on campus which allowed for varied seating arrangements for large group discussions and lectures as well as small group projects. In addition, holding the class in an open accessible multipurpose room contributed to a more exploratory approach to the subject material.

Zoom has consistently worked well for tech purposes by allowing both faculty and the students to be able to share screens quickly, including digital media for lectures and discussions as well as student projects. Our course has also made use of having students upload nearly all work to a shared Google Drive which has further fostered a communal environment often lost in an online classroom outside of learning platform discussion posts. Google Drive allows almost all work to be accessible to students for peer review and for group work. Using a shared drive versus a learning platform does have its drawbacks, including the inability to be able to track resubmissions, such as revised work, so we recommend using the format that best fits your needs. Because all grades were posted to the learning platform and separated from Google Drive, we could easily share work without the fear of sharing private information.

EXPERIENTIAL AND INTERACTIVE LEARNING FOR ESL LEARNERS

With most of our students being English as a Second Language (ESL) Learners, we employed numerous methods to diversify our course, making it more accessible to non-native English speakers and readers. There are many approaches widely discussed throughout the teaching literature, but we can see it specifically mentioned in DeWaelsche's research, which emphasizes specifically students who come from Korean education backgrounds, as most of our students do.[2] Diverse, Western-styles of teaching are common at our US-based university, however, as most of our students come from a Korean background, our interactive, non-exam approach is new to many who went to school where "memorization of knowledge…[is] the rule rather than the exception."[3] Within the context of Korean public education, the "personal" is altogether erased from the learning environment. Modeled after the "banking" method of teaching and learning, this educational style centers the instructor as the key source of knowledge who deposits information into learners through lectures. Students succeed by absorbing the most amount of information possible to be regurgitated on the tests. This method of teaching and learning ensures an instructor-topped hierarchy with little-to-no room for critical thinking that might challenge or even make more complex the instructor's ideas. Korea, in particular, is renowned for its reliance on testing as a measure of student worth that often divides students along income levels, with stress culminating at college entrance exam.[4]

As DeWaelsche points out, some professors may think that because Korean students are most comfortable in systems the reward memorization, classes designed to mimic that is the best model to help students feel comfortable. The problem with that, of course, is that for many classes, including ours, the key terms or facts that a student needs to master are relatively small, and instead, the key learning strategies are in demonstrated skills. As with most courses in the humanities, our course focused instead on applying critical thinking and creativity to given situations or learning tasks. For many students, this was "fun" and freeing—several students mentioned that the assignments "felt like playing"—but some students certainly were less immediately comfortable with the open-ended assignments (which we'll discuss further in the labor-based grading system section.) However, critical

thinking and applied learning can happen, even in introductory courses like ours, when there are a range of activities which allow for different methods of engagement.[5] We also prepared students for conversation or active learning by first assigning texts as outside reading, often with discussion questions or learning tasks designed to lead into the classroom task for the day, which is designed to help students prepare for an interactive classroom model that may otherwise be uncomfortable for them.

Methods of Assessment

Throughout the course we used varied methods of assessment beyond written papers, including storyboards, mind maps, group presentations, and audio and video recordings. While the course still included numerous forms of shorter written assignments, these varied methods of assessment helped create an atmosphere of fun exploration not found in traditional coursework that heavily relies on written papers, tests, or presentations. When assigning longer texts that could take ESL learners much longer to absorb, we employed a "divide and conquer" strategy that allowed students to work in groups to read and present chapters to their classmates. With this format, groups were able to record presentations, which lessened language-induced performance anxiety because they were able to recite scripts before answering questions in a collective Q&A. Group videos were uploaded to a shared drive and assigned to watch as homework, allowing students to watch at a slower speed and even re-watch at their own pace. Finally, we followed up with short untimed reading quizzes that asked students to individually answer questions about all of the presentations to ensure comprehension.

Part of our work in designing the class was making a student-centered classroom, which includes students teaching each other. Designing the class with a group-work emphasis, we kept in mind Sampson and Cohen's advice that group work and peer learning means an "acceptance that different students will learn different things, that learning outcomes related to wider learning skills are as important as particular subject-matter understandings, and that students should be encouraged to make their own decisions about their learning."[6] This model worked especially well in our experiential model, and we would add that in our class, learning wider learning skills was far more important than any particular subject-matter, given the breadth of the course's topics and that it was taught as an introduction to non-majors.

Labor-Based Grading

Because the course was designed as an exploratory humanities course as an introduction to the liberal arts, our goal was to focus on exposure versus mastery (for us and for the students). In order to de-emphasize rote learning and emphasize engagement with the work of the class, our course used a modified version of Inoue's "labor-based grading contracts."[7] This method is specifically designed with composition classes is mind but transfers well to our activity-based humanities course where the goal is not mastering a specified list of terms, but the exploration of concepts in a range of areas. The basic formula for Inoue's grading scheme is that no grades or points are assigned to any task (there is still a formula for determining final letter grades, but it is not a points-based system. The details aren't as essential for our discussion here, and we recommend interested teachers look to Inoue or any number of other innovators using "gradeless" grade systems.)

Local to Transnational

Throughout the course, we aimed to create opportunities for students to connect their own personal experiences with food with the broader world, including global systems of food, larger transnational relationships with food, and transhistorical experiences of food. In some fields in the humanities, the "personal" is often perceived by faculty as non-academic. While Scott's work in creative nonfiction thrives on centering the personal, in fields like history where Kera's research is centered, students-

turned-scholars are often groomed early on to remove all personal connections in academic papers. At the Utah Asia Campus, many students coming from the Korean public education system often begin their college careers struggling to challenge this "learn for the test" mindset that encourages critical thinking and discussion. With the goal of disrupting traditional modes of inquiry, our class included assignments throughout the course inviting students to share their personal experiences through a disciplinary lens. As a response to reading the graphic memoir *Umma's Table*, students were tasked with reading such food-themed personal essays as "As I Boil Ramyon," by Kim Hoon, "Comfort Foods," by Lisa Ohlen Harris, and "American Rarebit," by John Leavitt, before writing a brief personal essay exploring their relationship with a comfort food.[8] The assignment became the foundation for their later oral history interview assignment in which they had to record a discussion with a family member on aspects of food (cooking, eating, gardening, buying, etc.) in their past. While first-year students often begin the course in search of the "right" answer, assignments that centered their personal experiences encouraged them to explore ideas—circling them with the goal of asking more questions than finding answers. Through these assignments, we encouraged students to embrace their own quirky food habits and their unique family food recipes as valuable academic texts.

Centering the personal also helped us create empathic connections with our students despite the isolation online learning during Covid. We encouraged students to play, take risks, and have food in their personal spaces, such as with our "Play with your Food" assignment that required students to create an exploratory sound video about food. In a utilitarian framework that focuses on efficiency of use, food play is perceived as wasteful. Parents often discourage us from playing without food so as to "not waste money." Even within the context of Korea, stories about the postwar period illuminate how desperate starving survivors after the Korean War. As captured in Grace Cho's memoir *Tastes Like War*, impoverished Koreans were left to scour the trashcans of military bases after North Koreans destroyed food supply lines.[9] The legacy of this experience continues to shape Korean culture, with platitudes about eating the last grain of rice out of respect, and sharing every part of a meal from coffee to dessert. For the "Play with your Food" assignment, we used food sounds as a form of autonomous sensory meridian response (ASMR) as a lens to explore Korean *mukbang* culture. *Mukbang* (meaning eating as a performance) is one of the most popular ways in which Korean culture is spreading globally through platforms like YouTube. In *mukbang* videos, hosts usually eat an extremely large quantity of a certain meal with a highly sensitive microphone capturing the sounds of slurping, chewing, and groaning. As *mukbang* has gained popularity across the world, now YouTube hosts *mukbang* channels from diverse backgrounds. Because being a celebrity YouTuber remains a career goal for some of our Korean students, we assigned a podcast episode and reading on *mukbang* and ASMR audiences, revealing the many reasons viewers watch *mukbang*, from countering the shame of eating alone to serving as a coping mechanism for dieters.[10] Students were then tasked with creating their own food ASMR video in which they had to generate at least ten different sounds from any aspect of the food system, even thinking beyond food eating and cooking to include grocery shopping, farming, disposing of food waste, etc. While some students were hesitant to play with their food and stuck to common food and beverage sounds used in food advertising (such as the clinking of ice and pouring of liquid), some students explored the symphony of pizza by throwing pepperoni against their dorm room wall and scratching crust against their face. The videos then became a conversation starter for how certain food-related sounds, such as chewing and slurping, make us feel that speak to larger cultural narratives about the symbolic meaning of food consumption. Throughout the course we welcomed the strange and silly, but most importantly we created an environment in which students were encouraged to take creative risks in innovative ways.

CONCLUSION

For professors who would like to adapt a similar course, or any course that focuses on such a wide breadth of concepts, we offer a few final conclusions, ones that we will also keep in mind as we prepare for the third iteration of the course which we will teach in Fall 2022. An essential lesson we learned through teaching this course is the need for flexibility in course and assignment design. When we first imagined the class, we did not imagine the impact of Covid, especially the unpredictability of when we would and would not be allowed to have class in person. Over the past two years, we have had to quickly adapt from teaching in person one week to immediately social distancing and teaching online for the following two weeks. While we hope that the return to in-person classes will stick now that the student population is vaccinated, the future remains uncertain. Intentionally designing the class to easily move between online or in-person platforms meant there was less scrambling when situations changed, and having teaching strategies prepared for both Zoom or live lectures meant we didn't have to doubt our strategy with each lecture.

The other way flexibility becomes important is in the assignments themselves. The labor-based contract, the small-group work, and the embracing of creative rather than derivative work meant students had a significant amount of freedom in what they could turn in and still receive a Complete grade. In such a system, transparent, clear boundaries for what is acceptable while also celebrating a student's creative approach that the professor hadn't entirely expected becomes very important, as does feedback that is less about correct vs incorrect, and more about effective vs ineffective. In this way, the flexibility encourages students to take risks in their creativity, showing their learning in new ways. As Inoue says in his book, all labor is learning, so the goal with student engagement is not to get a specific answer, but to have students work, because even a task that comes out "wrong" or ineffective was a chance to learn, which is more important than any specific outcome.

Perhaps the most important takeaway is that we must have the same attitude for ourselves that we allow for our students: failure is a learning experience. The attempt is worthwhile even if not every lesson or activity was a huge success. Just as we tell our students, we are learning from failure and working to improve the class for next time. For example, our board game design unit had some excellent portions, but the actual act of making board games rarely produced any high-level thinking we were hoping for. Given our school's interest in game design, we will keep that unit, but find a way to do game analysis rather than game making. This way, students will still engage with the excellent concepts that can be taught through game design, but not have to do the designing itself—a highly technical skill our class isn't prepared to devote the time to. Because we are constantly learning from our own teaching, our classes will never be the same from semester-to-semester, as each new iteration of the course will have tweaks, large and small, trying to give students the more rewarding, engaging experience.

NOTES

[1] Roy Chan, Krishna Bista, and Ryan Allen, eds., *Online Teaching and Learning in Higher Education During COVID-19: International Perspectives and Experiences* (New York: Routledge, 2022); Sinjini Mitra and Denise Stanley, Pandemic Studies: Remote Learning During Covid, Significance 19, no. 2 (April 2022): 22-24.

[2] Scott A. DeWaelsche, "Critical Thinking, Questioning and Student Engagement in Korean University English Courses," *Linguistics and Education* 32 (2015): 131-147.

[3] Organization for Economic Cooperation and Development. *Reviews of National Policies for Education: Korea 1998* (Paris: OECD Publications, 1998), Qtd in DeWaelsche, 132.

[4] S.C., "Class Struggle: An Interview with South Korea's Education Minister," *The Economist*, October 29, 2013), https://www.economist.com/banyan/2013/10/29/class-struggle; *Reach for the Sky*, directed by Wooyoung Choi and Steven Dhoedt (Boda Media Group, 2015), 1:30; DeWaelsche, "Critical Thinking."

[5] Ibid.

[6] Jane Sampson and Ruth Cohen, "Designing Peer Learning." in *Peer Learning in Higher Education: Learning from & With Each Other*, David Boud, Ruth Cohen, Jane Sampson, eds. (London: Kogan Page Limited, 2001): 21-34.

[7] Asao B. Inoue, *Labor-based Grading Contracts: Building Equity and Inclusion in the Compassionate Writing Classroom* (Fort Collins: WAC Clearinghouse, 2019).

[8] Kim Hoon, translated by J.Y. Lee, "As I Boil Ramyŏn," *Azalea: Journal of Korean Literature & Culture* 13 (2020): 123-135; Lisa Ohlen Harris, "Comfort Food," *Brevity* 34 (September 2010), https://brevitymag.com/nonfiction/comfort-food/; John Leavitt, "I Keep a Stack of Kraft Singles in the Fridge," *Electric Lit* 52 (Feb 2019), https://electricliterature.com/i-keep-a-stack-of-kraft-singles-in-the-fridge/

[9] Grace Cho, *Tastes Like War: A Memoir* (Feminist Press: New York, 2021).

[10] Tatiana Carrier, "Hyunee - On the Mukbang Phenomenon, Eating on YouTube for a Living, and her HyuneeBee Community," episode of podcast *Behind the Influence* (November 12, 2019), https://podcasts.google.com/feed/aHR0cHM6Ly9mZWVkcy5tZWdhcGhvbmUuZm0vSFNXNTU5OTgxMzYyNQ/episode/MTljZmI5ZGEtZGYxNy0xMWU5LWEyNTEtZDNmZGRjZmRhODEw?ep=14; Joceline Anderson, "Now You've Got the Shiveries: Affect, Intimacy, and the ASMR Whisper Community," *Television & New Media* 16, no. 8 (2015): 683-700.

BIBLIOGRAPHY

Anderson, Joceline. "Now You've Got the Shiveries: Affect, Intimacy, and the ASMR Whisper Community." Television & New Media 16, no. 8 (2015): 683-700.

Carrier, Tatiana. "Hyunee - On the Mukbang Phenomenon, Eating on YouTube for a Living, and her HyuneeBee Community," Behind the Influence (November 12, 2019), https://podcasts.google.com/feed/aHR0cHM6Ly9mZWVkcy5tZWdhcGhvbmUuZm0vSFNXNTU5OTgxMzYyNQ/episode/MTljZmI5ZGEtZGYxNy0xMWU5LWEyNTEtZDNmZGRjZmRhODEw?ep=14.

Chan, Roy, Krishna Bista, and Ryan Allen, eds. Online Teaching and Learning in Higher Education During COVID-19: International Perspectives and Experiences. New York: Routledge, 2022.

Cho, Grace. Tastes Like War: A Memoir. Feminist Press: New York, 2021.

DeWaelsche, Scott. "Critical Thinking, Questioning and Student Engagement in Korean University English Courses." Linguistics and Education 32, part B (December 2015): 131-147.

Harris, Lisa Ohlen. "Comfort Food." Brevity 34 (September 2010), https://brevitymag.com/nonfiction/comfort-food/.

Hoon, Kim, translated by J.Y. Lee. "As I Boil Ramyŏn." Azalea: Journal of Korean Literature & Culture 13 (2020): 123-135.

Inoue, Asao B. Labor-based Grading Contracts: Building Equity and Inclusion in the Compassionate Writing Classroom. Fort Collins: WAC Clearinghouse, 2019.

Leavitt, John. "I Keep a Stack of Kraft Singles in the Fridge." Electric Lit 52 (Feb 2019), https://electricliterature.com/i-keep-a-stack-of-kraft-singles-in-the-fridge/.

Mitra, Sinjini and Denise Stanley, Pandemic Studies: Remote Learning During Covid. Significance 19, no. 2 (April 2022): 22-24.

Organization for Economic Cooperation and Development. Reviews of National Policies for Education: Korea 1998. Paris: OECD Publications, 1998.

Reach for the Sky. Directed by Wooyoung Choi and Steven Dhoedt. Boda Media Group, 2015.

Sampson, Jane and Ruth Cohen. "Designing Peer Learning." In Peer Learning in Higher Education: Learning from & With Each Other, David Boud, Ruth Cohen, Jane Sampson, eds. London: Kogan Page Limited, 2001: 21-34.

S.C. "Class Struggle: An Interview with South Korea's Education Minister." The Economist. October 29, 2013, https://www.economist.com/banyan/2013/10/29/class-struggle.

STUDENT AS SITE: PEDAGOGICAL PARALLELS

Author:
EMILY WETTSTEIN

Affiliation:
UNIVERSITY OF VIRGINIA, USA

INTRODUCTION

As design education slowly diversifies, it continues to bias in deeply implicit ways, as it largely fails to incorporate the abundant research on inclusive teaching and learning into its foundations. I propose that instead of adopting methods and techniques directly from other fields, such as education, we might draw from the design disciplines themselves, and leverage the disciplines' core concepts and methodologies to construct a deeper inclusivity that is developed of the discipline itself and tailored to its needs and ways of working. In summary, we might learn from *what* we teach, for *how* to teach, to construct an inclusive, and specifically *design*, pedagogy, thereby increasing the likelihood of successful integration.[1]

Modelling this approach, I have developed a Student as Site pedagogy—first articulated in *The Journal of Architectural Education* and at the *2020 AMPS Teaching-Learning-Research Conference*—which draws on landscape architecture's deep engagement with site and sitedness to develop an alternative pedagogical model that seeks to approach students with the nuance and care with which landscape architecture approaches sites, with careful "attention to situation, position, and identity, and as generative of their own"[2] specific potentialities to be embraced in the co-construction of a more inclusive design education.[3]

The further development and articulation of this framework requires a deeper understanding of how site is engaged in both landscape architecture pedagogy and practice. This article begins an exploration into the former—specifically how landscape architecture programs' studio curricula engage sites. As a starting point, I analyse the foundation studio curriculum in the landscape architecture graduate program at the University of Virginia (UVA).

I begin by exploring varying approaches to and framings of "site" in UVA's foundation studios to distil a set of core curricular conceptions of site. These will then provoke a set of pedagogical practices that mirror the pedagogy's site practices. These parallels will then be supported by analyses of "students" in contemporary educational theory to frame a series of site/student parallels.

SITE IN PEDAGOGY

The University of Virginia School of Architecture's Master in Landscape Architecture (MLA) program is an accredited graduate program, in which all students complete the same first 2-year course sequence, including courses in Visualization/Media, Ecology/Technology, History/Theory, and Design/Studio.[4] For the purposes of this study, I will focus exclusively on the Design/Studio sequence, which includes: LAR 6010 Foundation I Studio, LAR 6020 Foundation II Studio, LAR 7010 Foundation III Studio, and

LAR 7020 Foundation IV Studio. The study will not include LAR 7010 Foundation III Studio, as the 2021 coordinator opted out of the study.

By analysing the studios' syllabi and assignments of the 2021-2022 academic year as primary research documents, I have attempted to summarize their approaches to site with the goal of drawing a series of parallel approaches to students. To begin, I will outline for each studio the basic course details and the design sequence through which students are guided over the course of the semester.

LAR 6010 Foundation I Studio

The first semester studio, LAR 6010 Foundation I Studio: Elements of Landscape Architecture, was sited on a relatively discrete site on Observatory Hill, a dense woodland immediately adjacent to the University of Virginia campus.[5]

The design sequence was outlined by four exercises, each lasting three to four weeks: *Ex01 Reveal*, *Ex02 Assemble*, *Ex03 Entangle*, and *Ex04 Inscribe*. *Ex01 Reveal* begins with a deep study of a walk through a key transect of the site. Students are asked to reveal a range of existing site conditions through critical reflection upon their embodied experience, the development of notational analyses, and the execution of a range of experimental documentation.[6] From this thick description of existing site conditions, students then extract essential site elements in *Ex02 Assemble*. These elements are then re-assembled into a series of new configurations and spatial units to "create a system of sequence and narrative … to generate a new progression of movement."[7] These novel models are then entangled with the additional complexity of a "community of living species or a dynamic abiotic medium" chosen by each student in *Ex03 Entangle*.[8] From this research, students will develop a series of specific design principles and strategies to site their interventions. Finally, the last exercise, *Ex04 Inscribe*, synthesizes the previous exercises by grounding the newly designed sequence in the site, speculating upon, and subsequently choreographing the design's evolution over time.[9]

LAR 6020 Foundation II Studio

The second-semester foundation studio in the sequence, LAR 6020 Foundation II Studio: Landscape Entanglements, engaged various sites in downtown Charlottesville, Virginia.[10]

The design sequence begins in *Assignment #1: Sitting in Public, Seating for Lingering and Conviviality*, where, following a series of case study analyses, students each design a bus stop along a primary street in downtown Charlottesville.[11] These smaller site designs spark a series of questions to be interrogated at the scale of the larger urban area. These inquiries establish the ground for *Assignment #2 Public Space, Racialized Topography and the Socio-ecological City*, an urban analysis mapping and modelling of the broader site of the city, through a socio-ecological lens—more specifically as a "racialized topography."[12] Thus, students' mappings and analyses reveal the context's interrelated systems as essential to understanding and subsequently designing a place-based intervention on a smaller discrete site. This urban analysis then lays the groundwork for *Assignment #3 Public Spaces of Gathering, Lingering and Conviviality* wherein students design one of two selected public spaces with deep socio-ecological histories. Finally, students are asked to develop a public space network that weaves their various designs together and into tapestry of the city.[13]

LAR 7020 Foundation IV Studio

The foundation studio sequence concludes with the fourth-semester studio, LAR 7020 Foundation IV Studio: Prototyping the Bay, with a design site of the broader Chesapeake Bay territory.[14]

The LAR 7020 design sequence is organized by a series of three modules. In *Module I: Unpacking the Bay*, students discover the plural histories and existing site conditions of the Chesapeake Bay territory.[15] This exploration uncovers various key processes ongoing on site, which are then extracted and

developed into a series of experimental prototypes in *Module II: Live Models*. Through this series of operative models, students test various interventions into existing site processes and study their emergent effects and feedback loops.[16] These studies are then mobilized to develop an adaptive strategy that can be implemented across the territory, with its effects studied and further shaped over time in *Module III: Adaptive Strategies*.[17]

SITE TO STUDENTS

Building on these summaries of the course materials of the three studios, I now turn to capturing three shared characteristics of their approaches to site: 1) embracing existing site conditions, 2) engaging site processes, and 3) adaptive site design. For each of these three characteristics, I will identify and describe parallel approaches to students, treating students as analogous to sites, and finally explore how those approaches accord with best practices in educational theory as summarized in three texts, *What Inclusive Instructors Do: Principles and Practices for Excellence in College Teaching* (hereinafter "*Inclusive Teaching*"), *Developing Learner-Centered Teaching* (hereinafter "*Learner-Centered Teaching*"), and the UVA's Center for Teaching Excellence's "Equitable Course Design Framework" (hereinafter "*Equitable Course Design*").

Embracing Existing Site Conditions

The first shared characteristic in the studio materials is the emphasis on understanding and embracing existing site conditions. LAR 6010's Ex01 Reveal, begins with the premise of "Design as outgrowths of landscape conditions."[18] Similarly, LAR 7020's *Module I: Unpacking the Bay*, asks "How do we engage this rich medium [of the site], the soil, the water, the history, the biota in ways that might enrich and diversify life? … Is it possible to reimagine the territory of the bay without reducing it through abstraction and generalization, without homogenizing and simplifying?"[19] This is taken a step further in LAR 6020's *Assignment #2* which focuses on the ways in which sites are necessarily situated in their contexts.[20]

Each set of course materials implicitly reject a *tabula rasa* approach that positions the site as an abstract empty container to be filled with a design, and instead, encourages embracing the site's existing richness and utilizing the site's existing material (both tangible and intangible) to design. They also insist that a site cannot be understood separately from its context—social, cultural, economic, ecological, among others—and that these larger forces are continually shaping the site. With this commitment to acknowledging and understanding existing site conditions, each course then employs mapping, understood broadly, to reveal those conditions.

A parallel approach to students advocates that students, like sites, have rich histories, backgrounds, prior knowledge, and skills to be revealed, unpacked, and engaged in the pedagogical process. And, as with sites, students' conditions include their situational contexts—we need to understand that students' identities are situated within larger societal forces, considering students' race, gender, class, ethnicity, etc.—each of which affects students' learning experiences within educational institutions.

We can facilitate exercises, paralleling site mapping, in which students develop a thick mapping of their experiences and prior knowledge. This begins a process of self-reflection and sharing, both between students and between student and instructor, encouraging an acknowledgement and appreciation of each student's skills and the skills of their peers. This builds confidence and community, while also establishing the ground material with which instructors must engage in their pedagogical design process, enabling us to pull from the threads of a student's existing knowledge and skills to weave in new disciplinary knowledge and design skills.

Similar to LAR 7020's *Module I: Unpacking the Bay's*, twofold objective of both "becom[ing] familiar with [the site] through a variety of lenses" and "establish[ing] a series of core design values that will

help guide the work of the studio,"[21] we can use this deeper understanding of each student to collectively develop a series of core values—classroom norms—to help guide the work of the class towards equity and inclusion.

The approach also resonates with some of the educational theory best practices in our texts. *Inclusive Teaching* advocates that "[s]tudents are valued for their differences in backgrounds, experiences, abilities, perspectives, internal and external pressures,"[22] and that "designing learning opportunities that tie into students' cultures can increase their intrinsic motivation and engagement with the material."[23] It also promotes a frame of "[m]ulticulturalism [that] acknowledges differences between learners and looks at such differences as assets to be celebrated,"[24] in contrast to frameworks that ignore difference and often inadvertently reinforce existing social hierarchies. Similarly, *Equitable Course Design* explains that "[e]ffective course design explicitly values and affirms students' identities, while acknowledging that power, privilege, and disadvantage intersect in unique ways to impact each students' learning experiences."[25] Finally, *Learner-Centered Teaching* explains that "[c]urrent knowledge is the foundation on which students can build future knowledge [because l]earning is a constructive process that involves building links between new information and experiences onto the individual's existing knowledge base."[26] This brings us to our second shared characteristic.

Engaging Site Processes

The second shared characteristic approach to site across the three course materials is the emphasis on engaging site processes. Building on the thick mapping of existing site conditions as established in LAR 7020's *Module I: Unpacking the Bay*, described above, the second module of LAR 7020 uses this information to reveal, and subsequently extract the site's operational frameworks and ongoing processes. The course asks students to "[l]ook forward and backward to uncover the plural histories of this region and to use time as a driving factor in our propositions. Our engagement with time will be to understand that landscape has its own agency, endemic processes that occur without our intervention and that can be choreographed, catalysed, or ossified through our actions."[27] These processes are therefore modelled, intervened upon, and shaped, testing the emergent effects that result from these changes. The method is intended to be iterative and playful, generating new knowledge through prototyping these different processes in a more abstract space. Similarly, LAR 6010's *Ex02 Assemble* pulls out various spatial units from the existing site to be re-arranged and experimented with to generate new spatial sequences.

Applying these same approaches to students would require instructors to focus on the process of learning and students' individual learning styles, engaging various forms of metacognition through which students learn how they learn. Mapping the ways that students learn allows instructors to test different teaching techniques that adapt to students' unique needs and synergize with their learning processes, including various active learning techniques.

This accords with educational theory best practices. *Learner-Centered Teaching* describes the necessity that students have "a self-awareness of their learning abilities and how they acquire knowledge," so that they can "think about their own learning and assess how successful they are as learners [and] consciously use different thinking strategies in different learning situations."[28] It explains that "[p]sychologists sometimes group these [strategic processing strategies] under the terms *general cognitive* or *meta-cognitive strategies.*"[29] It also emphasizes the importance of the kind of active learning that this attention to student/site processes entails, explaining that "[t]heories of learning highlight the roles of active engagement and social interaction in the students' own construction of knowledge," and that "[p]eople learn better when they interact and collaborate with others throughout the instructional task,"[30] such that "[s]uccessful students are actively involved in their own learning, monitor their thinking, think about their learning, and assume responsibility for their own learning."[31]

Adaptive Site Design

The third shared characteristic in the course materials is adaptive site design. This appears most clearly in LAR 7020's *Module III*. With the foundational knowledge of the site's rich existing material, ongoing processes, and operational frameworks, as well as its relation to broader forces, the design of the site is framed as a catalysing and choreographing of these existing processes on the site. "To operate within this region requires the embrace of indeterminacy, calculated failure, and methods to harness feedback." This approach is captured in the syllabus in Brian Davis's exhortation that "proposals become more like highly informed finely tuned hypotheses–responding to new information, constantly subject to testing and evaluation, modification and adaptation … They are design experiments in their own right, and in reckoning with the presence and agency of complicating and contingent factors at work … they conjure forth an ongoing engagement on the part of all those involved." These adaptive site design approaches demand a nuanced and sophisticated interplay between the agency of the site and the agency of the designer. By sensitively and strategically intervening in the processes already present through the site, designers are neither imposing their vision on a blank slate, nor evading their responsibility for their own agency and vision.

Instructors can apply this same nuance and care to their students in their course design. With careful attention to the processes identified in the previous section, and the understanding that effective learning requires integrating new knowledge with existing ways of thinking, connecting, and knowing, instructors can engage in adaptive course design, building in the flexibility to meet the unique learning needs and styles of every student. This is most effective when students are—collectively and individually—participants in and co-constructors of the course, but just as adaptive site design does not mean ignoring or avoiding the agency of the designer, adaptive course design does not mean handing over all elements of the course to students. Instead, it requires engaging students as fully as possible while the instructor holds and maintains a strong design vision for the course.

Moving from the terminology of site design to the terminology of our education theory texts, this accords with the idea that "[b]eliefs about one's own competency or ability to succeed, called *self-efficacy*, correlate with grades," and "students who believe they have control over their learning are more likely to be more actively engaged in their academic work and work harder, achieving higher grades that do students who do not believe they have control over their learning."[32] At the same time, "[t]he instructor plays essential roles in creating the learning situation or context."[33] But "[r]ather than being the person who gives the information, the instructor's primary role is to be a guide or facilitator of learning by creating environments for student learning."[34]

As in adaptive site design, this is ultimately a question of balance, such that "*[t]he balance of power* shifts so that the instructor shares some decisions about the course with the students, such that the instructor and the students collaborate on course policies and procedures. Learner-centered teaching … giv[es] students opportunities to learn and some control over expressing perspectives and their methods of learning and assessment."[35] This requires transparency, as described in *Equitable Course Design*: "[e]ffective course design is transparent about the purposes, tasks, and criteria for success. Instructor assumes and respects student agency, unpacks hidden curriculum."[36] It also requires the appropriate level of flexibility. *Learner-Centered Teaching* proposes that "[i]nstructor provides increasing opportunities for students to assume responsibility for their own learning"[37] and that "[i]nstructor is flexible on most course policies: assessment methods, learning methods, deadlines, *and* instructor always adhere to what instructor has agreed to with the students."[38]

CONCLUSION

This article has sought to further articulate a Student as Site pedagogy, drawing on the approaches to site articulated in the foundation studio course materials of the graduate landscape architecture curriculum at the University of Virginia, and pairing them with some best practices from education theory. If this approach has been successful, it will serve as a pilot for a more extensive engagement with the Student as Site framework as it applies to design pedagogy and practice, continuing to be grounded by the pursuit of an inclusive and equitable design education that draws on the design discipline's own concepts.

NOTES

[1] Emily Wettstein, "SITE • ED: A Student as Site Pedagogy," *The Journal of Architectural Education* 74, no. 2 (2020): 182.

[2] Emily Wettstein, 182.

[3] See both: Emily Wettstein, "SITE • ED: A Student as Site Pedagogy," *The Journal of Architectural Education* 74, no. 2 (2020): 182-183.
Emily Wettstein. "Student as Site: Embodied Landscape Research." Paper presented at the AMPS (Architecture, Media, Politics, and Society) conference *Teaching-Learning-Research: Design and Environments Conference*, Manchester School of Architecture, Manchester, UK, December 2020.

[4] "Landscape Architecture," University of Virginia School of Architecture, accessed May 19, 2022, https://www.arch.virginia.edu/programs/landscape-architecture.

[5] Leena Cho. "Fall 2021. LAR 6010 Foundation I Studio: Elements of Landscape Architecture" (syllabus, University of Virginia, Charlottesville, VA, 2021).

[6] Leena Cho. "Fall 2021. LAR 6010 Foundation I Studio: Elements of Landscape Architecture, Exercise 01: Reveal" (assignment, University of Virginia, Charlottesville, VA, 2021).

[7] Leena Cho. "Fall 2021. LAR 6010 Foundation I Studio: Elements of Landscape Architecture, Exercise 02: Assemble" (assignment, University of Virginia, Charlottesville, VA, 2021).

[8] Leena Cho. "Fall 2021. LAR 6010 Foundation I Studio: Elements of Landscape Architecture, Exercise 03: Entangle" (assignment, University of Virginia, Charlottesville, VA, 2021).

[9] Leena Cho. "Fall 2021. LAR 6010 Foundation I Studio: Elements of Landscape Architecture, Exercise 04: Inscribe" (assignment, University of Virginia, Charlottesville, VA, 2021).

[10] Elizabeth K. Meyer. "Landscape Entanglements: LAR 6020 Landscape Architecture Core Design Studio II" (syllabus, University of Virginia, Charlottesville, VA, 2022).

[11] Elizabeth K. Meyer. "Assignment #1 Sitting in Public. Seating for Lingering and Conviviality" (assignment, University of Virginia, Charlottesville, VA, 2022).

[12] Elizabeth K. Meyer. "Assignment #2 Public Space, Racialized Topography and the Socio-ecological City" (assignment, University of Virginia, Charlottesville, VA, 2022).

[13] Elizabeth K. Meyer. "Assignment #3 Public Spaces of Gathering, Lingering and Conviviality" (assignment, University of Virginia, Charlottesville, VA, 2022).

[14] Bradley Cantrell. "Prototyping the Bay, choreographing islands. LAR 6020 Foundation Studio IV. Spring 2022" (syllabus, University of Virginia, Charlottesville, VA, 2022).

[15] Bradley Cantrell. "Module I: Unpacking the Bay, research, mapping, modeling" (assignment, University of Virginia, Charlottesville, VA, 2022).

[16] Bradley Cantrell. "Module II: Live Models, prototypes, experiments" (assignment, University of Virginia, Charlottesville, VA, 2022).

[17] Bradley Cantrell. "Module III: Adaptive Strategies" (assignment, University of Virginia, Charlottesville, VA, 2022).

[18] Quote by David Leatherbarrow in Leena Cho. "Fall 2021. LAR 6010 Foundation I Studio: Elements of Landscape Architecture, Exercise 01: Reveal" (assignment, University of Virginia, Charlottesville, VA, 2021): 1.

[19] Bradley Cantrell. "Prototyping the Bay, choreographing islands. LAR 6020 Foundation Studio IV. Spring 2022" (syllabus, University of Virginia, Charlottesville, VA, 2022): 2.

[20] Elizabeth K. Meyer. "Assignment #2 Public Space, Racialized Topography and the Socio-ecological City" (assignment, University of Virginia, Charlottesville, VA, 2022).

[21] Bradley Cantrell. "Module I: Unpacking the Bay, research, mapping, modeling" (assignment, University of Virginia, Charlottesville, VA, 2022): 1.

[22] Tracie Marcella Addy, Derek Dube, Khadijah A. Mitchell, and Mallory SoRelle, *What Inclusive Instructors Do: Principles and Practices for Excellence in College Teaching*, (Sterling: Stylus, 2021): 22.

[23] Addy, 21.

[24] Addy, 20.

[25] "Equitable Course Design Framework," Center for Teaching Excellence, accessed May 10, 2022, https://cdi.cte.virginia.edu/system/files/netbadge/CDI-Equitable-Course-Design.pdf: 3.

[26] Phyllis Blumberg, *Developing Learner-Centered Teaching*, (San Francisco: Jossey-Bass, 2009): 12.

[27] Bradley Cantrell. "Prototyping the Bay, choreographing islands. LAR 6020 Foundation Studio IV. Spring 2022" (syllabus, University of Virginia, Charlottesville, VA, 2022):4.

[28] Phyllis Blumberg, *Developing Learner-Centered Teaching*, (San Francisco: Jossey-Bass, 2009): 13.

[29] Blumberg, 13.

[30] Blumberg, 16.

[31] Blumberg, 17.

[32] Blumberg, 14.

[33] Blumberg, 16.

[34] Blumberg,16.

[35] Blumberg,18.

[36]"Equitable Course Design Framework," Center for Teaching Excellence, accessed May 10, 2022, https://cdi.cte.virginia.edu/system/files/netbadge/CDI-Equitable-Course-Design.pdf: 2

[37] Phyllis Blumberg, *Developing Learner-Centered Teaching*, (San Francisco: Jossey-Bass, 2009): 19.

[38] Blumberg,19.

BIBLIOGRAPHY

Addy, Tracie Marcella, Dube, Derek, Mitchell, Khadijah A., & SoRelle, Mallory. *What Inclusive Instructors Do: Principles and Practices for Excellence in College Teaching*. Sterling: Stylus, 2021.

Blumberg, Phyllis. Introduction to *Developing Learner-Centered Teaching,* 3-22. San Francisco: Jossey-Bass, 2009.

Cantrell, Bradley. "Prototyping the Bay, choreographing islands. LAR 6020 Foundation Studio IV. Spring 2022." Syllabus, University of Virginia, Charlottesville, VA, 2022.

Cantrell, Bradley. "Module I: Unpacking the Bay." Syllabus, University of Virginia, Charlottesville, VA, 2022.

Cantrell, Bradley. "Module II: Live Models." Syllabus, University of Virginia, Charlottesville, VA, 2022.

Cantrell, Bradley. "Module III: Adaptive Strategies." Syllabus, University of Virginia, Charlottesville, VA, 2022.

Center for Teaching Excellence. "Equitable Course Design Framework." accessed May 10, 2022 https://cdi.cte.virginia.edu/system/files/netbadge/CDI-Equitable-Course-Design.pdf.

Cho, Leena. "Fall 2021. LAR 6010 Foundation I Studio: Elements of Landscape Architecture." Syllabus, University of Virginia, Charlottesville, VA, 2021.

Cho, Leena. " Fall 2021. LAR 6010 Foundation I Studio: Elements of Landscape Architecture, Exercise 01: Reveal." Assignment, University of Virginia, Charlottesville, VA, 2021.

Cho, Leena. " Fall 2021. LAR 6010 Foundation I Studio: Elements of Landscape Architecture, Exercise 02: Assemble." Assignment, University of Virginia, Charlottesville, VA, 2021.

Cho, Leena. " Fall 2021. LAR 6010 Foundation I Studio: Elements of Landscape Architecture, Exercise 03: Entangle." Assignment, University of Virginia, Charlottesville, VA, 2021.

Cho, Leena. " Fall 2021. LAR 6010 Foundation I Studio: Elements of Landscape Architecture, Exercise 04: Inscribe." Assignment, University of Virginia, Charlottesville, VA, 2021.

Meyer, Elizabeth. "Landscape Entanglements: LAR 6020 Landscape Architecture Core Design Studio II." Syllabus, University of Virginia, Charlottesville, VA, 2022.

Meyer, Elizabeth. "Assignment #1 Sitting in Public. Seating for Lingering and Conviviality." Syllabus, University of Virginia, Charlottesville, VA, 2022.

Meyer, Elizabeth. "Assignment #2 Public Space, Racialized Topography and the Socio-ecological City." Syllabus, University of Virginia, Charlottesville, VA, 2022.

Meyer, Elizabeth. "Assignment #3 Public Spaces of Gathering, Lingering and Conviviality." Syllabus, University of Virginia, Charlottesville, VA, 2022.

University of Virginia School of Architecture. "Landscape Architecture." Accessed May 19, 2022. https://www.arch.virginia.edu/programs/landscape-architecture

Wettstein, Emily. "SITE • ED: A Student as Site Pedagogy." *The Journal of Architectural Education* 74, no. 2 (2020): 182-183.

Wettstein, Emily. "Student as Site: Embodied Landscape Research." Paper presented at the AMPS (Architecture, Media, Politics, and Society) conference *Teaching-Learning-Research: Design and Environments Conference*, Manchester School of Architecture, Manchester, UK, December 2020.

A CASE STUDY OF BLENDED LEARNING IN HIGHER EDUCATION IN CHINA

Author:
WANG HUIWEN, WU YANG

Affiliation:
COMMUNICATION UNIVERSIYT OF CHINA NANJING, CHINA

INTRODUCTION
Learning Autonomy
Findings from the measurement of Chinese university students' learning autonomy indicate that most students do not have a clear career plan, rely more on teachers' support instead of independent problem-solving, and display reluctance to draw inferences about other cases from one instance, resulting in a declining trend for self-management performance.

Such an issue is triggered by both intrinsic factors from students and negative external influences from the learning environment. Specifically, the former includes the lack of intrinsic interest reflected in the limited class time, fewer practice opportunities, and too much theoretical content. External reasons include results-oriented traditional learning assessment methods, as well as the disconnection between the content students learning in classrooms and the job requirements in the workplace. All these contribute to the lack of students' subjective initiative in independent learning.[1]

Blended Teaching
During the COVID-19 pandemic, it is inevitable and technically possible to explore blended learning to make use of online components, combining it with traditional classroom teaching. Blended learning pedagogy integrates constructive frameworks into a complex adaptive pedagogical approach that represents a fundamental re-conceptualization and reorganization of the teaching and learning dynamic. It adds an important reflective element with multiple forms of communication to meet specific learning requirements. However, it is rather ambiguous as to how much, or how little, online learning is inherent to blended learning, let alone practice-oriented models in Higher Education, where lecture-based teaching methodology is dominant, resulting in lack of context and interest for students, thus posing challenges in its reception.

This essay aims to address the challenges of how to better enable students' learning and prepare them to deliver public speaking via task-based teaching, offering suggestions for activities and the management of learning. Following a task-based teaching method, students can be highly motivated. Particularly, the use of task-based techniques could facilitate a strong social context for learning and provide students a chance to apply theories into practice.

LITERATURE REVIEW
Overview of Blended Learning and Learning Autonomy
The Connotation of Learning Autonomy
Nowadays, learning autonomy is becoming increasingly important with the development and transformation of education, and it is fundamental to all kinds of learning.[3] The Twenty-First Century Competency Alliance considers the ability to learn autonomously as an essential lifelong and vocational skill for students. Thus, it may be necessary for learners to establish the concept of lifelong learning and develop strong independent learning abilities to keep pace with the fast-developing society. As a result, cultivating students' learning autonomy is an important goal of education.

Learning autonomy has been defined differently in different fields. In terms of education, the concept was first introduced by Holec, who defined it as the ability to be responsible for one's own learning.[4] More specifically, a person qualifies as an independent learner when he or she could independently choose and set their goals. At the pedagogical level, learning autonomy is a process in which learners need to actively analyse their learning needs, plan their learning goals, identify learning resources, execute the learning process, and assess their learning outcomes.[5] Based on Gao Baoyu's analysis of the elements of self-directed learning ability, combined with the teaching context and pedagogy of the course, five learning elements were summarised,[6] namely, self-planning, self-execution, self-monitoring, self-evaluation, and self-revision. Therefore, the fostering of learning autonomy ranges from the training of self-managed learning ability, the transformation of learning psychology to the formation of self-directed learning behaviour in this case.[7]

The Connotation of Blended Teaching
The use of blended teaching has a long history, dating back to at least 2007.[8] At the beginning of the 21st century, some scholars proposed a new learning model that combines the advantages of online and offline learning named Blended Learning. However, the definition of blended learning is so diverse that it has become an umbrella term, referring to any learning which includes both online and offline components. In fact, the inclusion of online learning alone does not qualify as blended learning. Blended learning is a paradigm shift theoretically based on constructivist learning theory,[9] which focuses on students' independent learning and emphasises that the acquisition of knowledge and competencies is done by students in the process of active construction; in terms of approach, blended teaching is marked by the use of information technology, which integrates the advantages of online and offline learning and maximises the use of learning resources. Therefore, in this paper, blended teaching is defined as fusing the convenience and individuality of online teaching with the interactivity and depth of offline teaching, where students move from shallow to deep learning under the effective guidance of teachers,[10] and ultimately develop students' ability to learn independently.

Research on Blended Teaching and Learning Autonomy
The research on blended teaching is divided into the theoretical research stage, the practical exploration stage, and the diversified development stage.[11] In the theoretical research phase, scholars focus on the definitions and models of blended learning. Moving on to the practical exploration phase, studies focus on the specific practices, learning strategies and effect evaluation of various types of online learning. In the diversified development phase, research has developed towards novel directions such as the study of teachers' teaching behaviours.

However, there is limited research in China on how to integrate blended learning into more practical and more up-to-date subjects such as media English, to improve students' foreign language skills and professional application skills, and ultimately to develop students' independent learning ability.

Moreover, current domestic research on this topic is largely quantitative and lacks interpretive qualitative research.[12] Therefore, this paper proposes a more practical "4A" pedagogy, which is applied to the class *The Art of Public Speaking* in the framework of blended teaching, and conducts teaching experiments with an interpretive qualitative research method, and analyses and summarises the experimental results to explore a foreign language learning model adapted to the new era.

RESEARCH DESIGN
Participants
The Art of Public Speaking is designed for third-year graduate students at Communication University of China, Nanjing, a media-related and practice-based university in China. Students major in various media or English-related subjects such as English Broadcasting, TV Production, International Business Interpretation, and so on, aging from 18 to 21. There are approximately 30 students in each class, and they meet once a week for two 45-minute sessions, as is typical of classroom schedules in most Chinese universities. The course relies on the "SuperStar" online learning platform to record and assess all students' learning activities, including quizzes, reflections, surveys, and discussions, where students can view their scores and feedback.

Course Description
This course is developed for CUCN senior students, preparing them for a variety of academic and other situations in which formal presentations are required. It aims to provide students with a basic background in the theories and principles of public speaking, as well as practical experience with the basic types of speeches. Topics will include active listening and note-taking, speech preparation, and speech presentation. Students will learn how to choose a topic, analyze the audience, research, outline, and deliver presentations for the purpose of informing, persuading, and presenting. Theoretical foundations will be covered to familiarize students with speech preparation and sharpen their public speaking skills. Speaking opportunities will be given for students to practice their skills, reduce their anxiety and evaluate their peers' performance.

This course is set to improve students' acquisition and application of public speaking skills, skills of intercultural communicative competence, ability to think critically and to apply the skills of critical thinking to the analysis of public discourse, and the ability to utilize research skills and strategies.

Data collection and analysis
This study adopts an interpretive qualitative analysis method. Firstly, semi-structured one-to-one interviews were conducted between the teacher and students at the beginning, middle and end of the course, with questions including students' perceptions of blended learning and their reflections on their own progress. The interviews were conducted in Chinese to minimise misunderstandings. In addition, a range of other tools were used for analysis in this study, including students' self-reflection logs, task completion reports, classroom participation records, and students' use of online learning resources. All interviews were recorded and transcribed. To ensure the reliability of the open-ended responses, two instructors of the course coded and categorised the students' responses separately. The data was analysed using top-down coding to provide insight into student changes in self-planning, self-execution, self-monitoring, self-evaluation and self-revision.

TEACHING MODEL
The system used in this course is a blended learning model consists of three main steps based on Bloom's Taxonomy,[13] with an original '4As Teaching Method', combined with 3-dimensional evaluation methods, aiming to improve students' speaking skills and cultivate their learning autonomy. Specifically, online

teaching mainly carries out pre-class conceptual learning and records students' enhancement, while off-line teaching mainly stresses independent learning, real-life implementation, and critical reflection.

The first step involves online pre-learning. Before class, students are required to read the textbook to acquire an overview of the course, and watch a micro-learning video recorded by teachers to have a systematic understanding of the chapter, after which they need to complete an online quiz and and gain a passing score (60 percent of the questions answered correctly) before they attend physical classes.

The second step concerns offline implementation. During class, students conduct the chapter tasks and reflect critically on them based on their theoretical knowledge.

The third step is out online recording. After the lesson, students write a self-reflection reports online based on the completion of the task to record improvements. The details are shown in the following diagram:
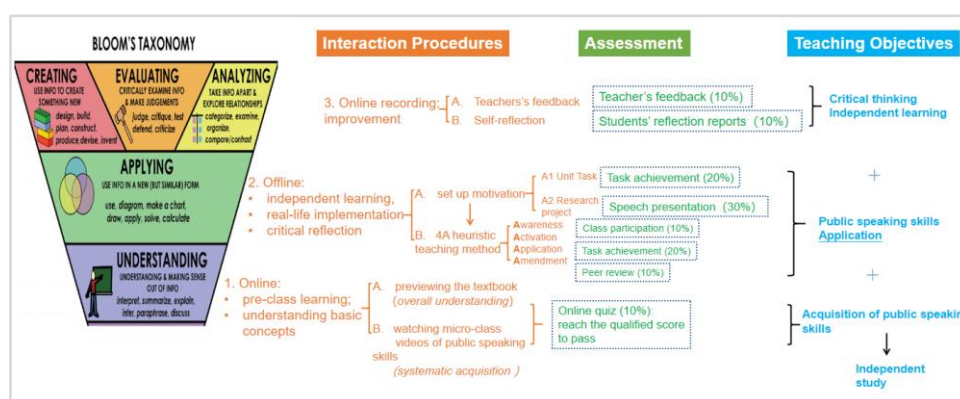
Figure 1. Teaching Model

In order to help students, put theories into practice, this course adopts the self-coined 4A teaching method combined with the task teaching method in the offline courses. It could cultivate students' autonomous learning ability via scaffolding from teachers and empirical practice of conducting research. The 4As stand for "Awareness", "Activation", "Application", and "Amendment" respectively. Firstly, teachers set up goals to motivate students. Teachers will clearly inform students at the beginning of the semester that students need to do a 5-minute presentation at the end of the course based on a topic they are interested in. In addition, teachers need to set corresponding tasks for students to apply this knowledge. After setting up the task, students need to initiate the 4A method for autonomous learning. The first step is Awareness, which is to get ready for the tasks. After teachers release tasks, students need to cooperate in groups, interpret and assign tasks, so as to cultivate students' ability to communicate and cooperate. At the same time, teachers need to check by asking questions to ensure that students are clear about the key points they need to use. If students are unfamiliar with any key points, teachers can review and explain them to the students.

The second step is Activation, which requires students to apply theoretical knowledge they have learned through using it in preparing their public speaking.

The third step is Application, which requires students to perform a task related to their majors or the society according to the feedback, to apply transferable skills in larger contexts and to ensure that students can infer what they have learned and cultivate their global vision and independent learning. After that, students report the achievement of the task, and conduct peer review.

The fourth step is Amendment, which requires students to compose a reflection report according to the achievement of their tasks, including advantages and room for improvement, as to cultivate their critical thinking and innovation. Teachers make supplements based on students' self-reflection reports. The specific design is shown in Figure 2. After the four steps are completed, Amendment then triggers a

new round of Awareness. By doing so, the essay offers a window into fostering students' autonomy in learning.
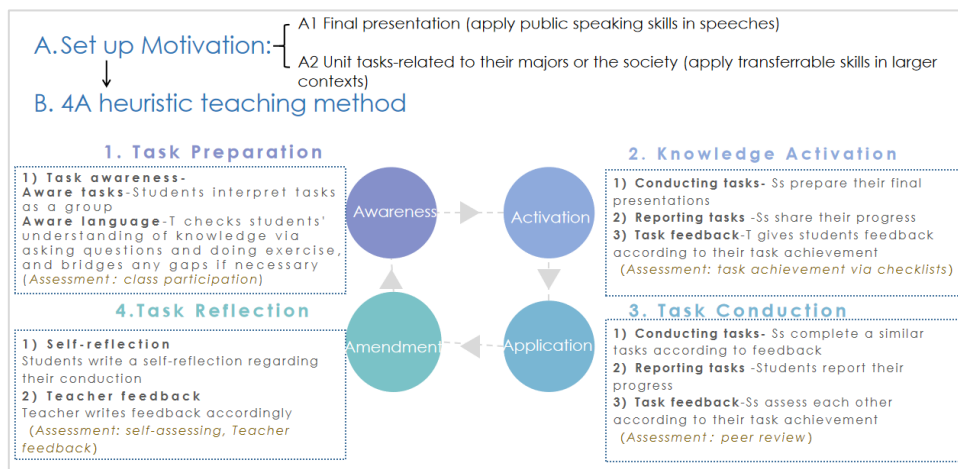

Figure 2. 4A Model

Finally, limited evaluation methods have also limited teaching effectiveness and professional development. This course insists on combining formative assessment and summative assessment, making full use of the network platform, and adopting a three-dimensional assessment. The first dimension of teaching evaluation is online learning. After completing online learning, students need to answer questions to test their learning effect and provide direction for the follow-up teaching content in the classroom; the second dimension is classroom performance, including participation in classroom discussions and presentations, homework completion and learning reflection; the third dimension is final speech, which evaluates students' language fluency, accuracy, and perspectives on problem-solving. The specific evaluation method is shown in Figure 3.
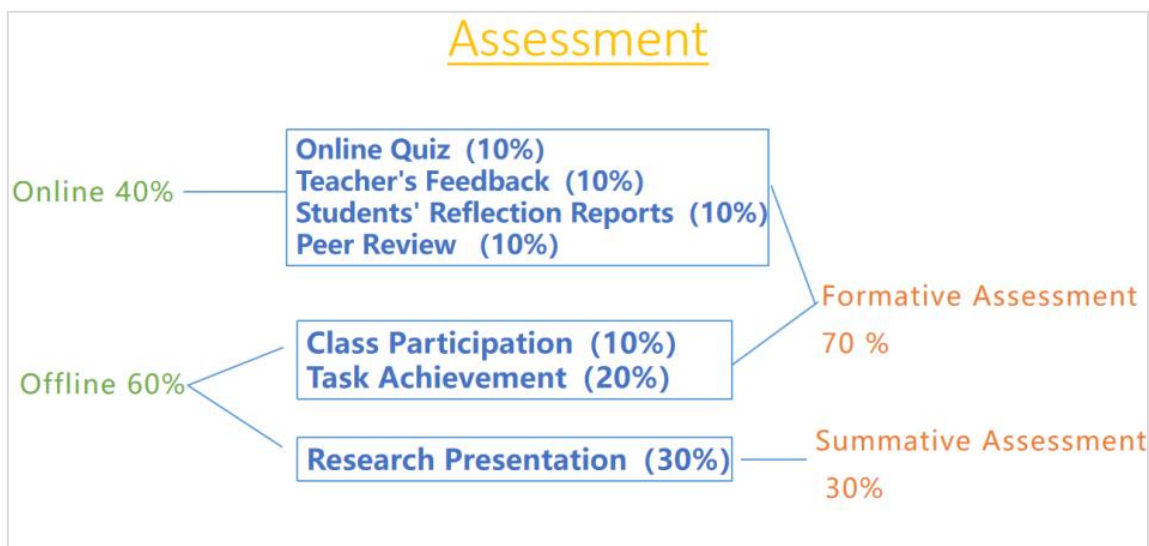
Figure 3. Evaluation Method

FINDINGS AND DISCUSSIONS

Effectiveness Analysis of Blended Teaching on the Development of college Students' Autonomous Learning

Self-planning

This phase fits within the scope of the "Awareness" step in the "4A" pedagogy. Through the analysis of a range of assignments and tasks, students master the way of decomposing tasks, including speech tasks and tasks related to students' work or social practice.

When working to complete the speech task at the end of the class, students have not only managed to master the decomposition of simpler tasks but also learned the knowledge and skills needed to complete the speech task. Apart from that, in completing the tasks related to their future occupations, students mastered how to decipher the more complex tasks, and break them down into executable steps, with a clearer career-oriented awareness.

Here is feedback from student A: Giving a speech is not only to write a good manuscript, memorize it, and give a speech. I've learned from the lessons that there is a more systematic approach to all these, and I have noticed numerous details and ideas, such as the needs of target groups and audience analysis.

Self-execution

This phase fits within the scope of the "Activation" step in the "4A" pedagogy. According to the data collected by the "Superstar" platform, the total number of students' visits to online videos has increased significantly from 73% to 94%, indicating that students are now more willing to take the initiative to fulfill their learning tasks before class and explore to do so by integrating online learning resources provided. Once they have done a comprehensive preparation for classroom teaching, they would be more confident and engaged in a series of activities and can yield better results as for how complete and accurate they finish their classroom tasks. Then, after class, they would be more encouraged to further exercise the ability of cooperation and communication.

Self-monitoring level

This phase fits within the scope of the "Application" step in the "4A" pedagogy. Through self-monitoring, students are clearly aware of their participation and contribution in online and offline learning activities and do a better job of drawing inferences from other facts. Students can use the evaluation checklist provided by the teacher to dismantle their previous performance, and at the same time, based on the feedback from teachers and classmates, perform a similar task again, which is related to future work or social hot spots. Students are also required to conduct self-review during the implementation process and focus on progress and direction to improve task completion.

During the course, as an accurate indication of how students can apply what they have learned in the classroom into practices, several students participated in a number of speaking activities and competitions, including:

− the "National Talents Cup English Speech Contest of Foreign Research Institute": second prize (the provincial level)

− the "21st Century Coca-Cola Cup" National College English Speech Contest: third prize (the provincial level)

− "30-second elevator pitch on earning an ideal job"

− the National English Debating Competition: third prize (the provincial level)

− the FLTRP Cup Short Video Competition: first prize (the provincial level)

Self-evaluation and correction

This phase fits within the scope of the "Amendment" step in the "4A" pedagogy. Students can improve their review and revision behavior based on the reflection reports they have written, which include their own strengths and room for improvement in task execution, and such statements have to be supported by relevant examples, ensuring that students have mastered the elements of self-reflection. At the same time, students made reflections and supplements based on feedback from teachers and learned about the dimensions of behavioral evaluation and improvement paths from different perspectives.

Here is feedback from student B: I have always known that reflection is very important, but it is difficult to make an objective evaluation and analysis of my own learning. In this class, the teacher conducts targeted evaluations on our task completion, group discussions, peer evaluations, as well as providing self-evaluation checklists, this external information helped me a lot.

Reception of the initiative

During the course, the total number of students' visits to online videos has increased significantly. Also, the questionnaire on course satisfaction and course harvest shows the course has received full 5-star praise. Among the 30 students surveyed, nearly 94% expressed their approval and support for the new curriculum model, and 6% showed that they were not used to the new model or preferred the traditional classroom teaching. The comparison result is shown in Figure 4.
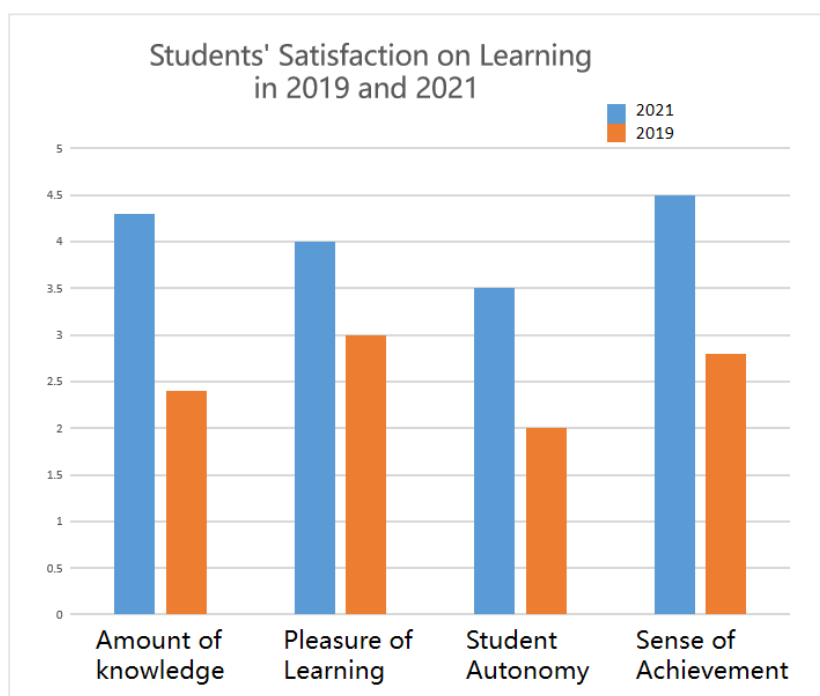

Figure 4. Results of the Survey on Students' satisfaction for the blended course

CONCLUSION

In response to the current pandemic, this essay explores to provide practical application of task-based teaching linking all its four phases with the learners' experiences and learning from recently conducted in-depth multiple case studies in China. It introduces a self-coined task-based theoretical framework for teaching *The Art of Public Speaking*, under the innovative proposal of '4A' pedagogy comprised of four phases, including Awareness, Activation, Application, and Amendment, where Amendment then triggers a new round of Awareness. By doing so, the essay offers a window into fostering

students' autonomy in teaching. Rather than discussing a case study in general, a targeted step-by-step plan with real-time examples to conduct a case study is given, with favorable results regarding the facilitation of students' learning autonomy in self-planning, self-implementation, self-monitoring and self-assessment and correction.

NOTES

[1] Xiulin Ma et al. "An Empirical Study of Blended Learning to Foster Learning Autonomy." *The Journal of Chinese E-education (*2016*)*: 99-106.

[2] Zejun Ma and Peng Gao. "Promoting Learner Autonomy through Developing Process Syllabus—Syllabus Negotiation: The Basis of Learner Autonomy." *Journal of Language Teaching & Research* (2018), 1(6).

[3] Margaret Francisco Williamson and Roberta Lee Watson. "Learning styles research: Understanding how teaching should be impacted by the way learners learn part III: Understanding how learners' personality styles impact learning." *Christian Education Journal*, 4(1) (2007): 62-77.

[4] Henri Holec. *Autonomy in Foreign Language Learning.* Oxford: OUP, 1981.

[5] Xiulin Ma et al. "An Empirical Study of Blended Learning to Foster Learning Autonomy." *The Journal of Chinese E-education* (2016): 99-106.

[6] Baoyu Gao. "Exploring Learning Autonomy in Hong Kong via Integrating Western and Eastern Theories." *Journal of Curriculum Studies*, 13(1) (2018): 29-53.

[7] Zhengxi Liu and Qianhui Wu. "Fostering Learning Autonomy via Blended Learning in Higher Education." *The Journal of Modern Education*, 25(11) (2015): 67-72.

[8] Nicky Hockly. "Blended learning." *Elt Journal*, 72(1) (2018): 97-101.

[9] Donn Randy Garrison and Heather Kanuka. "Blended learning: Uncovering its transformative potential in higher education." *The internet and higher education*, 7(2) (2004): 95-105.

[10] Shusha Ding et al. "Practices and Reflections on Blended Teaching in Higher Education." *The Journal of Beijing Education*, 2020 (11): 43-46.

[11] Shusha Ding et al. "Practices and Reflections on Blended Teaching in Higher Education." *The Journal of Beijing Education*, 2020 (11): 43-46.

[12] Xiulin Ma et al. "An Empirical Study of Blended Learning to Foster Learning Autonomy." *The Journal of Chinese E-education (*2016*)*: 99-106.

[13] Benjamin Samuel Bloom. Reflections on the development and use of the taxonomy. National Society for the Study of Education: 92(2) (1994), 1-8.

BIBLIOGRAPHY

Bloom, Benjamin Samuel. *Reflections on the development and use of the taxonomy*. National Society for the Study of Education 92(2) (1994): 1-8.

Ding, Shusha et al*.* "Practices and Reflections on Blended Teaching in Higher Education." The Journal of Beijing Education: 2020 (11): 43-46.

Gao, Baoyu. "Exploring Learning Autonomy in Hong Kong via Integrating Western and Eastern Theories." Journal of Curriculum Studies 13(1) (2018): 29-53.

Garrison, Donn Randy and Kanuka, Heather. "Blended learning: Uncovering its transformative potential in higher education." The internet and higher education 7(2) (2004): 95-105.

Hockly, Nicky. "Blended learning." Elt Journal 72(1) (2018): 97-101.

Holec, Henri. *Autonomy in Foreign Language Learning.* Oxford: OUP, 1981.

Ma, Zejun and Gao, Peng. "Promoting Learner Autonomy through Developing Process Syllabus—Syllabus Negotiation: The Basis of Learner Autonomy." Journal of Language Teaching & Research 1(6) (2018).

Ma, Xiulin et al. "An Empirical Study of Blended Learning to Foster Learning Autonomy." The Journal of Chinese E-education *(*2016*)*: 99-106.

Williamson, Margaret Francisco and Watson, Roberta Lee "Learning styles research: Understanding how teaching should be impacted by the way learners learn part III: Understanding how learners' personality styles impact learning." Christian Education Journal 4(1) (2007): 62-77.

MAKING TECTONICS

Author:
MARTIN MEJIA

Affiliation:
LOUGHBOROUGH UNIVERSITY, UK

INTRODUCTION

The School of Architecture, Building, and Civil Engineering (ABCE) at Loughborough University was established in 2017, procuring an international, creative, and innovative environment developed with the collaboration of members of staff and students. The content presented in this paper exemplifies teaching innovation in response to four factors. Firstly, a fourfold increase in the student cohort, from fifty students in 2017 to two-hundred students in 2021. Secondly, to ensure the content of this module transitions to be interdisciplinary. Thirdly, the transition of the mode of delivery from online to in-person. And fourthly, the reduced staff allocated to support this module, compared with previous years. Tectonics is a first-year undergraduate module, conceived originally for Architecture students. Its main objective was to encourage the students' critical thinking, and the aim was to make this possible by promoting research and experimentation. This module was later included in the first-year curricula of Construction Engineering Management (CEM), and Commercial Management and Quantity Surveying (CMQS). While all the courses of ABCE are involved in the multi-disciplinary project in the context of the Professional Practice week (PP), during weeks two and fifteen of Semester One; Tectonics is the only interdisciplinary module for those courses that run during the first academic year.

The Module consists of two coursework and one end-of-the-year exam. Coursework One was prepared in a way that the students would develop practical skills that would prepare them for interdisciplinary dialogues in the professional world. It was planned to encourage the student's interaction and co-production of knowledge. Coursework Two was intended as an introduction to research thinking, in which the students are encouraged to use deductive logic to verify knowledge acquired during lectures.

COURSEWORKS ONE AND TWO
Coursework One: How did they build it?

This group coursework was preceded by the PP week, where the students from different courses worked in multi-disciplinary teams of five to six students, comprising one to two Civil Engineers, one Architect, one CMQS, and one to two CEM and AEDM students. As the students had already been introduced to teamwork, they had already reflected on the possibilities and challenges of working within a group, and how they could make this experience better. Coursework One aimed to understand building construction as a sequence.[1] Students had to do two weeks of independent research prior to the tutorials, to gather all the available information about their case studies. The piece of coursework to be produced was an "A-One" size poster, a similar format that was used for the PP week. This poster had to include a Graphic sequence of the building construction process of their allocated case study, this had to be done in six stages. Each stage would have one paragraph below with a clear description of what is been

shown. A Gantt chart would represent the timeline of the construction process, but also logical sequence. This chart had to include at least twenty-one activities. Finally, one paragraph at the bottom, with extra information about the case study context, its socio-cultural role, or the technology development that made it possible.

Introduction to constructive process representation

Students had a tutorial with over ten case studies, each with an identified constructive sequence that was represented with different kinds of media, from sketches to "three-dimensional" rendered models. For example, the famous sequence that was drawn by Kaufmann to represent the constructive sequence of the Fallingwater house by Frank Lloyd Wright;[2] the physical models prepared by ENSAMBLE STUDIO to represent the constructive process of their Hemeroscopium House;[3] and the photographic sequence of the construction of the Gate House by Phillip Johnson.[4] Special emphasis was given to the level of detail and definition of the graphics to be produced; but also, to the character of the coursework, "How did they build it?" as opposed to "How was it built?" assuming the agency of the different workers and professionals involved in the construction process, this was also encouraged to be represented.

By the end, the groups and case study allocation would be revealed. The groups would be set virtually, and every group would have an MS Teams channel to meet. The selected case studies for this academic year were Tecla WASP, by Mario Cucinella;[5] the Cork house, by Matthew Barnett Howland, Dido Milne, and Oliver Wilton;[6] the Kivik pavilion, by David Chipperfield and Antony Gormley;[7] The Delta shelter, by Olson Kundig;[8] the Stone market, by Elisabeth Polzella;[9] and the AWEL Workshop, by Rossetti+Wyss.[10] Minimal information about the case studies was provided to the students.

Some prior considerations in selecting the case studies included: easy-to-understand spatial features and a small scale. Also, those case studies must have at most, three materials. The building materials of the case studies would be introduced during the live lectures before the submission deadline. In this sense, students would benefit from including the knowledge gained in the Lectures in their submissions. Finally, a poster template was provided to the students, with some restrictions on the way the information should be displayed in the layout, font size, and margins to be respected.

Live Lectures on case studies

In previous years, the module produced a series of video-recorded sessions for Semester One. Those sessions were intended for the students to watch before attending the Live Lectures, which originally were delivered online, but started the transition to in-person delivery at the beginning of the 2021 academic year. The recorded sessions would cover the specificities of different building construction materials, including concrete, metals, timber, soil, glass, polymers, and clay masonry. The specifications of those materials included: Material fundamentals, cultural context, tradeoffs, environmental impact, conventional applications, and innovations/trends. Each of those lectures was divided into three parts and made available to the students from day one of the module. The Live Lectures would comprise the fourth part of those Lectures and focus on case studies of those specific materials. This is illustrated in Figure 1, which corresponds to part four of the Lecture about metals. While the recorded lectures would serve as the theoretical framework, useful mainly for a general understanding of the building construction materials, and the end-of-the-year exam; the live lecture would focus specifically to provide a narrative of building construction, exploring the building construction sequence, and examples of how to represent those narratives, this directly linked with Coursework 1.

During the live lectures, there was a didactical and communicative undertaking. On the one hand, students would see pictures and diagrams of the different building construction elements assembled. On the other hand, there was an intention to expand the vocabulary of the students, emphasizing that

building construction elements can be for example: applied, attached, bolted, cladded, covered, embedded, erected, excavated, fastened, filled, fitted, fixed, installed, joined, laid, layered, nailed down, overlapped, poured, screwed, sealed, stacked, stapled, treated, welded, wrapped, etc.
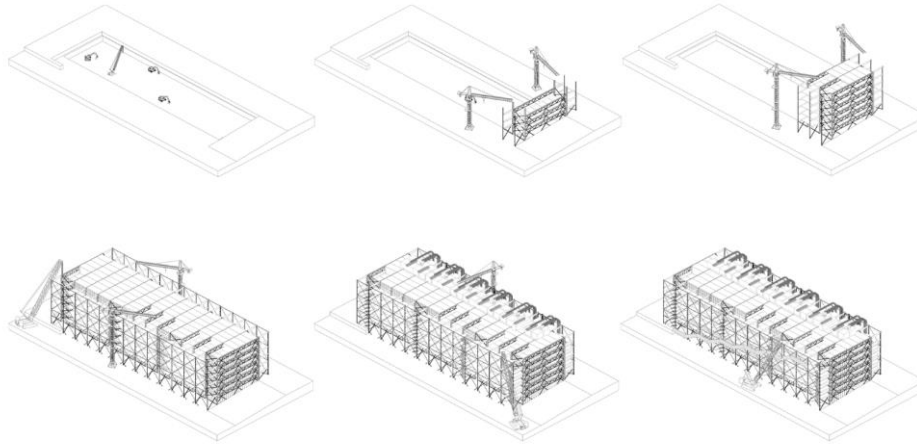

Figure 1. The graphic sequence of construction of the Pompidou center in Paris by Martin Mejia

In-person tutorials

The cohort was divided into thirty-six groups, with five to six students each. Each group had two students from Architecture, two CMQS, and one to two CEM. Each group would have two tutorial sessions either on weeks three and five or on weeks four and six. The submission deadline was on week eight. The tutorial sessions would last twenty minutes, and the groups had to prepare a presentation also showing a draft of their poster. Each session would be overseen by a tutor, which ideally should be a member of staff representative of the other courses. The tutorials would work as a consultancy, and the tutors would have to know little about the specificities of the different case studies, but mainly focus on the logical sequence of the events. As the students were presenting using the projectors of the rooms, the tutorials were recorded and made available to everyone.

Submission and marking

A total of thirty-six posters were marked by the tutors together during a meeting in person. Given that the submission of the posters was digital, the approach was to make a virtual display of all the posters together. To do this, we used the online platform Miro,[11] and a room projector made it possible to see the posters projected in real size. In this sense, we had the chance to be more critical and observant of the quality of the outcomes produced. Examples of the posters submitted are illustrated in Figure 2.
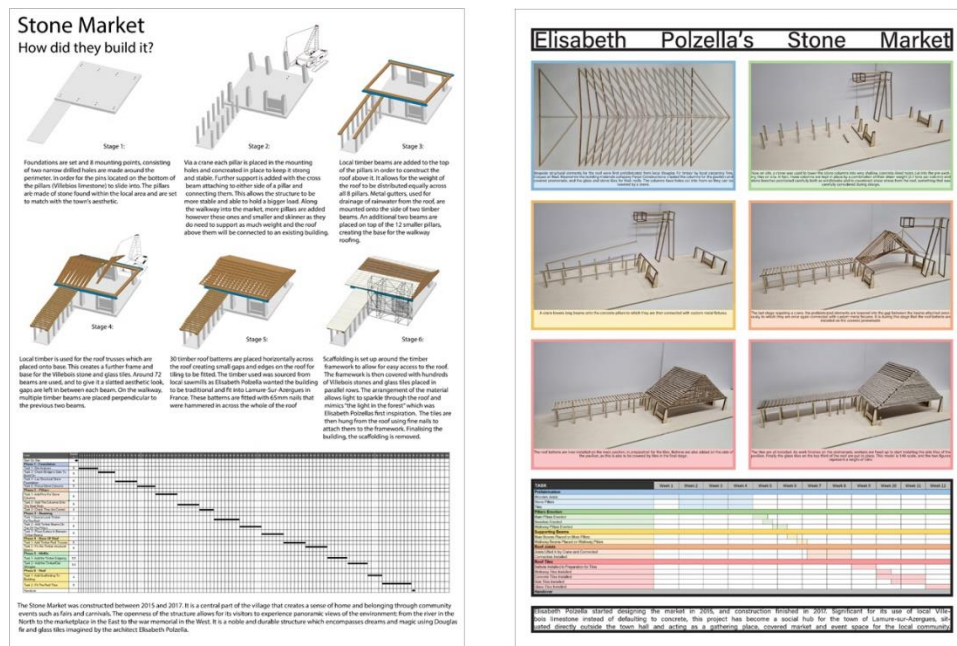
Figure 2. Examples of submission, courtesy of Group five (left), and Group twenty-three (right).

Learning outcomes

Those students with experience in model making, enriched their graphic sequence, by showing physical models, based on laser cut elements, designed over orthographic available material. Therefore, this coursework provided an opportunity to improve their model-making ability and to understand model-making not as a result, but as a logical process. Some students would express their satisfaction with their now gained understanding of construction. Another aspect that was praised was the introduction of not-so-familiar building construction methods, such as Cross Laminated Timber and Three dimensional printed clay, this triggered the question of whether students should be trained in the manufacturing processes of physical models that could represent more clearly the case studies to be analyzed. There was, on the other hand, another achievement, which was about the students getting back to the drawing board as most of the students did their graphic sequence by hand, with isometric drawings using ink on paper. This somehow revalidates the importance of hand drawings to easily represent their ideas.

Coursework 2: Why is this structure standing?

The second coursework was intended as an introduction to Structural Analysis. In previous years, Semester Two represented a challenge because the students had to prepare an individual report, but also because they had to find their own case study. The previous academic year meant a hundred and forty different case studies to be graded. But also, this implied that one tutorial would have to be dedicated to the selection of the case study, and the following tutorials to answer the specific questions about their diagrams. This previous approach would demand more staff hours, but also would demand specific staff with an understanding of Structural Analysis. To minimize the staff time and ensure any staff could help with the tutorials regardless of their background, the case studies were predesigned.

CW2 was conceived as a Scientific Method[12] report to respond to the question: "Why this structure is standing?" The structure of the report comprised an Introduction, Analysis, and Conclusion. For the Introduction, students would first have to observe the pictures of the case study, then prepare an initial hypothesis, which should try to answer that question out of their own understanding. The experimentation would be done in the context of experiment sessions, where the students would interact

in a room with the specific physical model of their case study. The Analysis comprised the production of a set of the following Graphic Static diagrams:[13] Structural hierarchy diagram, Load path diagram, Force diagram due to vertical forces, and Force diagram due to horizontal forces. And the Conclusion. The case studies were prepared with the qualitative structural analysis modeling kit, MOLA.[14] This kit was proven to be accurate to depict the deformation of structural elements under external forces, and this was crucial to ensuring a meaningful understanding of structural analysis, and the representation using Graphic Statics diagrams.

Initial preparation of the case studies

The MOLA kit offered many possibilities to represent structures. There was also the possibility to inspire Architecture students, as during the second semester they must make the "Home project" for Design Studio A. The structures that were created were in that sense architectural structures which with little imagination, could be imagined as inhabitable spaces, this is visible in Figure 3. In that sense, all the structures had a point of access, a mezzanine, and/or a cantilever. All the structures had cross bracings even if a single bracing was sufficient. This was done so that during the experiment sessions, some bracings would be removed, uncovering the primary and secondary structural elements.
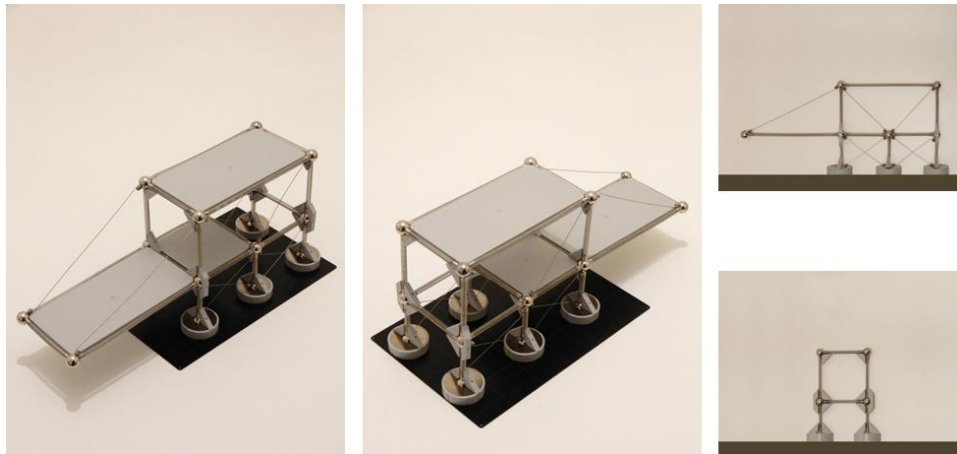

Figure 3. Case study "F", initial pictures that were given to the students by Martin Mejia

Introduction to writing the report

After issuing the report brief to the students, one tutorial session was planned to clarify any questions. During this session, the difference in the point of view, from buildings, as seen during Semester One, to structures, was explained. As many students are not familiar with the Scientific Method, a historical review of the method was presented, including clarification on its appropriateness for this kind of undertaking. A review of the brief would be done afterward, including the presentation of an example of the requested diagrams to be produced.

Live Lectures on the principles of Structural analysis

Semester Two had six lectures in total, each introducing different concepts of structural analysis. Different than Semester One, those live lectures were pre-recorded and made available to the students in advance, this was done because the content was conceptual or abstract and the content had to be accessible to everyone. The following concepts were introduced in the Lectures: Loadpath, Tension & Compression, Joints, Structural Hierarchy, Geometric Stability, and Catenaries. On the one hand, those lectures would provide meaningful content to produce the report diagrams; on the other hand, would introduce concepts and definitions that would take part in the end-of-the-year exam.

Experiment sessions

Due to the number of students and the limited staff time allocated, each student would only attend one experiment session. There was one tutor per room in charge of six sessions, each session lasting thirty minutes, with a maximum capacity of six students. The experiment sessions were delivered on weeks four, five, and six; and the submission deadline was on week eight. The attendance was recorded, as the students who missed the session would be unable to follow the method and therefore unable to produce and submit the report. The tutor would first let the students get in close contact with the physical models, to account for the number of pieces that made the model, filling an inventory that was made available to the students in the brief. After this, the tutor would make the interaction with the MOLA kit model in front of the students. Students were encouraged to request pieces to be taken and to video record the session for future reference.

Submission and marking

The CW2 marking was both qualitative and quantitative. The Introduction and Conclusion were marked from a qualitative point of view and intended to measure the critical thinking of the students in formulating a hypothesis. In the case of the Conclusion, this had to draw on the analysis, the experiment session, and the initial Hypothesis. The Analysis was marked quantitatively. In a similar way to an exam, a set of possible acceptable diagrams were set by the Module Leader, an example of those diagrams is visible in Figure 4. The marking team comprised one member of staff for each case study, done this way to prevent mistakes in the marking. One of the advantages of this approach for marking was that the markers would not necessarily need prior experience with Graphic Statics, as they would only have to make a contrast with the already available solutions.

Reflection

During the experiment sessions, the students did not have direct contact with the case study models, this was due to a couple of reasons. The first reason was that the MOLA kit pieces connect with magnets, under excessive interaction the models would collapse. While one tutor would be part of the session all the time, having to verify if pieces were always in place, and therefore ensuring a similar experience for all the students would be difficult if those were to collapse constantly. The other reason was because of the size of the pieces, it would be very difficult to clean the pieces between users, given the COVID restrictions back in the day. However, one advantage of the tutor doing the interaction and the students being observers, was the point of view. On doing the interaction, the students would only see the model from top-below, the same as the tutor did; while being observers, the students had the chance to see the model frontally, this was very handy to reproduce the observation in the requested diagrams.
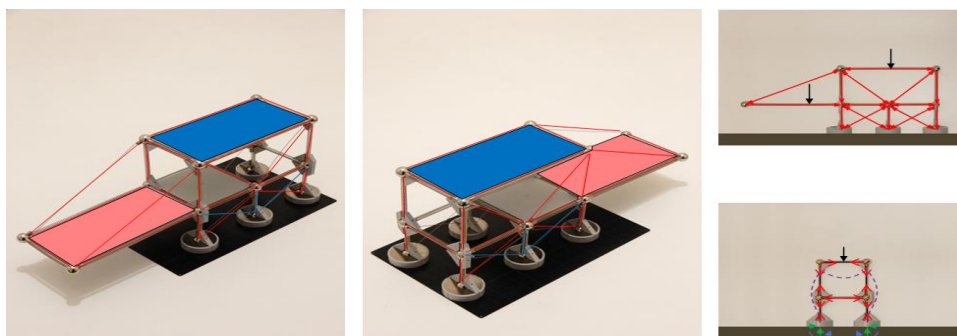

Figure 4. Case study F, Graphic statics diagrams to be produced by the students. Left and center, Structural Hierarchy diagrams. Top right, Loadpath diagram. Bottom right, Force diagram due to vertical forces, by Martin Mejia.

CONCLUSION

Making Tectonics was not easy. The module had to overcome criticism from past academic years about being an Architecture module delivered to other courses. Tectonics made a transition to becoming an interdisciplinary module. This was possibly more evident during Semester One, as the focus of Coursework One was to see construction as a process, that involves multiple professionals and agencies. Despite this not being totally evident during Coursework Two, adopting the point of view of a Structural Engineer, which is another course in ABCE, would make the students adopt another discipline temporarily. Also, the experiment sessions, and learning a method to produce a report, were valuable experiences for any other future undertaking.

There is yet room for improvement, for example, for Coursework One, the submission can be followed by an open exhibition, in this way students would be aware of how good their submission in comparison to other groups was. Coursework Two could find a way to ensure students have direct contact with the case study models, probably promoting a group or team experiment, but an individual report submission. Under the scarcity of staff time, and the sudden increase in module cohort, the possibility to simplify the module to make it more bearable was greatly welcome. As Alejandro Aravena said, "scarcity of recourses can define the meaning, limit possibilities and lead to quick and effective solutions". Making Tectonics was proof that under scarce resources and an increase in demand, a university module content can adapt to ensure it covers its ultimate purpose, which is to promote learning.

NOTES

[1] Chad Schwartz, *Introducing architectural tectonics: Exploring the Intersection of Design and Construction.* (New York: Routledge, 2016), xxvii.
[2] Edgar Kauffmann, *Fallingwater, a Frank Lloyd Wright Country House.* (New York: Abbeville Press, 1986), 51-53.
[3] Ensamble Studio, "Hemeroscopium House. Madrid, 2008," *Ensamble Studio*, accessed May 29, 2022, https://www.ensamble.info/hemeroscopiumhouse.
[4] Andrea Deplazes, *Constructing Architecture Materials, Processes, Structures.* (Birkhäuser: Basel, 2005), 141.
[5] James Parkes, "Tecla house 3D-printed from locally sourced clay," *Dezeen*, April 23, 2021, accessed May 29, 2022, https://www.dezeen.com/2021/04/23/mario-cucinella-architects-wasp-3d-printed-housing/.
[6] Paula Pintos, "Cork House / Matthew Barnett Howland + Dido Milne + Oliver Wilton," *ArchDaily*, May 4, 2020, accessed May 29, 2022, https://www.archdaily.com/938586/cork-house-matthew-barnett-howland-plus-dido-milne-plus-oliver-wilton.
[7] Rose Etherington, "Kivik pavilion by David Chipperfield and Antony Gormley," *Dezeen*, July 17, 2008, accessed May 29, 2022, https://www.dezeen.com/2008/07/17/kivik-pavilion-by-david-chipperfield-and-antony-gormley/.
[8] Marcus Fairs, "Tom Kundig's Delta Shelter," *Dezeen*, February 1, 2007, accessed May 29, 2022, https://www.dezeen.com/2007/02/01/tom-kundigs-delta-shelter/.
[9] Tom Ravenscroft, "Elisabeth Polzella creates structural-stone covered market in Lamure-Sur-Azergues," *Dezeen*, April 22, 2020, accessed May 29, 2022, https://www.dezeen.com/2020/04/22/elisabeth-polzella-stone-covered-market-lamure-sur-azergues/.
[10] Dan Howarth, "Interlocking timber planks form Workshop Andelfingen by Rossetti + Wyss Architekten," *Dezeen*, March 20, 2017, accessed May 29, 2022, https://www.dezeen.com/2017/03/20/interlocking-timber-planks-form-workshop-andelfingen-by-rossetti-wyss-architekten/.
[11] "Miro online whiteboard," Miro, accessed May 19, 2022, https://www.miro.com/.
[12] Robin Millar, "What is the 'scientific method' and can it be taught?" In *Teaching Science,* ed. Ralph Levinson (London: Routledge, 2016), 167-168.
[13] Hans Straub, *A History of Civil Engineering* (Cambridge MA: MIT Press, 1964), 197-202.
[14] "MOLA STRUCTURAL KIT, A new way to study and teach structural behavior," MOLA accessed May 19, 2022, https://molamodel.com/.

BIBLIOGRAPHY

Deplazes, Andrea. *Constructing Architecture Materials, Processes, Structures.* Birkhäuser: Basel, 2005.

Ensamble Studio, "Hemeroscopium House. Madrid, 2008," *Ensamble Studio*, accessed May 29, 2022, https://www.ensamble.info/hemeroscopiumhouse.

Etherington, Rose. "Kivik pavilion by David Chipperfield and Antony Gormley," *Dezeen*, July 17, 2008, accessed May 29, 2022, https://www.dezeen.com/2008/07/17/kivik-pavilion-by-david-chipperfield-and-antony-gormley/.

Fairs, Marcus. "Tom Kundig's Delta Shelter," *Dezeen*, February 1, 2007, accessed May 29, 2022, https://www.dezeen.com/2007/02/01/tom-kundigs-delta-shelter/.

Howarth, Dan. "Interlocking timber planks form Workshop Andelfingen by Rossetti + Wyss Architekten," *Dezeen*, March 20, 2017, accessed May 29, 2022, https://www.dezeen.com/2017/03/20/interlocking-timber-planks-form-workshop-andelfingen-by-rossetti-wyss-architekten/.

Kaufmann, Edgar. *Fallingwater, a Frank Lloyd Wright Country House.* New York: Abbeville Press, 1986.

Millar, Robin. "What is the 'scientific method' and can it be taught?" In *Teaching Schience,* ed. Ralph Levinson, 165-178. London: Routledge, 2016.

Miro. "Miro online whiteboard," accessed May 19, 2022, https://www.miro.com/.

MOLA. "MOLA STRUCTURAL KIT, A new way to study and teach structural behavior." Accessed May 19, 2022, https://molamodel.com/.

Parkes, James. "Tecla house 3D-printed from locally sourced clay," *Dezeen*, April 23, 2021, accessed May 29, 2021, https://www.dezeen.com/2021/04/23/mario-cucinella-architects-wasp-3d-printed-housing/.

Pintos, Paula. "Cork House / Matthew Barnett Howland + Dido Milne + Oliver Wilton," *ArchDaily*, May 4, 2020, accessed May 29, 2022, https://www.archdaily.com/938586/cork-house-matthew-barnett-howland-plus-dido-milne-plus-oliver-wilton.

Ravenscroft, Tom. "Elisabeth Polzella creates structural-stone covered market in Lamure-Sur-Azergues," *Dezeen*, April 22, 2020, accessed May 29, 2022, https://www.dezeen.com/2020/04/22/elisabeth-polzella-stone-covered-market-lamure-sur-azergues/.

Schwartz, Chad. *Introducing architectural tectonics: Exploring the Intersection of Design and Construction*. New York: Routledge, 2016.

Straub, Hans. *A History of Civil Engineering.* Cambridge MA: MIT Press, 1964.

A RELATIONAL APPROACH TO TEACHING IN THE EDUCATIONAL DESIGN STUDIO

Authors:
RUTH NEUBAUER, ELKE BACHLMAIR, ERIK BOHEMIA

Affiliations:
NEW DESIGN UNIVERSITY, AUSTRIA. UNIVERSITY OF ART AND DESIGN LINZ, AUSTRIA. SHANDONG UNIVERSITY OF ART & DESIGN, CHINA

INTRODUCTION

Remote learning and teaching during the recent pandemic have exacerbated existing challenges for design teachers: How do we make meaningful connections with the students? Many of us will be familiar with the following situation: We meet on an online video conferencing platform, such as Zoom, to welcome the students, but they turn their cameras off. Or attempts to get them to discuss an idea are met with an icy silence until a student finally makes a comment. The pandemic and distance learning have made visible the invisible work of relating with the students, drawing them into the learning spaces, and encouraging them to become a part of the space that will 'make' them designers. Becoming part of a professional community of practice, such as design, requires the learning of the particular knowledge, rules and art of the practice.[1] But it has been proposed that, beyond the closeness of the "master-apprentice model", design teachers need to give students the space to tell their own stories.[2] Thus, we ask: What spaces can facilitate teaching and learning to achieve this aim? How do we, the educators, assert a structure that pulls students together in but at the same time give them the independence to take up their own positions?

In this paper we reflect on our work of making meaningful connections in learning and teaching spaces as design teachers with emerging designers. We look at instances where it worked well, and where it did not work so well. Our experience shows us that students with different education backgrounds (business, technology, art) approach the design studio differently, and respond differently to our attempts of inviting them into the learning spaces. Sometimes, we manage to capture students' easily, and at other times we experience an enduring distance. In exploring this space and reflecting on our experiences, we derive ideas about the teaching relations that make up the engaged learning space. We use concepts of relationality which postulate an emphasis of relations between people and things as formative for spaces, people and things.

DESIGN EDUCATION CULTURES

The authors' own experience of attending art school around the 1990s matches the description of the culture of design education by Guy Julier: "The art school ethos separates itself from other educational cultures", through factors such as "the relative lack of strict timetabling, the provision of personal studio space instead of classrooms".[3] The authors experienced extreme freedom in their studies at the art universities they attended. The studio spaces they had as students illustrate the freedom they had, for

example, the Semper-Depot, a building from the 1870s belonging to Academy of Fine Arts Vienna, which was originally built for the production of theatre stage designs.[4] Due to their original purpose, the studios were spacious, made up of large high-ceiling rooms, in which the students were able to install their desks and work independently. Students were expected to develop their own topics and approaches in artistic reflection. From today's perspective and judgement of the teachers, the freedom they experienced as students was almost too much. It caused feelings of uncertainty and students wasted time in finding their direction. However, the freedom made it possible to develop strong and independent work styles. For certain, these personal experiences have imposed on the authors – then as students – the culture of art and design education, and these experiences are probably active today in the authors' teaching of the studio classes. They have shaped the teachers' abilities and their positions as teachers.

The design studio in the literature has been described to consist of the elements of "the studio, the design tutorial, the library, and the crit".[5] The "studio" is the room in which students organise their time and structure their activities. The "design tutorial" is the interaction between the student and the teacher. In this relationship, the teacher focuses on developing the students' abilities, whilst the teacher "may become a kind of collaborator". The "design library" is the store of existing information, data or standards that students can access in order to support their designs. The "design crit" is a public forum of teachers who review students' work, either during or at the end of a project.

The Global Studio is based on, and extends, studio-based education approaches and puts a strong emphasis on the teacher-student relationship. But rather than following a master-apprentice model which postulates that the "mastery" be transferred from teacher to student in a close collaboration, the Global studio encourages distance in the relationship between teacher and student, in order to introduce space for the students to develop their skills in organizing themselves in an increasingly complex world of product design.[6] In the Global Studio, student teams from universities around the world act as designers and clients for each other, to design a product or service related to a particular topic that the teachers set. The student teams follow a plan of activities which defines milestones that need to be reached in a certain amount of time.[7] Within this structure, however, the students are free to engage with each other and their work.[8] They can work in their own space and time.[9] A website, which hosts a project blog for each the student teams, acts as the 'virtual studio', which allows students to engage with each other asynchronously and remotely.[10] A key feature in the teaching approach is the peer review, where students act as peer reviewers of each other's work.[11] The endeavor of the Global Studio is to introduce a space that gives students room to develop a more independent and self-determined way of working.[12]

RELATIONALITY: REFRAMING THE STUDIO AS A RELATIONAL SITE

Student-teacher relations have become a particularly prominent issue during remote teaching in the virtual studio. We take this experience as an opportunity to reflect on the design studio as a site of learning and teaching. How might this space look like, and what is it ideally made up of, in order to effectively enable students to learn design? Drawing on the literature around the design studio, we find particularly compelling the idea of the Global Studio – that students need space to develop their own approaches. This approach reflects important aspects of the authors' experience as students. The Global Studio draws on understandings of creativity as a relational product of "structure and play".[13] This emphasises the relational capacity in learning between structure and freedom. Concepts of relationality emphasise the relationship between entities, rather than the entities themselves. Relational spaces are, therefore, spaces that open up in between entities.

In relational concepts of knowledge, the "knowing subject and the known object" co-emerge in interaction.[14] Intangible discursive elements and concrete material elements are entangled and produce

states of knowing that are not stable, but rather emerge over time. In a series of workshops, Yoko Akama, Sarah Pink and Shanti Sumartojo have explored the concept of "uncertainty" and how it may be "harnessed as a technology for producing new and open ways of understanding, making and imagining".[15] Their methodological framework conceptualises the "emergence", the "relational" and the "in-between" of spaces that enable the development of knowledge.[16] Another concept that draws on the emergent capacity of relationality, is "ambiguity" as discussed by William Gaver, Jacob Beaver, and Steve Benford.[17] In their work, they describe situations where either information, contexts, or relationships are represented in ambiguous ways. They point to the productive tension that these ambiguities create for participants to resolve. Ambiguous situations force participants into action as they have to choose a path forward: They have to actively rethink, privilege or integrate different interpretations, or perhaps even expand them.[18] Relational concepts postulate the emergence of knowledge in situated action.[19] debunking understandings of the development of knowledge as ordered processes or simply as transfers between people.

The relational concept of structure and play, underpinning the Global Studio, is a useful concept for reframing the design studio as a site that relates design teachers with design students and encourages in these relationships the learning of design. Therefore, instead of focusing on the teacher, the student or the studio, in understanding learning design, we focus on the relations that span all of these, and imagine a space opening up amongst these relations.

DESIGN STUDIO ENCOUNTERS

As teachers of design at different universities and programmes, we are familiar with teaching in different settings. Different student cohorts require different teaching approaches. We need to distinguish their level of experience, and we also need to differentiate students' educational background and the type of studies they pursue. If students are studying for a technical degree, they will have a different perception of design than students studying for an art degree. And students with a first degree in art will have a different approach to the design process than students with a management background. We will illustrate the experiences setting up the design studio for teaching these different types of students. Teaching remotely during the pandemic has further exacerbated the issue of adapting to different teaching situations.

This study uses sensory ethnography as a method of design anthropology.[20] Data collection and analysis takes place through "embodied" and "emplaced" participation in fields of study. The data was collected at three different universities where the authors teach. The students of our studios study for three different degrees: for a technical degree, a design management degree, and an art degree in graphic or industrial design. In the following text, we will refer to the teachers, who are the authors, in the third person.

One of the teachers regularly teaches design in a technology-oriented program. She has experienced these students insisting on an orderly design process, while they struggled to open up to a more creative approach. She felt, they expected to be guided through a sequence of activities that would begin with the plan of the object and would end when the design was implemented accordingly. The teacher focused a lot on nudging students to become more open-minded in their thinking and doing, during the encounters of the design process, and to be more led by the situated reflection in action.[21] Another issue she experienced was the studio room, which was set up like a classroom. Through this interior architecture, the students were set up to be guided from the front, which was not helpful to the intention of the design teacher at all.

The other teacher was struggling to connect to a cohort of design management students during a design studio that sought to explore the concepts of reflective practice.[22] She felt that students completed tasks without engaging deeper. On several occasions, students asked if they had done enough to complete the

task, and whether they were allowed to move on. The teacher would have liked the students to be more motivated in going further and deeper with the design tasks. It was a new problem to her, that students didn't have this self-determination of exploring a topic.

In remote teaching during the pandemic, these problems were exacerbated. Students turned their cameras off. Often, students did not engage much in conversation. When teaching the art students, it seemed to the teacher that the students were exhausted and did not want to be in the virtual studio space. The other teacher put it like this: "It is a struggle to bring the students into the same space. It is like they come from a different star, each time we get back together after a break."

These experiences in the different settings caused the teachers to realise that there was much pedagogical work going into the making of meaningful connections with the students in the design studio. Making connections with students is a main goal in design teaching in general, and it is amongst the largest challenges in distance learning situations.

STUDIO ENCOUNTERS THROUGH THE LENS OF THE RELATIONAL DESIGN STUDIO

The design space can be described as a relational site that includes relations between students, teachers, material structures, and existing experiences and knowledge. As we reflect on the challenges we faced, we discover more about the studio as a relational design space.

The teacher, who taught a design class with technology-oriented students, felt that the students were passive and waited to be guided through a stepped process. the class room architecture supported the passiveness; the room was organised as tables facing towards a teacher's desk, "demanding" a teacher-centred approach to learning. The teacher approached the students with her understanding of an open design process: "At the beginning", she explains, "we do not know what we want to achieve and what the design is about." The activity of framing a problem is key to finding a solution.[23] The plan of the design object – a white cane – that the students expected to implement, was a working material for the teacher, but not the final design. Before continuing with the plan, as a set of predefined needs, she initiated the students to invite users to help define the problem. At that moment, when the students engaged with the community, they realised that they needed to reframe the problem, as the community members explained that they would not require certain aspects, or that they were interested in other details of the design. Thus, the students realised that they needed to be more open in the process of designing, so they could respond to the new situation. Tackling the teacher-centred classroom setup, the teacher asked the students to remove all chairs and desks. She then organised the design activities along the flat surfaces of the floor and the walls, with the students moving freely, instead of being seated on chairs. And in order to create a more relaxed situation, the teacher introduced games such as 'blind portrait', where students needed to draw each other without looking at their drawing. These interventions to remove structures – both in terms of the design process and in terms of the classroom setup – was disconcerting for the students at first, but it stopped passiveness and helped them become more open-ended in their activities.

The teacher who taught the design management students was surprised to be confronted with the reoccurring question by students whether they had done enough work. On some occasions, students stated confidently that they could stop early as they had "finished" the task. The teacher was not familiar with this superficial satisfaction with a design, and the lack of motivation in going deep into a problem. In her understanding of being a designer, designs were subject to critical review processes, and a design did not easily pass as 'done'. The review activity was partly inner reflections and partly a public review process. The teacher has not managed to overcome this issue between her and the students. Upon reflection, it becomes evident, that the review process – the crit, as an important cultural part of the design studio [24] – needed to be made explicit. What was self-evident to the designer, was not so evident to design students coming from management: Alongside the design, the students are required to work

on the development of quality criteria about what 'done' or 'good enough' means. This is critical reflection. Making visible the required activity of critical reflection, turns the studio space into a more tangible space that invites students to engage.

In the remote teaching with art students, it happened frequently that the students turned their cameras off and engaged little in conversation. The teachers reflected that during studio class at the university the students used to organize their activities in accordance with each other, even if they worked on individual projects. When they worked next to each other in the studio, they took regular breaks together, for example, they cooked meals together in the kitchen. When they returned to the studio, they seemed aligned, or elated, or in some other way inspired through the exchange. However, during remote teaching, each time they returned to the virtual space after a break, they seemed to come "from another star"; they seemed very far apart, and disconnected from the studio space. One of the teachers began to explore exercises to reconnect the students. She asked them to take photographs of the items in their personal design space and to share these photographs with each other in the virtual space (see Figure 1). This making public of invisible spatial structures helped the students connect better with the virtual space and with each other. They could curate the items that they revealed, but through sharing, they were no longer able to stay invisible with their work spaces; they needed to commit to the studio space and become visible.

Figure 6. Photograph of items in the personal design space

The making visible of spatial features and structures changed something for the students. It made the online experience more tangible and more connected.

In all these studio encounters, the teachers worked with the studio's relations, balancing structure and openness. In the encounter with the technology students, the teacher needed to introduce more play and less structure. When the management students were not able to relate to the invisible task of critical review, the teacher needs to make this structure visible, that the students need to develop the quality criteria alongside the design and continuously apply these. When structures are implicit and thus hidden, the students struggle to use them. In another paper, we have discussed how digital materialities need to

become more tangible in the design of virtual spaces.[25] More material 'handles' need to be given to the students in the virtual studio, to allow them different options in how to engage. The typical face to face video in the virtual studio creates a strong dependency on the teachers and on the directions given by them. The only 'handhold' becomes the teacher and their video face and voice. The reduction of material structure to real-time video limits the possibilities for engagement. Therefore, attention need to be paid to what structures are provided by the teacher. The reflections and learnings from the virtual design studio – that structures are important assets of the design studio – informs our teaching encounters with students from educational backgrounds different to ours. As design teachers, we need to ensure that students have structures (tasks made explicit, spaces made visible), but just as much they need to space to respond in their own space and time (open spaces, open activities). If the students find open spaces amid the visible structures, they will be able to engage and form their own paths.

We attempted to illustrate the possibilities that open up for the educational design studio when we look at our challenges in teaching through the lens of relationality – where knowledge emerges 'in-between'.[26] We conclude that it is crucial to pay attention to the relationship between visible structures and open spaces in the design studio. An overly open space without noticeable structures might make students listless, as they cannot recognize their options to act. An overly structured space will restrict students to follow a prescribed linear path of action, such as the implementation of a plan, and it will deny them the experience of finding their own voice and responding to the new situations that arise.[27]

The aim is to create an engaging learning space in which students can learn design. The studio space in which the teachers make structures visible, whether playful or task-oriented, but leave it up to the students how they respond to these structures, creates a space that pulls students inside. The relational studio, such as the Global Studio, from which this paper draws its ideas, provides visible structures to which students can respond openly according to their capacity. The space that arises facilitates these relations between the student, the teachers, the design materials, so that students can find their own positions and identities as designers.

NOTES

[1] Silvia Gherardi, and Davide Nicolini, *Organizational knowledge: The texture of workplace learning* (Oxford: Blackwell Publishing, 2006).

[2] Erik Bohemia, and Aysar Ghassan, "Opening Doors: Broadening Designers' Skill Set," in *IASDR2011: 4th World Conference on Design Research*, edited by Norbet Roozenburg et al. (Delft, The Netherlands: TU Delft, 2011).

[3] Guy Julier, *The Culture of Design*, (London: SAGE Publications, 2000).

[4] Architekturzentrum Wien, "Semper – Depot. Nextroom," accessed May 29, 2022.
https://www.nextroom.at/building.php?id=2703

[5] Michael Tovey, "Designerly Thinking and Creativity," in *Design Pedagogy: Developments in Art and Design Education*, (Farnham: Gower Publishing Ltd, 2015).

[6] Erik Bohemia, and Kerry Harman, "Globalization and Product Design Education: The Global Studio," Design Management Journal 3, no. 2 (2008): 53–68.

[7] Boeun Bethany Hong, Erik Bohemia, Ruth Neubauer, and Laura Santamaria, "Designing for Users: The Global Studio," in *DS 93: Proceedings of the 20th International Conference on Engineering and Product Design Education (E&PDE 2018)*, edited by Erik Bohemia et al. (London: Design Society, 2018).

[8] Erik Bohemia, and Aysar Ghassan, "Globally Networked Collaborative Learning in Industrial Design," American Journal of Distance Education 26, no. 2 (2012): 110–25. doi: 10.1080/08923647.2012.663678.

[9] Erik Bohemia, Kerry Harman, and Kristina Lauche, *The Global Studio: Linking Research, Teaching and Learning. Research in Design Series*, (Amsterdam: IOS Press, 2009).

[10] Aysar Ghassan, and Erik Bohemia, "The Global Studio: Incorporating Peer-Learning into the Design Curriculum." *FormAkademisk - forskningstidsskrift for design og designdidaktikk* 8, no. 1 (2014):
1–11. doi: 10.7577/formakademisk.1406.

[11] Erik Bohemia, Kerry Harman, and Liz McDowell, "Intersections: The Utility of an 'Assessment for Learning' Discourse for Design Educators," Art, Design and Communication in Higher Education 8, no. 2 (2009): 123–34. doi: 10.1386/adch.8.2.123/1.

[12] Aysar Ghassan, and Erik Bohemia, "Amplifying Learners' Voices through the Global Studio," in *Design Pedagogy: Developments in Art and Design Education*, edited by Michael Tovey (Farnham: Gower Publishing Limited, 2015).

[13] Kerry Harman, and Erik Bohemia, "Another way of thinking: Creativity and Conformity." Paper presented at Creativity or Conformity? Building Cultures of Creativity in Higher Education, Cardiff, 2007.

[14] Silvia Gherardi, *How to conduct a practice-based study: Problems and Methods* (Northampton, Massachusetts: Edward Elgar Publishing Limited, 2012), 78.

[15] Yoko Akama, Sarah Pink, and Shanti Sumartojo, *Uncertainty and possibility: New approaches to future making in design anthropology.* (London: Bloomsbury Publishing, 2018).

[16] Yoko Akama, Sarah Pink, and Shanti Sumartojo, *Uncertainty and possibility: New approaches to future making in design anthropology,* (London: Bloomsbury Publishing, 2018), 7.

[17] William Gaver, Jacob Beaver, and Steve Benford, "Ambiguity as a Resource for Design" (paper presented at SIGCHI conference on Human factors in computing systems, 2003).

[18] William Gaver, Jacob Beaver, and Steve Benford. "Ambiguity as a Resource for Design" (paper presented at SIGCHI conference on Human factors in computing systems, 2003).

[19] Lucy Suchman, *Human-Machine Reconfigurations: Plans and Situated Actions* (New York: Cambridge University Press, 2007=.

[20] Sarah Pink, *Doing sensory ethnography* (London: SAGE, 2009).

[21] Donald A Schön, *The reflective practitioner: How professionals think in action* (New York: Basic Books, 1983).

[22] Donald A Schön, *The reflective practitioner: How professionals think in action* (New York: Basic Books, 1983).

[23] Kee Dorst, *Frame Innovation: Create New Thinking By Design*, edited by Ken Friedman et al. (Cambridge, MA: The MIT Press, 2015).

[24] Michael Tovey, "Designerly Thinking and Creativity," in *Design Pedagogy: Developments in Art and Design Education*, (Farnham: Gower Publishing Ltd, 2015).

[25] Ruth M Neubauer., and Christoph H. Wecht, "Materiality of Space and Time in the Virtual Design Studio," in *Proceedings of the DRS LEARNxDESIGN 2021*, edited by Erik Bohemia et al. (Jinan, China: Design Research Society, 2021).

[26] Yoko Akama, Sarah Pink, and Shanti Sumartojo, *Uncertainty and possibility: New approaches to future making in design anthropology* (London: Bloomsbury Publishing, 2018), 7.

[27] Donald A Schön, *The reflective practitioner: How professionals think in action* (New York: Basic Books, 1983).

BIBLIOGRAPHY

Akama, Yoko, Sarah Pink, and Shanti Sumartojo. *Uncertainty and possibility: New approaches to future making in design anthropology*. London: Bloomsbury Publishing, 2018.

Architekturzentrum Wien. "Semper – Depot. Nextroom." Accessed May 29, 2022. https://www.nextroom.at/building.php?id=2703

Bohemia, Erik, and Aysar Ghassan. "Opening Doors: Broadening Designers' Skill Set." In *IASDR2011: 4th World Conference on Design Research*, edited by Norbet Roozenburg, Lin-Lin Chen and Pieter Jan Stappers. Delft, The Netherlands: TU Delft, 2011.

Bohemia, Erik, and Aysar Ghassan. "Globally Networked Collaborative Learning in Industrial Design," American Journal of Distance Education 26, no. 2 (2012): 110–25. doi: 10.1080/08923647.2012.663678.

Bohemia, Erik, and Kerry Harman. "Globalization and Product Design Education: The Global Studio." Design Management Journal 3, no. 2 (2008): 53–68.

Bohemia, Erik, Kerry Harman, and Kristina Lauche, *The Global Studio: Linking Research, Teaching and Learning. Research in Design Series*. Amsterdam: IOS Press, 2009.

Bohemia, Erik, Kerry Harman, and Liz McDowell. "Intersections: The Utility of an 'Assessment for Learning' Discourse for Design Educators." Art, Design and Communication in Higher Education 8, no. 2 (2009): 123–34. doi: 10.1386/adch.8.2.123/1.

Dorst, Kees. *Frame Innovation: Create New Thinking By Design*, edited by Ken Friedman and Erik Stolterman. Cambridge, MA: The MIT Press, 2015.

Gaver, William, Jacob Beaver, and Steve Benford. "Ambiguity as a Resource for Design." Paper presented at SIGCHI conference on Human factors in computing systems, 2003.

Ghassan, Aysar, and Erik Bohemia. "The Global Studio: Incorporating Peer-Learning into the Design Curriculum." *FormAkademisk - forskningstidsskrift for design og designdidaktikk* 8, no. 1 (2014): 1–11. doi: 10.7577/formakademisk.1406.

Ghassan, Aysar, and Erik Bohemia.. "Amplifying Learners' Voices through the Global Studio." In *Design Pedagogy: Developments in Art and Design Education*, edited by Michael Tovey, 215–236. Farnham: Gower Publishing Limited, 2015.

Gherardi, Silvia. *How to conduct a practice-based study: Problems and Methods*. Northampton, Massachusetts: Edward Elgar Publishing Limited, 2012.

Gherardi, Silvia, and Davide Nicolini. *Organizational knowledge: The texture of workplace learning*. Oxford: Blackwell Publishing, 2006.

Harman, Kerry, and Erik Bohemia. "Another way of thinking: Creativity and Conformity." Paper presented at Creativity or Conformity? Building Cultures of Creativity in Higher Education, Cardiff, 2007.

Hong, Boeun Bethany, Erik Bohemia, Ruth Neubauer, and Laura Santamaria, "Designing for Users: The Global Studio." In *DS 93: Proceedings of the 20th International Conference on Engineering and Product Design Education (E&PDE 2018)*, edited by Erik Bohemia, Ahmed Kovacevic, Lyndon Buck, Peter Childs, Stephen Green, Ashley Hall and Aran Dasan, 738–743. London: Design Society, 2018.

Julier, Guy. *The Culture of Design*. London: SAGE Publications, 2000.

Neubauer, Ruth M., and Christoph H. Wecht. "Materiality of Space and Time in the Virtual Design Studio." In *Proceedings of the DRS LEARNxDESIGN 2021*, edited by Erik Bohemia, Liv Merete Nielsen, Lusheng Pan, Naz A.G.Z. Börekçi and Yang Zhang, 756–765. Jinan, China: Design Research Society, 2021.

Pink, Sarah. *Doing sensory ethnography*. London: SAGE, 2009.

Schön, Donald A. *The reflective practitioner: How professionals think in action*. New York: Basic Books, 1983.

Suchman, Lucy. *Human-Machine Reconfigurations: Plans and Situated Actions*. New York: Cambridge University Press, 2007.

Tovey, Michael. "Designerly Thinking and Creativity." In *Design Pedagogy: Developments in Art and Design Education*, 51–66. Farnham: Gower Publishing Ltd, 2015.

FREEHAND DRAWING AS A DIDACTIC INSTRUMENT

Author:
RAFAEL SOUSA SANTOS,[1] CLARA PIMENTA DO VALE,[1] BARBARA BOGONI,[2] POUL HENNING KIRKEGAARD[3]

Affiliation:
[1]FACULTY OF ARCHITECTURE, UNIVERSITY OF PORTO, PORTUGAL. [2]SCHOOL OF ARCHITECTURE URBAN PLANNING CONSTRUCTION ENGINEERING, POLITECNICO DI MILANO, ITALY. [3]DEPARTMENT OF ENGINEERING, AARHUS UNIVERSITY, DENMARK.

INTRODUCTION

This paper was guided by the following research question: how freehand drawing teaching influences design teaching? The bibliography regarding freehand drawing as a design instrument is extensive and diverse, underlining its different associated procedures, such as perception, conception and communication.[1] Less relevance has been given to freehand drawing as a didactic instrument, that is, as a means used by instructors and students for the transmission and acquisition of knowledge.[2] It is intended to consider the didactic role of freehand drawing and its importance in the architectural design teaching, based on the analysis of the intersections between the courses of drawing and architectural design at the Faculty of Architecture of the University of Porto (FAUP). Considering the progressive loss of relevance of drawing in architectural curriculum plans in recent decades,[3] the aim of this paper is to understand why to continue to teach freehand drawing and how this interferes or determines the way of teaching architectural design.

METHODOLOGY

The research was conducted as a qualitative embedded single-case. All courses of Architectural Design and Drawing from the five years of the FAUP master's program in architecture were considered, according to three units of analysis: educational purposes, principles and practices. In order to guide the procedures of data collecting, recording, analyzing and interpreting, a Characterization Matrix (CM) was formulated. The CM allows to relate the three embedded unities of analysis – i.e., the educational purposes, principles and practices – with the three main sources of evidence in which the object of study manifests itself: instructors, expressing how the model is assumed; architectural design classes, expressing how the model is achieved; and students, expressing how the model is acquired. The main research methods that have been used are naturalistic observation, participatory observation, in-person-interview and conversation, complemented with artifact analysis, and documentary and bibliographic review. Field data were collected through direct observation and recorded in raw field notes. Considering the exploratory nature of the research, an open data collection model was followed during the recording sessions. Later, the field notes were revised and transcribed to digital form and submitted to thematic analysis.

RESULTS

Curricular context and organization

The analyzed courses are part of the integrated master's degree in architecture at FAUP, which in total lasts for five years. The design studios are mandatory and on an annual regime, so there are five studios, one in each academic year, called Architectural Design 1, 2, 3, 4 and 5. The workload of the five studios is the same, 12 hours per week. Among the five Architectural Design studios there is a curricular alignment, both in terms of topics covered, pedagogical objectives and teaching approach. Thus, the general organization of design studios is not decided year by year by the responsible instructor, but is defined collectively.

The two drawing courses are also required to be attended annually and are taught in the first two years of the master's degree, called Drawing 1 and 2. In terms of workload, and consequently, in terms of curricular weight, Drawing 1 is quite considerable, when comparing to Architectural Design, with 8 hours per week, while Drawing 2 is 3 hours. Also in the case of the two drawing courses there is a previously established curricular alignment, with a program that must be completed by all classes.

Horizontal and vertical intersections

It is possible to verify by the context and curricular organization, that the most direct intersections between the design studios and the drawing courses – which here are called horizontal intersections – happen in the first two years of the master's program, where they are simultaneously taught. In addition to the coordination that exists between courses, it is also during this period that students need to follow a singular rule of this school, which is the prohibition of computer use in design studios. According to this rule, students must produce all design representations with analogue means, where freehand drawing plays a major role. While in the drawing courses students are learning the fundamentals of freehand drawing – through the systematization of the instrumental and expressive component, the different ways of drawing and the various representation systems[4] – in the design studios they are making the practical application of this learning.

In the first year, the intersection between design studios and the drawing course takes place mainly at an instrumental and procedural level. In Architectural Design 1, for example, students are required to use visual drawing to approach the intervention site, as they do in Drawing 1. The entire design process is also supported by freehand drawing – and complemented by physical models – where in addition to the technical representations, studies of shape and volume are carried out.

In the second year, however, there is a direct link between the exercises of the two courses. In Drawing 2, students produce drawings of the intervention site used in Architectural Design 2, such as perspectives with one or two vanishing points, impressive surveys of the plans and elevations of the site and the surroundings, axonometries and aerial perspectives. This material is then used in both courses and serves as a basis for experimenting with design solutions.

In these first two years, design studios have then explicit intersections with drawing courses. However, there are also intersections throughout the different academic years, more discreet and subtle,[5] which here are called vertical intersections. These intersections have to do with a particular use of freehand drawing in the design process, but also with the teaching approach itself, as will be explained below.

Freehand drawing and design teaching

As already mentioned, during the first two years, students are required to use only analogue means of representation, which are essentially freehand or technical drawing and physical models. In addition to the project design drawings, where freehand drawing is used as a thinking resource, students are led to resort to freehand drawing for the recognition of the intervention site, producing perspectives with one or two vanishing points, aerial perspectives, axonometric perspectives and impressive surveys [Figure

1]. It is assumed that during these first two years, the propaedeutic character[6] of the design studios is not only related to the acquisition of instrumental capacities, the dexterity and mastery of the different representation systems, but also the indication of a method of designing.[7]

After these first two years, the use of freehand drawing as a design instrument is significantly reduced. Having the freedom to choose the forms of representation they prefer, many students start using Autocad, Revit or Archicad. The freehand drawing used as a way of thinking, in the exploration of design solutions, however, continues to be used. No longer for the entire class, but for a significant part of it. It is common for students to associate freehand drawing with other forms of representation in the design process, especially digital ones, using one or the other according to specific needs [Figure 2]. There is a cycle in the elaboration of the design project – a process –, which consists of the production of digital representations, which are then printed, and manipulated through freehand drawing, using tracing paper or drawing directly on the prints [Figure 3].

Freehand drawing is also used as a means of interaction between instructors and students, during the so-called design critiques.[8] Not just for the first two years, when students are required to just use freehand drawing, but for the entire five years of the masters. Even when students are working almost exclusively with digital media, freehand drawing is always used in design critiques. It is very common for instructors to ask students to print out the design elements so they can draw on it [Figure 4]. Several instructors mention that this is a kind of necessity, since without direct demonstration through freehand drawing, critiques would be much less effective for students.[9]

One manifestation of the importance of freehand during design critiques was during the pandemics.[10] Despite the discussions taking place through the screen, instructors and students quickly began to resort to drawing tools, using the mouse to interact and manipulate the students' productions [Figure 5].
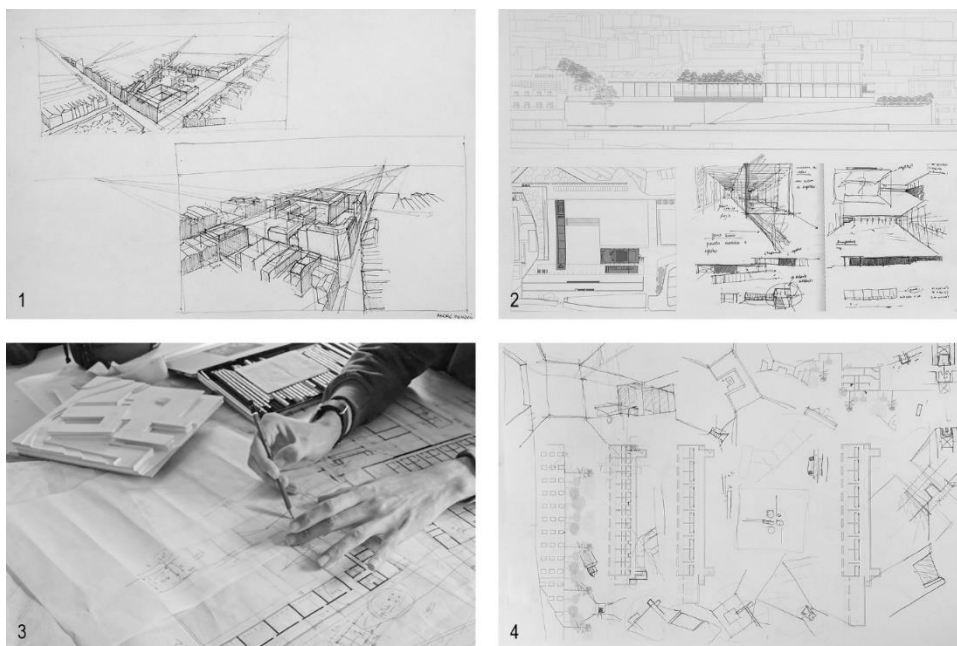

Figure 1. Aerial perspectives of the intervention site – Drawing 2, 2020.
Figure 2. Student's poster with analogue and digital representations – Architectural Design 4, 2022.
Figure 3. Student using tracing paper to draw on a printed CAD drawing – Architectural Design 4, 2022
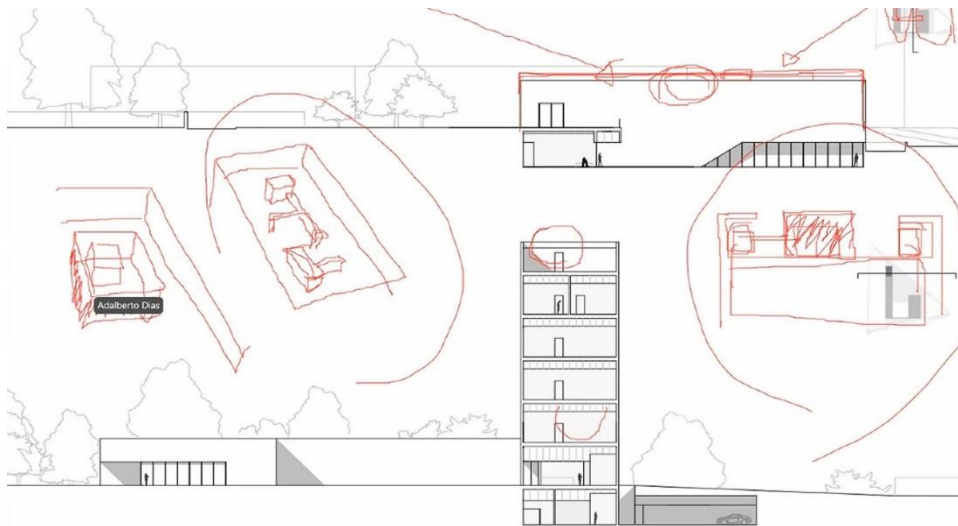*Figure 4. CAD drawing with drawn annotations – Architectural Design 4, 2022.*

Figure 5. Shared screen during design critiques – Architectural Design 4, 2021.

DISCUSSION

Freehand drawing as a design instrument

Considering the horizontal and vertical intersections analyzed, as well as the didactic approach in design studios, it is possible to recognize two roles of freehand drawing in design teaching at FAUP. The first is the role of freehand drawing as a design instrument. In this school, the training of the student in freehand drawing is considered fundamental, and therefore there is a large investment in the first two years of the integrated masters. Not only because students must attend two annual and mandatory drawing courses, but also because they are subject to the rule of not using digital media in the design studios. It can thus be seen that there is a direct coordination between courses for a common objective, in this case, the teaching of a design process or methodology based on freehand drawing.[11]

While in the drawing courses the technical and expressive dimension of drawing is focused, in the design studios students learn how to apply this knowledge. Students then use freehand drawing: as a perceptive tool to approach the intervention site [Figure 6]; in the process of form finding, definition of design ideas, volumetric and spatial studies [Figure 7]; to make technical representations of the design project, such as plans, sections and elevations [Figure 8]. Freehand drawing is also used in the more advanced stages of the design process, to solve a particular detail or a constructive issue [Figure 9] – which is rarely mentioned in the literature, as freehand drawing is usually associated with the initial conceptual phases.[12]

Despite drastically decreasing its use after the first two years, freehand drawing continues to be present in the design process of many students, especially in the so-called study drawings.[13] These study drawings are often crude and dirty, produced quickly, as an extension of thought.[14] Freehand drawing can then be seen as the starting point of students' training, a kind of prerequisite, which gives them instrumental and technical skills of spatial perception, representation, conception and communication, which constitutes a method of designing.

Freehand drawing as a didactic instrument

There is a second role of freehand drawing that can be recognized in design teaching, and that is its use as a means of interaction between instructors and students in the teaching and learning process, that is, as a didactic instrument. As mentioned, students start the master's program with a propaedeutic period, where they have an intensive training in freehand drawing. On the one hand, because there is a

conviction in this school of the importance of freehand drawing as a design instrument, due to its several qualities as a form of representation.[15] On the other hand, because freehand drawing plays a fundamental role in the learning process itself.[16]

At a more immediate level, the teaching of freehand drawing corresponds to a didactic strategy, whose objective is to circumvent the enormous heterogeneity of students when they arrive at university. Considering that they all have very different backgrounds, from arts, humanities, sciences and technical courses, this is a way to put them all on the same starting point, with the same knowledge and resources.[17] Moreover, students receive training similar to that of design studio instructors. This aspect is very important, because the fact that they share a representative and procedural literacy – in other words, metaphorically, they share the same language – makes it possible to create a unique "trading platform" between them.[18]

Figure 6. Recognition of the intervention site – Architectural Design 1, 2022.
Figure 7. Student's design process – Architectural Design 2, 2020.
Figure 8. Handmade technical representations – Architectural Design 4, 2022.
Figure 9. Student drawing on a printed CAD drawing – Architectural Design 4, 2022.

This form of interaction is significant in the early years, when students still have little autonomy, but also throughout the master's program. If, as it was mentioned, the use of freehand drawing in the most advanced years reduces substantially, its use in design critiques is never reduced. During the five years of the masters, passing through all the design studios, it is visible how instructors and students actively resort to freehand drawing to support design critiques. Even when students are working essentially with digital representation forms, instructors ask them to print the design elements before the design critiques, so that the criticism is not merely verbal or gestural [Figure 10].

The fact that instructors draw during design critiques is not a particularity of FAUP, since in other schools, even where freehand drawing is not part of the curriculum, instructors often draw. As referred by Gero and Milovanovic,[19] about 60% of instructors' verbalizations during design critiques are followed up with an action in external representations. However, what happens at FAUP is that students also draw. Most of them resort actively and systematically to freehand drawing, which makes it form

of dialogue with instructors [Figure 11]. They can use freehand drawing to quickly ask questions, to clarify a design ambiguity, in short, to discuss [Figure 12]

Students' drawn productions also play an important role in, as an expression of their knowledge and pedagogical situation.[20] Whether the drawings made during design critiques, in real time, or the drawings made during the design process, are crucial for instructors to track their progress [Figure 13]. This is done for an extended period, for one entire year, with different points of intermediate evaluation, where both instructors and students consider the progress made so far. It is also an opportunity to recognize the relationship between didactics and the results achieved, which is an important aspect of the learning process. Because, as mentioned by Quadros,[21] one of the difficulties of this type of didactics is the mismatch between awareness of learning and its experience.
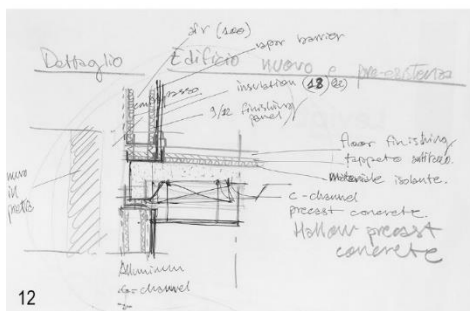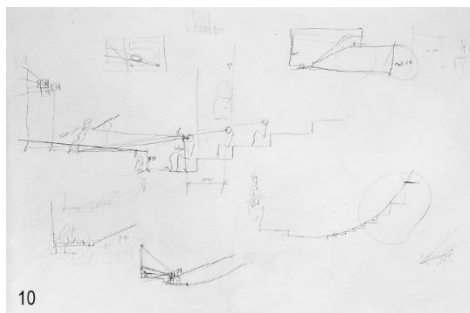

Figure 10. Professor's drawing explaining a design issue – Architectural Design 4, 2022.
Figure 11. Instructor and student drawing during design critiques– Architectural Design 4, 2022.
Figure 12. Student's drawing to clarify a constructive doubt – Architectural Design 4, 2022.
Figure 13. Student's design process – Architectural Design 2, 2020.

Teaching and learning vulnerabilities

Finally, after characterizing this way of teaching and learning, it is important to point out some of its vulnerabilities. They can be organized into two groups. The first group has to do with a difficulty for students to understand the school's didactic strategy, as already mentioned, about the importance given to freehand drawing in the first two years, associated with the prohibition of digital media. Not all students are able to understand the purpose of this option or agree with it, which can be problematic, as this can condition their readiness to learn.[22] There are cases where students even subvert the rules set by instructors, using Autocad, for example, then printing and reproducing the drawings by hand. Among the students, there are those who consider this way of learning old-fashioned, and that the importance given to freehand drawing in this school does not make sense. They usually argue with the professional issue, that is, that the university should prepare them more directly for professional life.

Another aspect has to do with the importance given to the representation as the center of didactics, and that can lead to an overvaluation and autonomy of the freehand drawing to the design itself. In some cases, students tend to confuse the design with its representation, and design qualities with graphic

qualities. As Mendes states,[23] the formal exploration or production of images without critical awareness, not understanding design in its relationship with reality, removes all the pedagogical value of design studios, making these simple graphic exercises or demonstrations of virtuosity.

Regarding the second group of vulnerabilities, it is related to an imbalance in the relationship between instructors and students, which is one of the pillars of this form of teaching. One of the aspects to consider is the subjective component of the criticism made by instructors. Besides objective questions, in which instructors may argue about typologies, constructive procedures, regulations and legislation, there is an aside from criticism that is entirely subjective, referring to their personal experience and sensibility.[24] For this reason, it sometimes happens that students do not accept criticism as valid, considering it just the instructor's opinion.

Moreover, it may also happen that students see the instructor as the last criterion to validate a design decision. This leads students to loss of autonomy, annulling their critical capacity, and making them unable to move forward without the instructor's approval. Another issue has to do with the personalization of this way of teaching, overlapping students' performance and work with themselves. At FAUP, where teaching is mainly about individuals – and where the idea of the author architect is still very present – students may personalize a failure, affecting their self-esteem, leading them to avoid risks. This is problematic because, as referred by Lawson,[25] mistakes and failures are a crucial part of the design learning process.

CONCLUSION

With this paper it was aimed to understand the role of freehand drawing in architectural design teaching and how it influences or determines the teaching approach at FAUP. Either by the curricular intersections of the design studios with the drawing courses or by its presence in the design critiques, it seems possible to refer that freehand drawing has a central importance in the way architectural design is learned and taught in this school. As it is learned, because as it was referred, all students in the first two years learn freehand drawing at the same time they learn to apply it in the design process, functioning as a general base training. Thus, freehand drawing becomes for all students the first and most important design instrument, which will later be complemented with other forms of representation. As it is taught, because freehand drawing in this school is also a didactic instrument, used as a means of interaction between instructors and students in monitoring the design process. The option of teaching freehand drawing does not seem to contradict or compromise the new possibilities brought by digital media, but rather the opposite. As mentioned, students often use freehand drawing in addition to CAD drawing or digital and physical models, acting as a structuring and articulating element between the various forms of representation. An important future work to do would be to analyze design teaching in a school where freehand drawing is not part of the curriculum. Considering that even in these cases, as referred by Gero and Milovanovic,[26] instructors often resort to drawing, it would be relevant to understand what changes in the interaction with students, and consequently in its pedagogical effectiveness.

ACKNOWLEDGEMENTS

NOTES

[1] Rein Have and Martin Toorn, "The role of hand drawing in basic design education in the digital age," (paper presented at the International Conference on Engineering and Mathemaatics – ENMA, 2012).

[2] Julie Milovanovic, "Exploration of architectural design studio pedagogy: Effect of representational ecosystems on design critiques" (PhD thesis, Loire Bretagne University, 2019).

[3] Jelena Pejkovic, "Why Are You Not Using Computers? A Case for Drawing Vernacular Architecture by Hand," Journal of Traditional Building, Architecture and Urbanism (2021).

[4] Rafael Sousa Santos et al., "Teaching freehand drawing" in *Stoà – Strumenti per l'insegnamento della progettazione architettonica,* ed. Alberto Calderoni et al. (Naples: Thymos Books, 2021).

[5] Tomas Dorta, Gokce Kinayoglu, and Sana Boudhraa, "A new representational ecosystem for design teaching in the studio," Design Studies 47 (2016).

[6] Teresa Pais, *O ensino do desenho nas faculdades de arquitectura de Lisboa e do Porto* (Coimbra: EDARQ, 2018).

[7] Manuel Mendes, "'Escola' ou 'generalismo' – ecletismo ou tradição, uma opção inevitável," in *Páginas Brancas*, ed. Manuel Maria Reis et al. (Porto: FAUP, 1986).

[8] Julie Milovanovic, "Exploration of architectural design studio pedagogy: Effect of representational ecosystems on design critiques" (PhD thesis, Loire Bretagne University, 2019).

[9] Teresa Pais, *O ensino do desenho nas faculdades de arquitectura de Lisboa e do Porto* (Coimbra: EDARQ, 2018).

[10] Rafael Sousa Santos et al., "Didactics and circumstance: External representations in architectural design teaching" (paper presented at the conference Online Education – Teaching in a Time of Change, Virtual, April 21-23, 2021).

[11] Eduardo Fernandes, "The Cognitive Methodology of the Porto School: Foundation and Evolution to the Present Day" Athens Journal of Architecture 1 (2015).

[12] Terry Purcell and John Gero, "Drawings and the design process" Design Studies 19 (1998).

[13] Daniel Herbert, "Study Drawings in Architectural Design: Their Properties as a Graphic Medium" Journal of Architectural Education 41 (1988).

[14] Gabriela Goldschmidt, "Manual sketching – Why is it still relevant?," in *The Active Image: Architecture and Engineering in the Age of Modeling*, ed. Sabine Ammon et al. (Cham: Springer, 2017).

[15] As qualities of freehand drawing as a design instrument, Goldschmidt (1991) refers: speed of production, minimal generation rules, tolerance to ambiguity, inaccuracy and incompletion, transformability and reversibility, and flexible stop-rules. Tversky and Suwa (2009) also add: the possibility of focusing on some aspects without losing the general sense, the possibility of exaggerating, emphasizing or distorting components, such as the possibility of acquiring a public nature, even when fulfilling an initial private purpose.

[16] Alberto Carneiro, "Entrevista com Alberto Carneiro," Risco – Revista de Pesquisa em Arquitetura e Urbanismo 2 (2017).

[17] António Quadros quoted in Teresa Pais, *O ensino do desenho nas faculdades de arquitectura de Lisboa e do Porto* (Coimbra: EDARQ, 2018).

[18] Julie Milovanovic, "Exploration of architectural design studio pedagogy: Effect of representational ecosystems on design critiques" (PhD thesis, Loire Bretagne University, 2019).

[19] John Gero and Julie Milovanovic, "A framework for studying design thinking through measuring designers' minds, bodies and brains," Design Society 6 (2020).

[20] Alberto Carneiro, "Entrevista com Alberto Carneiro," Risco – Revista de Pesquisa em Arquitetura e Urbanismo 2 (2017).

[21] António Quadros quoted in Teresa Pais, *O ensino do desenho nas faculdades de arquitectura de Lisboa e do Porto* (Coimbra: EDARQ, 2018).

[22] José Ortega y Gasset, *Missão da Universidade e outros textos* (Coimbra: Angelus Novus, 2003).

[23] Manuel Mendes, "'Escola' ou 'generalismo' – ecletismo ou tradição, uma opção inevitável," in *Páginas Brancas*, ed. Manuel Maria Reis et al. (Porto: FAUP, 1986).

[24] David Nicol and Simon Pilling, *Changing Architectural Education:Towards a New Professionalism* (London: Taylor & Francis, 2019).

[25] Bryan Lawson, *How Designers Think: The Design Process Demystified* (Boston: Architectural Press, 2005).

[26] John Gero and Julie Milovanovic, "A framework for studying design thinking through measuring designers' minds, bodies and brains," Design Society 6 (2020).

BIBLIOGRAPHY

Fernandes, Eduardo. "The Cognitive Methodology of the Porto School: Foundation and Evolution to the Present Day." Athens Journal of Architecture 1 (2015): 187-206.

Fernandes, Francisco Barata, Givaldo Luiz Medeiros, Joubert José Lancha, Maria Madalena Ferreiro Pinto da Silva, Paulo Cesar Castral, Simone Helena Tanou and Vizioli and Vitor Manuel Oliveira da Silva. "Entrevista com Alberto Carneiro." Risco – Revista de Pesquisa em Arquitetura e Urbanismo 2 (2017): 124-133.

Dorta, Tomas, Gokce Kinayoglu, and Sana Boudhraa. "A new representational ecosystem for design teaching in the studio." Design Studies 47 (2016): 164-186.

Gero, John, and Julie Milovanovic. "A framework for studying design thinking through measuring designers' minds, bodies and brains." Design Society 6 (2020): 1-40.

Goldschmidt, Gabriela. "The Dialectics of Sketching." Creativity Research Journal 4 (1991): 123-143.

Goldschmidt, Gabriela. "Manual sketching: Why is it still relevant?." in The Active Image: Architecture and Engineering in the Age of Modeling, edited by Sabine Ammon and Remei Capdevila-Werning. Cham: Springer, 2017.

Have, Rein, and Martin Toorn. "The role of hand drawing in basic design education in the digital age." International Conference on Engineering and Mathemaatics, ENMA (2012): 72-80.

Herbert, Daniel. "Study Drawings in Architectural Design: Their Properties as a Graphic Medium." Journal of Architectural Education 41 (1988): 26-38.

Lawson, Bryan. How Designers Think: The Design Process Demystified. Boston: Architectural Press, 2005.

Lopes, José Maria. "O desenho como meio primevo de conhecimento." Risco – Revista de Pesquisa em Arquitetura e Urbanismo 2 (2017): 60-74.

Milovanovic, Julie. "Exploration of architectural design studio pedagogy: Effect of representational ecosystems on design critiques." PhD thesis, École Nationale Supérieure d'Architecture de Nantes, Loire Bretagne University, 2019.

Nicol, David, and Simon Pilling. Changing Architectural Education: Towards a New Professionalism. London: Taylor & Francis, 2019.

Ortega y Gasset, José. Missão da Universidade e outros textos. Coimbra: Angelus Novus, 2003.

Pais, Teresa. O ensino do desenho nas faculdades de arquitectura de Lisboa e do Porto. Coimbra: EDARQ, 2018.

Pejkovic, Jelena. "Why Are You Not Using Computers? A Case for Drawing Vernacular Architecture by Hand." Journal of Traditional Building, Architecture and Urbanism 2 (2021)1: 221-230.

Purcell, Terry and John Gero. "Drawings and the design process." Design Studies 19 (1998): 389-430.

Reis, Manuel Maria, Carlos Freitas, Guilherme Páris Couto and José Miguel Sousa, ed. Páginas Brancas. Porto: FAUP, 1986.

Sousa Santos, Rafael, Clara Pimenta do Vale, Barbara Bogoni, and Poul Henning Kirkegaard. "Didactics and circumstance: External representations in architectural design teaching." AMPS Proceedings Series 23.1. Online Education – Teaching in a Time of Change (2021a): 104-112.

Sousa Santos, Rafael, Clara Pimenta do Vale, Barbara Bogoni, and Poul Henning Kirkegaard. "Teaching freehand drawing." in Stoà – Strumenti per l'insegnamento della progettazione architettonica, edited by Carlo Gandolfi Alberto Calderoni, Jacopo Leveratto, Antonio Nitti. Naples: Thymos Books, 2021b.

Tversky, Barbara, and Masaki Suwa. "Thinking with sketches." in Tools for Innovation, edited by Arthur Markman and Kristin Wood. Oxford: Oxford Scholarship Online, 2009.

FACTORS DETERMINING FUTURE OF ARCHITECTURE EDUCATION AND PROFESSION

Author:
PASHMEENA VIKRAMJIT GHOM, ABRAHAM GEORGE

Affiliation:
INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR, INDIA

INTRODUCTION

A region's population, economy, and living standards are crucial in architectural expressions and employability. Thus, an analysis of past and present 'population statistics' of architects and architectural institutions and other influencing factors can play a critical role in planning for the critical survival profession of architecture. The methodology adopted for the study is the 'mixed method'. The dataset used for the quantitative part includes the number of architectural institutions, total enrolments, architects from various Indian states, *India Innovation Index* and *Foreign Direct Investment (FDI)*. The qualitative part comprised expert interviews (N = 40) and focused group discussion (N = 110) conducted to understand the challenges, architects' preferences*; academics, research, industry or practice,* and employability skills of the 21st Century. This research paper identifies the challenges and factors influencing architectural education and employability skills. There is a correlation found between the number of architects in any state of India with *the India Innovation Index* and *Foreign Direct Investment*. These determining factors will be of immense importance in planning architectural education and profession for critical survival in the future.

Architecture

Although architecture has many connotations, it has the operational domain *'to create state-of-the-art built environments, promote sustainability, and minimize resource-usage and energy consumption'*. Architecture facilitates health, well-being, sustainability, and possesses immense potential for value addition, enriching human life and environment. In building industry, architecture generates vast economic opportunities, and symbolizing expressions of culture and history. In post-independence and post-liberalization periods of technical education in India, profession of architecture commanded higher public acceptance. Students pursued architecture as a noble career resulting in the emergence of new institutions. There were only four architectural institutions in 1947, 12 in 1972, 50 in 1991, 177 in 2010, and the number has gone to 480 in 2021. [1] Today's architectural education has depleting quality which is of intense debate among the fraternity. Since, education imparted has to be relevant to the time, context, societal challenges and nations; *both locally and globally.* [2] This research paper addresses challenges and factors influencing architectural education and employability.

Methodology

The research framework has two stages; *quantitative and qualitative,* as shown in Figure 1. The data used for a quantitative method are given below. These studies used data from the sources as shown below.

1.Architectural institutions: '*growth in architectural institutions, enrolments, and admissions'* from 2008 to 2021.

2.B. Arch seats and *state-wise population density*: projected population of India 2022, registered architects till 2022, state-wise architectural institutions and intake, and institutions under closure by 2022.

3.Correlation study: *India Innovation Index*, state-wise *Foreign Direct Investment.*

The qualitative study comprises of 'semi-structured interviews' and 'focus group discussions.

1.Semi-structured interviews with architects yielded the factors influencing architectural education and practice in India.

2.Focus group discussions held with final year architecture students yielded their expectations and aspirations.
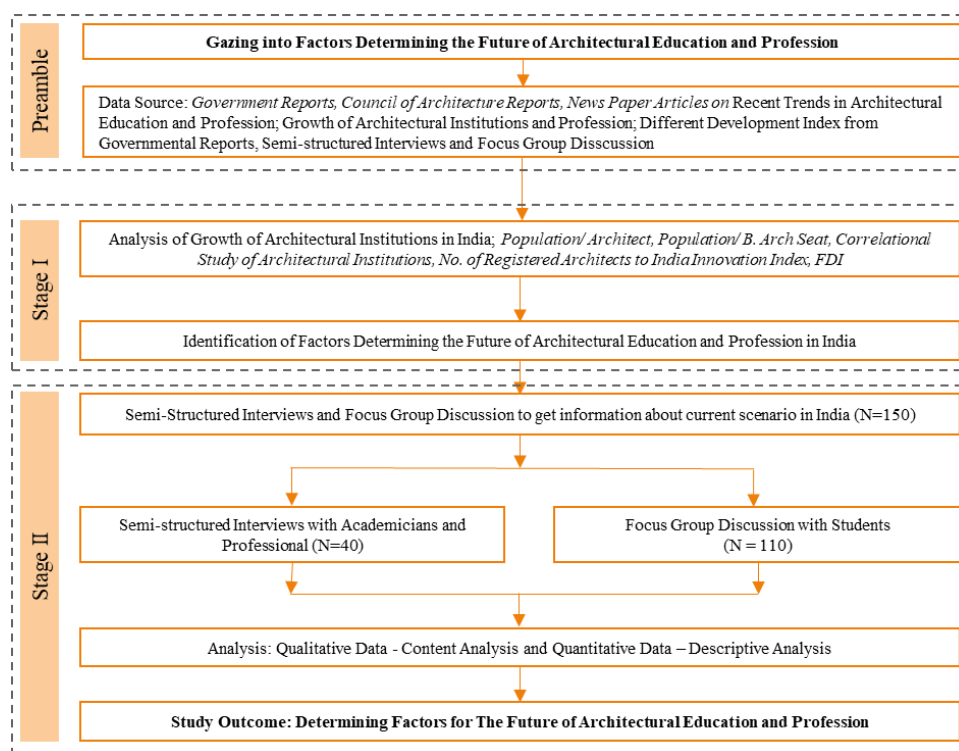

Figure 7. Research Framework (Source: Authors)

Recent Trends in Architectural Education and Profession

The profession of architecture in the nineteenth century became specialized, designing involving trained individuals in the conceptualization and realization of buildings. [3] Due to constant transformation, the responsibility of future architects is designing for sustainability, [4] climate change, programming, office management, construction management, financial analysis, resilience, operation and maintainability. [5] Architectural education prepares professionals for practice, research, education, industry, government and public enterprises, which require appropriate sets of skills and domain knowledge. There is a global divide between education and profession (Khodeir & Nessim, 2019; Salama, 2017) ; *India is no exception.*

Quantitative Explorations

Architectural Institutions in India

India is ethnically and geographically diverse, with the world's second-largest population and third-largest higher education system. [6] A panacea approach to architecture education in India is beyond reach. India has 28 states and eight union territories. *University Grants Commission* (UGC) supervises the coordination, determination, and maintenance of standards of university education. The *Council of Architecture* (CoA) is the statutory body responsible for regulating education and profession.

University Grand Commission (UGC), categorizes institutes in India are as follows:

1. Autonomous higher education institutes
2. Central Universities
3. State universities
4. Deemed Universities
5. State Private Universities

Accordingly 480 institutions exist, with 213 curricula and syllabi for B. Arch. *CoA Minimum Regulation 2020* specifies 75% curriculum content for B. Arch program, with remaining 25% left to institutes to accommodate regional requirements. It is a paradox that there is an increase in vacant seats in the later phase; *2008-09, 5.29% of seats were vacant, and as of now, 36.24%.* Growth in Architectural Institutions in India is expressed through absolute change, % change, average annual absolute change, and average annual % change (Table 1).

India	2008-2009	2020-2021	Absolution change	Percentage change	Average annual absolute change (AAAC)	Average annual percent change (AAPC)
Architectural Institutions	133	480	480 – 133 = 347	347/ 133*100 = 261%	347/13 = 27	[480/133]1/13 -1 = **10.37%**
Total Seats Available	6359	23184	23184-6359 = 16825	16825/6359*100 = 264%	16825/13 = 1294	[23184/6359] 1/13 -1 = **10.46%**

Table 1. Growth in India's' Architectural Institutions Size, Seats Available

Although the average annual percentage change is 10.37% (Table 1), there is uneven growth in many architectural institutes and total seats. Out of 480 institutes, 120 are in metro cities. In 2022-23, 56 institutes will close down due to paucity of admissions. [7] Most of these institutes were founded in 2005-20 and are located in rural or suburban areas. State-wise categorization of institutes under closure is 12 from Maharashtra, 11 from Gujrat, seven from Haryana, nine from Tamil Nādu, nine from Uttar Pradesh, two each from Rajasthan and Odisha, one each from Kerala, Jharkhand, Punjab and Himachal Pradesh (Table 3).

Year-wise Growth Rate

Institutional student intake is different; *beginning from 20 to 160 seats*. The year-wise growth from 2008-09 to 2020-21 of architectural institutions and student's intake are shown in Table 2.

Sr. No.	Academic Year	Year-wise Growth of Architectural Institutions		Year-wise Growth of Student's Intake in Architectural Institutions		Year-wise Admissions in the Architectural Institutions	
		No of Institutes	Growth Rate (P2-P1)/P1*100	Student's Intake	Growth Rate (P2-P1)/P1*100	No of Admissions	Growth Rate (P2-P1)/P1*100
1	2008 - 2009	133	-	6359	-	5783	-
2	2009 - 2010	152	14.3 ↑	8242	29.6 ↑	7462	29.03↑
3	2010 - 2011	186	22.4 ↑	10121	22.8 ↑	9586	28.46↑
4	2011 - 2012	234	25.8 ↑	15151	49.7 ↑	11466	19.61↑
5	2012 - 2013	302	29.1 ↑	19825	30.8 ↑	13137	14.57↑
6	2013 - 2014	337	11.6 ↑	20589	3.9 ↑	16329	24.30↑
7	2014 - 2015	379	12.5 ↑	23741	15.3 ↑	18342	12.33↑
8	2015 - 2016	423	11.6 ↑	24423	2.9 ↑	19241	4.90↑
9	2016 - 2017	458	8.3 ↑	24737	1.3 ↑	18702	2.80↑
10	2017 - 2018	468	2.2 ↑	24868	0.5 ↑	**14677**	**21.52↓**
11	2018 - 2019	477	1.9 ↑	**24177**	**2.8 ↓**	16576	12.94↑
12	2019 - 2020	**463**	**2.9 ↓**	25797	6.7 ↑	**8182**	**50.64↓**
13	2020 - 2021	480	3.7 ↑	**23184**	**10.1 ↓**		

Table 2. Year-wise Growth of Architectural Institutions and Student's Intake

Analysis of Table 2, proves that there is no consistent growth in number of architectural institutions and student intake but it fluctuates throughout the period. Drastic decline in employment opportunities is one of the significant reasons for vacant seats (Figure 2). Demand for fresh architects has decreased since the real estate sector suffered loss in the last five years. [8]
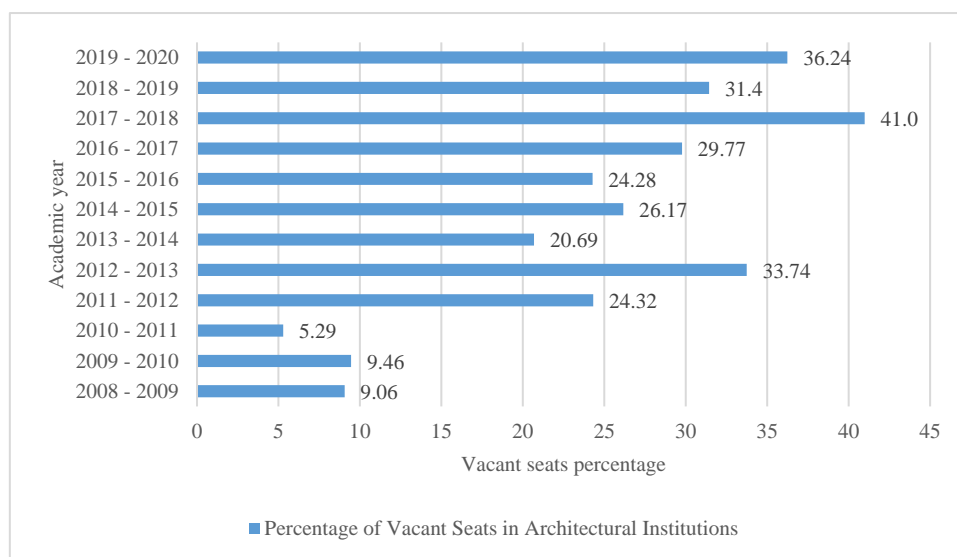

Figure 8. Percentage of Vacant Seats in Architectural Institutions (Source: Authors)

The percentage of vacant seats [9] created economic pressure on institutions. It resulted in "hiring fewer underqualified faculty members, or part-time teachers, who give insufficient time to teaching, and lack academic inclination". [10] A primary reason for the decline of standards in architectural education is the compromise in the quality and lowered institutional profit. Latest *Skill India* reports only 40% of

graduates are employable. Therefore, architectural institutes need to appropriate curricula to the market demands. [11]

State- wise Demographic Study

Density of registered architects, architectural institutions, number of seats, institutes under closure is shown in (Table 3; Figure 3 & 4).

Sr No	State	Projected Population 2022	Registered Architects	Architecture Institutions	No. of Seats	Under process of closure	Population/ Architect	Population/ B. Arch seat
1	Andaman and Nicobar	3,99,001	40	0	0	0	9975	0
2	Andhra Pradesh	9,17,02,478	1,537	9	400	0	59663	229256
3	Arunachal Pradesh	17,11,947	73	0	0	0	23451	0
4	Assam	3,59,98,752	718	2	80	0	50138	449984
5	Bihar	12,85,00,364	850	2	70	0	151177	1835719
6	Chandigarh	11,58,040	800	1	40	0	1448	28951
7	Chhattisgarh	3,21,99,722	948	4	130	0	33966	247690
8	D.& Nagar Haveli	4,53,008	22	0	0	0	20591	0
9	Daman & Diu	3,20,989	36	0	0	0	8916	0
10	Delhi	1,93,01,096	9,531	8	562	0	2025	34344
11	Goa	15,21,992	781	1	40	0	1949	38050
12	Gujarat	7,04,00,153	6,764	34	1320	**10**	10408	53333
13	Haryana	2,89,00,667	4,230	24	760	**7**	6832	38027
14	Himachal Pradesh	75,03,010	547	3	40	**1**	13717	187575
15	Jammu & Kashmir	1,49,99,397	360	4	160	0	41665	93746
16	Jharkhand	4,01,00,376	549	3	50	**1**	73043	802008
17	Karnataka	6,95,99,762	7,919	44	2800	0	8789	24857
18	Kerala	3,46,98,876	6,131	36	1770	**1**	5660	19604
19	Ladakh	-	4	0	0	0	0	0
20	Lakshadweep	66,001	4	0	0	0	16500	0
21	Madhya Pradesh	8,50,02,417	2,870	17	780	0	29618	108977
22	Maharashtra	12,49,04,071	30,377	101	5749	**12**	4112	21726
23	Manipur	34,36,948	126	0	0	0	27277	0
24	Meghalaya	37,72,103	134	1	30	0	28150	125737
25	Mizoram	13,08,967	107	1	30	0	12233	43632
26	Nagaland	20,73,074	62	0	0	0	33437	0
27	Odisha	4,70,99,270	1,161	9	280	**2**	40568	168212
28	Puducherry	16,46,050	217	1	40	0	7585	41151
29	Punjab	3,05,01,026	2,059	16	772	**2**	14814	39509
30	Rajasthan	7,95,02,477	2,280	16	688	**2**	34870	115556
31	Sikkim	6,58,019	81	0	0	0	8124	0
32	Tamil Nadu	8,36,97,770	11,929	76	3860	**9**	7016	21683
33	Telangana	3,81,57,311	3,736	15	1035	0	10213	36867
34	Tripura	41,84,959	40	0	0	0	104624	0
35	Uttar Pradesh	23,15,02,578	7,645	38	1224	**9**	30282	189136
36	Uttarakhand	1,17,00,099	846	6	170	0	13830	68824
37	West Bengal	10,08,96,618	2,408	8	304	0	41901	331897
	Total	**1,42,95,79,388**	**1,07,922**	480	23184	**56**	13246	61662

Note: The projected population for 2022 is taken from https://www.indiacensus.net/ and No. of Registered architects, Colleges, and total no. of seats in architectural education is taken from Council of Architecture Website (CoA 2021; 2022b).

Table 3. Overall Demographics of India in terms of Population, Registered Architects, Architectural Institutions and their Intake

There exist variations among states and union territories in the number of architects, architectural institutions, total number of seats, and actual admissions.

Qualitative and quantitative analysis regarding factors affecting architectural education and profession empowers the gearing up for future. Despite the projections by CoA and AICTE, there are scanty dependable estimates regarding number of architects required per population. These miscalculations contribute to the sad state of institutions with vacant seats, raising igniting questions:

1. Why do particular states have more density of architects?

2. Does the density of architects and number of institutions correlate with population, geographical area and the economy of states?
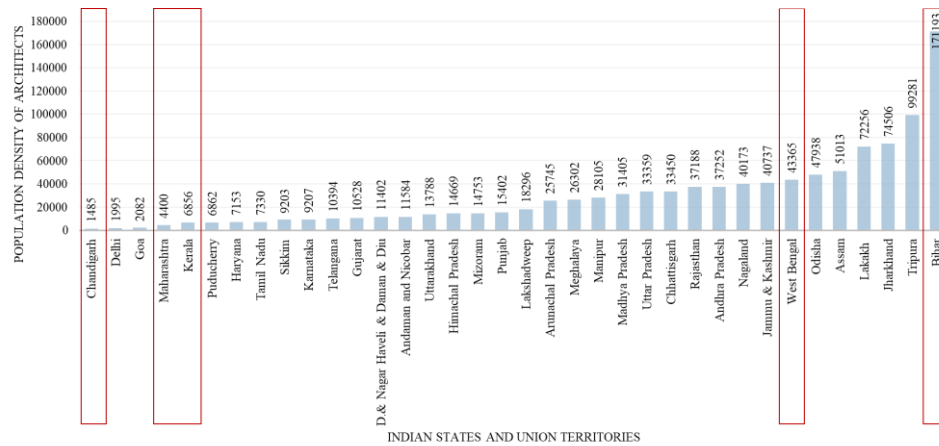
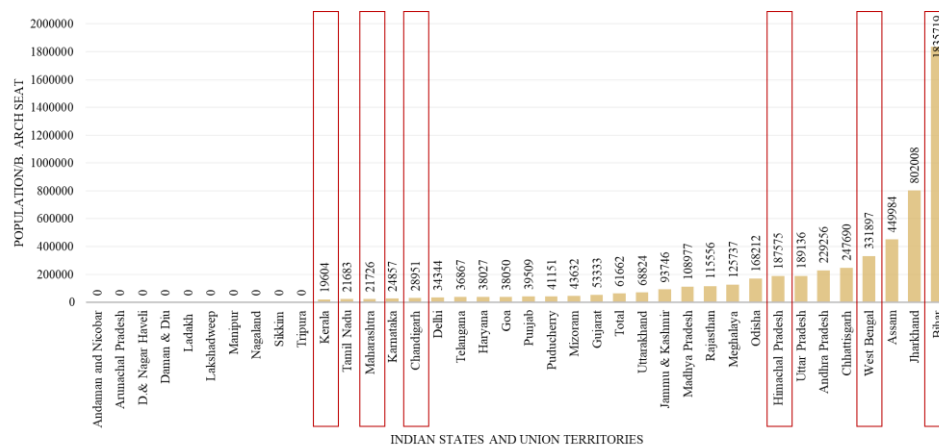*Figure 9. State-wise Population Density of Architects (Source: Authors)*

Figure 10. State-wise Population/ B. Arch Seat (Source: Authors)

State-wise, architects' population density varies. One architect for 1,485 people in Chandigarh, whereas one architect for 1,71 193 people in Bihar. Geographically, *Rajasthan,* the biggest state, has only 2.2% of architects, whereas *Maharashtra*, the third biggest state, has a 28% of architects. Thus, the density of architects does not correlate with population and geographical area (Figure 5). Further, the study indicates that relevant factors determining the density of architects required in the future needs to be identified.

Compared with overall Indian architects' population density, *i.e. 1:13247;* one architect for 3000 in the USA, and 400 in Italy and 580 in Greece. [12] "Architects work in a volatile economic sector". [13] Traditional Indian architecture is based on spiritual, climatic, geographical, building material availability, technological peak, and cultural needs. [14] Traditional designers design these buildings; *Sthapatis*, according to the principles of *Vaastu shastra*.
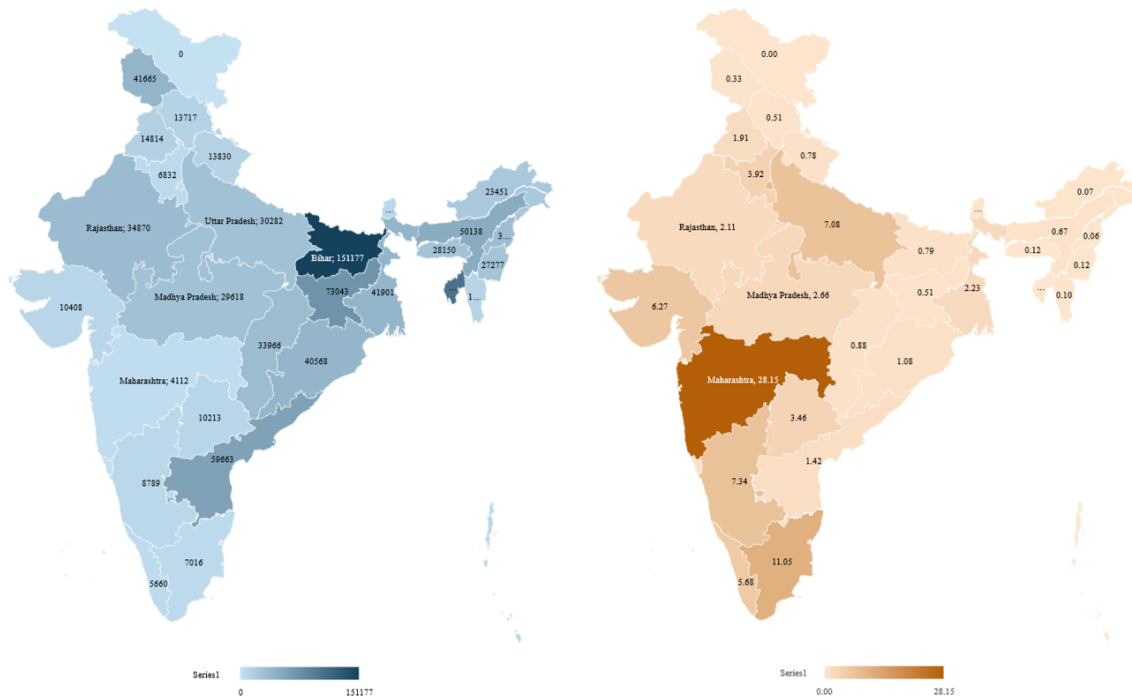
Figure 11. Population per Architect in State (Left Map) and Percentage share of Architect per State (Right Map) (Source: Authors)

Comparative analysis of Dispersion of architects

The Lorenz curve is the graphical method for dispersion, giving a measure of the deviation of actual distribution from the line of equal distribution. [15] The greater the distance of the Lorenz curve from the line of equal distribution more is the inequality in its series (Figure 6). In the case of India, the Lorenz curve is too far from the egalitarian line, which indicates unequal dispersion. More proximity to the Lorenz curve to the line of equal distribution indicates a lower degree of inequality (Figure 6) as in the case of European countries.
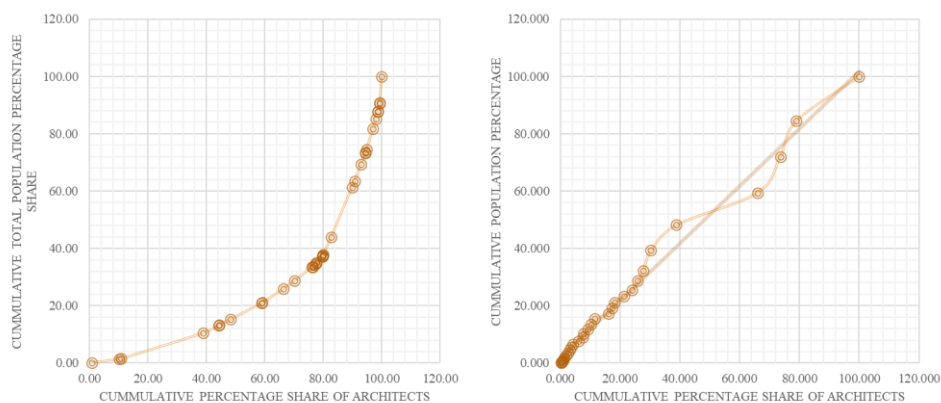
Figure 12. Lorenz Curve for Measuring inequality of Architects in States and Union Territories of India and Countries of Europe (Source: Authors)

Correlation Study: Architectural Institutions, Architects, India Innovation Index, and FDI

The number of registered architects depends on the number of architectural institutions and seats available, so there is a strong correlation between the registered architects, architectural institutions, and the number of seats available. But there is a moderate correlation between the number of universities

in the state and registered architects, architectural institutions and the number of seats available. Because architectural institutes are conglomerated in some states, there is inequality between a number of architects and institutes.

		Registered Architect	Architectural Institutions	No. of Seat Available in the State	No of Universities in the state
Registered Architect	Pearson Correlation	1	.923**	.937**	.517**
	Sig. (2-tailed)		<.001	<.001	.002
	N	36	36	36	32
Architectural Institutions	Pearson Correlation		1	.984**	.634**
	Sig. (2-tailed)			<.001	<.001
	N		36	36	32
No. of Seat Available in the State	Pearson Correlation			1	.559**
	Sig. (2-tailed)				<.001
	N			36	32
No of Universities in the state	Pearson Correlation				1
	Sig. (2-tailed)				
	N				32

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4. Correlation among Registered Architect, Architectural Institutions, Number of Seats Available in the State, and Number of Universities in the State (Source: Authors)

To understand the concentration of architects in any state, correlation study between innovation index, foreign direct investment is done. There is significant correlation between registered architects and *India innovation index*[1] and *Foreign Direct Investment* percentage[2]. Innovation has two criteria like *enablers* and *performance*. Enablers has sub-criteria like human capital, investment, knowledge workers, business environment, safety and legal environment. Performance has sub-criteria like knowledge diffusion and knowledge output (Figure 7a, 7b).
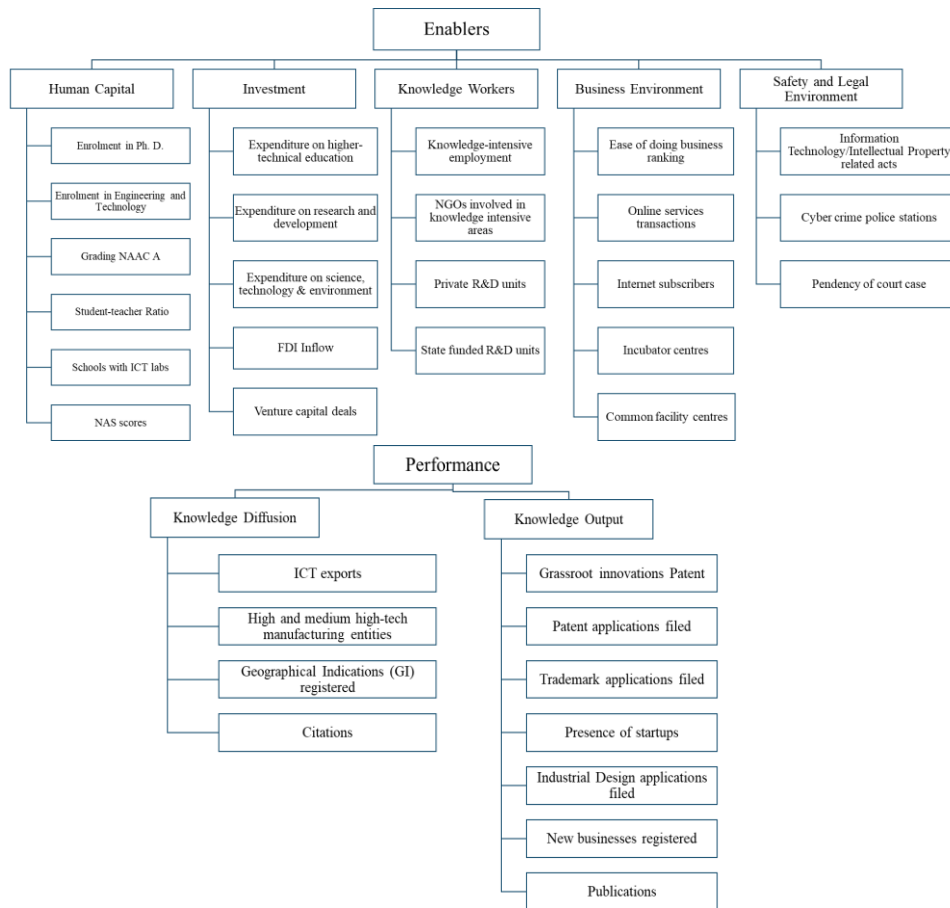
Figure 13a. Enablers in India Innovation Index (Source: Authors)
Figure 7b. Performance in India Innovation Index (Source: Authors)

		Registered Architect	Innovation Index	FDI Percentage
Registered Architect	Pearson Correlation	1	.609**	.783**
	Sig. (2-tailed)		<.001	<.001
Innovation Index	Pearson Correlation		1	.595**
	Sig. (2-tailed)			<.001
FDI Percentage	Pearson Correlation			1
	Sig. (2-tailed)			
**. Correlation is significant at the 0.01 level (2-tailed).				

Table 5. Correlation among Registered Architect, Innovation Index, and FDI Percentage (Source: Authors)

QUALITATIVE EXPLORATIONS

Qualitative exploration is done to identify factors and challenges in architecture education and profession. The structure for the exploration is shown in Figure 8.
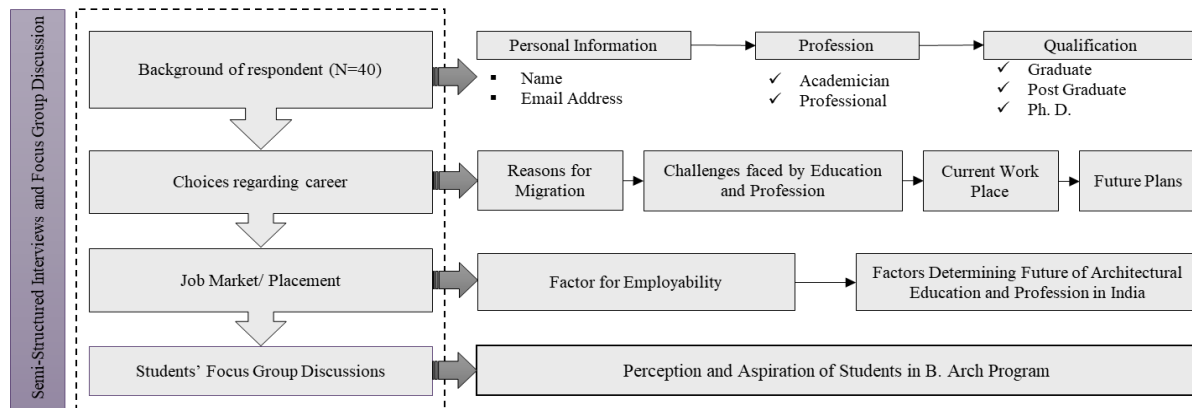
Figure 8. Structure for Qualitative Explorations (Source: Authors)

Semi structured interviews conducted with 40 experts. Criteria expert-selection: architects from industry and academics with more than ten years of experience whose demographic information depicted in Figure 9.

Educational Qualification   Architectural Institutions   Profession
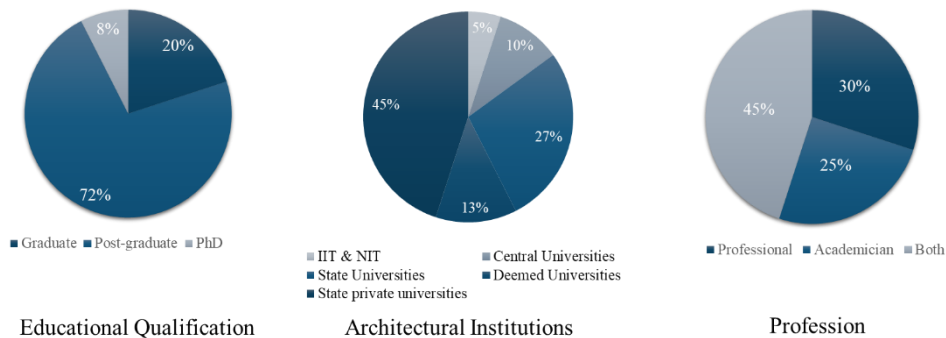
Figure 149. Demographic Details of Experts (Source: Authors)

Migration

The first question was whether *they had migrated for either education or jobs.* Reasons behind migration for education were: the absence of colleges, ranking of the institute and regulated through centralized admission system. 62% of people migrated for jobs because of location, organization's reputation, and salary.

Major challenges facing Architectural Education

The challenges are lower real-world exposure; minimal industry-academic interaction; low exposure to live projects; community participation in design. According to practitioners and academicians, most curriculum content, norms and regulations are outdated. CoA regulation -1983 has been in effect till recently without appropriate amendments. In spite of tremendous growth in architectural institutions and student intake, a shortage of appropriate faculty, mostly fresh graduates without any professional and research experience, has affected the teacher-student ratio and "fresh graduates lack employability skills". Arbitrary policies of CoA regarding new institutions and intake worsens the scenario.

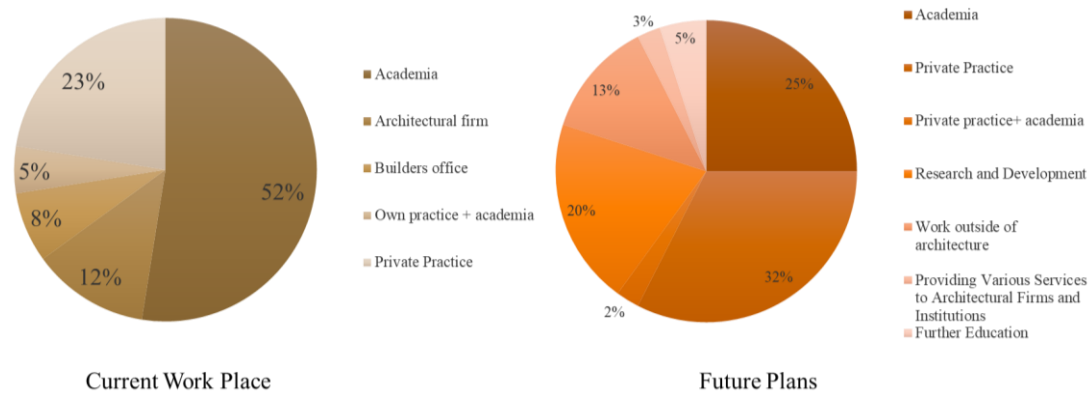Current Workplace and future Aspirations

Figure 10. Current Work Place and Future Plans (Source: Authors)

Workplace of the experts: 52% of experts in academia; 12% in architectural firms; 8% in builders' office; 5% have their practice and go to institutes as a *visiting faculty*; 23% in private practice. Their future aspirations are different from their current work. It's a dream for architects to express themselves in built environment: 32% want to have a private practice, 2% want to be researchers, 20% prefer working in other fields. Therefore, architecture education shall assume *interdisciplinary approach* so that people can excel in the field of their choice. *Virtual reality, Augmented reality, and mixed real*ity are buzz words in architectural education and profession. [16] 3% want to explore such and 5% want to go for further education or lifelong learning (Figure 10). The above scenario is not just related to the experts interviewed only! *National Education Policy 2020* emphasizes *'broad-based, multi-disciplinary, holistic undergraduate education with flexible curricula, creative combinations of subjects, integration of vocational education and multiple entry and exit points with appropriate certification'.*

Employability required for the 21st Century is *'appropriate cutting-edge knowledge of architecture'.* Crucial skills like creative thinking, critical thinking, problem-solving, analytical skills, communication skills, and lifelong learning, will enhance architects' survivability and competitiveness (Table 6).

Factors for Employability	Mean	Std. Deviation	Interpretation
Knowledge about Architectural Design	4.54	0.558	Highly Acceptable
Knowledge about Programming	3.81	0.938	Acceptable
Knowledge about Construction Technology	4.46	0.730	Acceptable
Knowledge about Building Services	4.46	0.605	Acceptable
Knowledge about Policies Regulations	4.30	0.661	Acceptable
Knowledge about Social Responsibility	4.11	0.809	Acceptable
Knowledge about Environmental Responsibility	4.51	0.607	Highly Acceptable
Knowledge about Sustainability	4.35	0.716	Acceptable
Knowledge about Advance Building Technology	4.30	0.661	Acceptable
Knowledge about Economics	4.05	0.880	Acceptable
Project Management	4.24	0.760	Acceptable
Analytical Skills	4.43	0.555	Acceptable
Problem Solving	4.68	0.475	Highly Acceptable
Communication Skills	4.68	0.626	Highly Acceptable
Continuous Learning	4.59	0.644	Highly Acceptable
Note* - Above Parameters measured on 5-point Likert Scale; Interpretation: 1.00 – 1.49 Not Acceptable, 1.50 – 2.49 Fairly Acceptable, 2.50 – 3.49 Moderately Acceptable, 3.50 – 4.49 Acceptable, 4.50 – 5.00 Highly Acceptable			

Table 6. Factors for Employability in Architectural Profession (Source: Authors)

Ability to learn and work with advanced technology; *digital environment i.e. Digital/ICT literacy,* is crucial in 21st Century. [17] Pivotal digital skills are *Building Performance Analysis, Building Information Management, 3D Modeling*, Parametric Design, Rendering, and GIS.

Students Perception and aspiration from B. Arch Program

B. Arch students are the primary stakeholder in architecture education will be exposed to a real-world, perceiving and taking into cognition the subjects they have learnt and academic stipulations wherein it is the responsibility of educators to formulate curriculum and syllabus considering students' expectations, and empowerment. Therefore, qualitative exploration, focus group discussions with final year students were conducted in three institutions who finished their practical training and fifth-year *thesis*. The aspirations are listed in Table 7.

Their aspirations are: highly paid job, information accrual, reputation, learning to design effectively, design skills, innovation, soft skill development, masters abroad, entrepreneurship, and connections. Such factors are highly correlated to empowerment which is crucial to students' personal, intellectual, educational growth and survival. The empowerment of an architect is the capacity to do the expected services based on core knowledge of architecture and skills that are mastered through the learning process.

No.	Factors
1	**Highly paid job**: empowerment and efficiency with which a project could be handled.
2	**Information accrual**: Efficient and empowering to handle any project with confidence, Higher education, Research in architectural science, Computational Design.
3	**Reputation**: empowerment
4	**Learning to design effectively**: empowerment
5	**Branch change**: option for other streams; Research, management, infrastructure, Technology, Design research, Computational Designs. Empowerment
6	**Designing according to own**: Nurturing design ability and confidence. Discourse and interaction among peers and professionals. Empowerment
7	Opportunities same as other departments in Engineering. Parity with empowerment.
8	**Innovation**: empowerment exposure to Innovation Hubs, Entrepreneurship, Start-up initiatives, management, liaison etc.
9	**Soft Skill Development**: Computational, Modelling and simulation over design and rendering software. Empowerment
10	**Real practical work**: Opportunity and efficient Practical Training; leading to Empowerment.
11	**Master's in foreign university**: Level of preparedness, awareness, Entrance exams like; GRE, TOEFL, CAT, GMAT etc. Availability of learning resources. Credit Equivalence of Indian Program with universities abroad.
12	**Starting own firm**: Empowerment
13	**Research Abroad**: Preparing for CAT/GRE/GATE/GMAT and other exams. Credit Equivalence of Indian Program with universities abroad.
14	**Placements**: empowerment; not only in architecture, but freedom to branch-off.
15	**Connections**; Human network and network among potential employers

Table 7. Students Perceptions and Aspirations from B. Arch Program

CONCLUSION

The study establishes that there is no consistent growth in the number of architectural institutions and student intake, but fluctuates from 2008 to 2021. Population per registered architect does not depend on state-wise population and geographical area. *Council of Architecture* granted arbitrary approval to

institutes based on a "first-come, first-served" basis, resulting in illogical growth in number of institutions, vacant seats, and demise of new institution; even though the latter. Factors determining the future of the architectural profession in India are 'standard of living, geographical location, construction market, growth in real estate, urbanization and infrastructure, research and development, human capital, investment, economy and development trend of a place, stable political situation, demand vs supply. Further, it is established that the factors affecting architectural education are "lower exposure to ground reality, minimal industry-academic interaction, lack of exposure to real-life projects, community participation in design, outdated curriculum content, inappropriate norms and regulations, shortage of appropriate faculty, lower teacher- student ratio, and lack of employability". The research establishes major challenges confronting architectural education in India, arising the inevitable need for curriculum revision and revamping based on current market demand. Further, Council of Architecture shall consider the factors affecting the architecture profession and education in grating approval for new institutes. Innovative teaching methods that impart core content knowledge and fine-tune students' computer-based architectural design and drawing abilities, advanced communication skills, and personality development are required to improve employability, industry-worthiness, and research abilities, which generate student empowerment and successful survival of the profession of architecture.

NOTES

1 CoA, "Council of Architecture: Annual Report 2019-20"; CoA, "Perspective Plan for Growth of Architectural Education."

2 Pashmeena Ghom and Abraham George, "View of Dynamics of Performing Aesthetics in Architecture: A Critical Study"; Pashmeena Ghom and Abraham George, "Gazing for a Cognition-Based Curriculum in Architecture Education."

3 Ashraf Salama, *Spatial Design Education: New Directions for Pedagogy in Architecture and Beyond*.

4 Jonathan Natanian and Or Aleksandrowicz, "Environmental Education of an Architect: The Case of Final-Year Design Studio at the Technion, Israel."

5 Mohammad Gharipour and Amber L. Trout, "Curriculum Development in Health and the Built Environment: Creating a Multidisciplinary Platform to Enhance Knowledge and Engagement."

6 Santosh Panda and Suresh Garg, "India"; Ministry of Education, "All India Survey on Higher Education 2019-20"; AICTE, "All India Council For Technical Education - Approval Process Handbook 2021-22"; NEP, "National Education Policy 2020 Government of India."

7 CoA, "Council of Architecture: Annual Report 2019-20"; CoA, "Approval Process Handbook (2022-23)."

8 DT Next, "Not Just Engineering , Even BArch Draws Little Interest."

9 (CoA 2019; 2020; 2021; DNA Correspondent 2018; The New Indian Express 2019; Hindustan Times 2022; Umamaheswara Rao 2022)

10 CoA, "Perspective Plan for Growth of Architectural Education."

11 Kritika Sharma, "Engineering Seats in India Hit 10-Year Low, While Management Seats Continue to Grow."

12 James Biber, "How Many Architects Is Too Many Architects?"; Mandrup, "Architects in Europe."

13 Karmit Baker, "How Many Architects Does Our Economy Need?"

14 Pashmeena Ghom and Abraham George, "Scientific Rationality in Vaastu Purusha Mandala: A Case Study of Desh and Konkan Architecture."

15 Frank A. Cowell, *Measuring Inequality*.

16 Abu Alatta and Ahmed Freewan, "Investigating the Effect of Employing Immersive Virtual Environment on Enhancing Spatial Perception within Design Process."

17 Susan Shannon, "'I Wish for More Than I Ever Get': Employers' Perspectives on Employability Attributes of Architecture Graduates"; Punya Mishra and Rohit Mehta, "What We Educators Get Wrong About 21st-Century Learning: Results of a Survey"; Ester van Laar, Alexander J.A.M. van Deursen, Jan A.G.M. van Dijk, Jos de Haan, "Determinants of 21st-Century Skills and 21st-Century Digital Skills for Workers: A Systematic Literature Review."

BIBLIOGRAPHY

AICTE. "All India Council For Technical Education - Approval Process Handbook 2021-22," 2021.

Alatta, Rawan Abu, and Ahmed Freewan. "Investigating the Effect of Employing Immersive Virtual Environment on Enhancing Spatial Perception within Design Process." *Archnet-IJAR* 11, no. 2 (November 1, 2016): 219–38. https://doi.org/10.26687/archnet-ijar.v11i2.1258.

Baker, Kermit. "How Many Architects Does Our Economy Need?" Architect, January 5, 2018. https://www.architectmagazine.com/aia-architect/aiafeature/how-many-architects-does-our-economy-need_o.

Biber, James. "How Many Architects Is Too Many Architects?" UX Collective, December 2, 2020. https://uxdesign.cc/how-many-architects-is-too-many-architects-a1b92f9c50e0.

CoA. "Approval Process Handbook (2022-23)," 2022.

CoA. *Council of Architecture: Annual Report 2017-2018*. 2019, 2019. https://www.coa.gov.in/app/myauth/notification/Annual_Report_20172018.pdf.

CoA. "Perspective Plan for Growth of Architectural Education." *Council of Architecture*, August 2020, 1–34.

Cowell, Frank. *Measuring Inequality*. New York: Oxford University Press, 2011. https://doi.org/10.1093/0191613061.001.0001.

Gharipour, Mohammad, and Amber L. Trout. "Curriculum Development in Health and the Built Environment: Creating a Multidisciplinary Platform to Enhance Knowledge and Engagement." *Archnet-IJAR* 14, no. 3 (September 22, 2020): 439–52. https://doi.org/10.1108/ARCH-09-2019-0212.

Ghom, Pashmeena Vikramjit, and Abraham George. "Dynamics of Performing Aesthetics in Architecture: A Critical Study." *VITRUVIO - International Journal of Architectural Technology and Sustainability* 6, no. 2 (December 31, 2021): 82–101. https://doi.org/https://doi.org /10.4995/vitruvio-ijats.2021.16424.

Ghom, Pashmeena Vikramjit, and Abraham George. "Gazing for a Cognition-Based Curriculum in Architecture Education." *FARU 2020 Proceedings*, November 6, 2020, 3–13. http://www.mrt.ac.lk/foa/faru.

Ghom, Pashmeena Vikramjit, and Abraham George. "Scientific Rationality in Vaastu Purusha Mandala: A Case Study of Desh and Konkan Architecture." *New Design Ideas* 5, no. 2 (December 2, 2021): 195–201.

Government of India, Ministry of Education. "All India Survey on Higher Education 2019-20," 2020. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.education.gov.in/sites/upload_files/mhrd/files/statistics-new/aishe_eng.pdf.

Laar, Ester van, Alexander J. A. M. van Deursen, Jan A. G. M. van Dijk, and Jos de Haan. "Determinants of 21st-Century Skills and 21st-Century Digital Skills for Workers: A Systematic Literature Review." *SAGE Open* 10, no. 1 (January 2020): 215824401990017. https://doi.org/10.1177/2158244019900176.

Mishra, Punya, and Rohit Mehta. "What We Educators Get Wrong About 21st-Century Learning: Results of a Survey." *Journal of Digital Learning in Teacher Education* 33, no. 1 (December 9, 2016): 6–19. https://doi.org/10.1080/21532974.2016.1242392.

Natanian, Jonathan , and Or Aleksandrowicz. "Natanian and Aleksandrowicz, "Environmental Education of an Architect: The Case of Final-Year Design Studio at the Technion, Israel." *Archnet-IJAR* 12, no. 1 (March 1, 2018): 356–66. https://doi.org/10.26687/archnet-ijar.v12i1.1305.

Panda, Santosh, and Suresh Garg. "India." In Open and Distance Education in Asia, Africa and the Middle East, edited by Olaf Zawacki-Richter and Adnan Qayyum, 139. Singapore: Springer Nature, 2019. https://doi.org/https://doi.org/10.1007/978-981-13-5787-9_4.

Salama, Ashraf M. *Spatial Design Education. New Directions for Pedagogy in Architecture and Beyond.* Routledge, 2016. https://doi.org/10.4324/9781315610276.

Sharma, Kritika. "Engineering Seats in India Hit 10-Year Low, While Management Seats Continue to Grow." ThePrint, September 21, 2021. https://theprint.in/india/education/engineering-seats-in-india-hit-10-year-low-while-management-seats-continue-to-grow/736775/.

Shannon, Susan J. "I Wish for More Than I Ever Get: Employers' Perspectives on Employability Attributes of Architecture Graduates." *Creative Education* 03, no. 06 (2012): 1016–23. https://doi.org/10.4236/ce.2012.326153.

A PRACTICAL METHOD TO GUIDE THE ARCHITECTURAL DESIGN PROCESS

Author:
FRANCINE VAN TONDER, MEL STANDER

Affiliation:
TSHWANE UNIVERSITY OF TECHNOLOGY, SOUTH AFRICA

INTRODUCTION

This paper presents a practical method to guide the architectural design process. The paper introduces the author, Errol Pieters, of two memoirs[1] that serves as the literature review content of this paper. The paper then tests the arguments posed in the memoirs as a research methodology and the conceptual sketches and architectural drawings produced during the tests are presented as research data. Finally, the paper is concluded with recommendations.

ERROL PIETERS

The practical method to guide the architectural design process presented in this paper was taught verbally, lecturer to students, by the Head of Department, the late Errol Pieters (5 April 1951 – 18 April 2020), of the then Department of Architecture at the Tshwane University of Technology. There are few records of the teachings of Errol Pieters. This paper aims to present some of Pieters' pedagogy methods and thoughts.

Pedagogue

Pieters was an enigmatic mentor and great artisan in architectural drawing, thinking and pedagogy who profoundly impacted thousands of students over a period of more than thirty years. He taught both the authors of this paper, first as his students and later as his colleagues. He taught his students the history of architecture, how to think architecturally, the fundamentals of design, how to argue a case or theoretical premise, and how to present an idea effectively from concept to detail. Pieters also invested time in teaching his students to be courageous and honest, act with integrity and always be ethical. Most importantly, he taught us how to sketch conceptually and draw architecturally.

The human

Pieters was a renaissance man and approached everything from the cooking of a meal[2] to the prelim of a painting with artistic vigour. As a result, at times, in his search for excellence and accomplishment in himself and others, he alienated students and colleagues who found it hard to live up to his expectations. The two authors of this paper acknowledge the struggle in their being when considering their mentor's approach to teaching them and how hard it was at times to reach the standards he set. That said, both authors conclude, without question, how privileged they were to have been taught and influenced by

him so closely. What Pieters taught the authors could not be read or searched with the same exuberance as he transferred his extraordinary knowledge base to those who wished to learn from him.

In this paper, the authors make available some of Pieters' theories and arguments on methods for future architectural students and designers, to demystify the architectural design process.
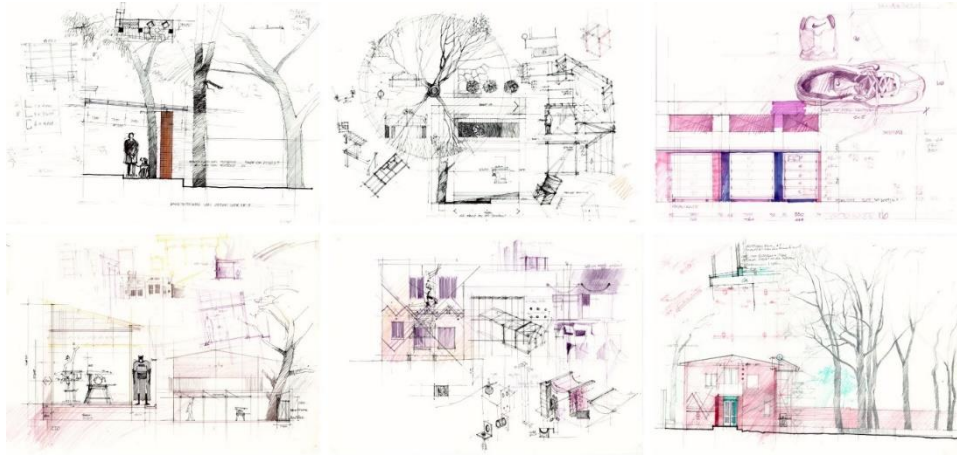

Figure 1. A compilation of architectural drawings by Errol Pieters, used with permission from Désirée Pieters

MEMOIRS AS A LITERARY STUDY
Origin of the memoirs

After Pieters' died in 2020, his widow Désirée Pieters began archiving and documenting his large body of work with the hope of publishing a coffee table book of his work.[3] Pieters' work is only known by those who studied with him, studied under him, or came in contact with the architectural presentation drawings or 'perries' he was commissioned to produce for commercial architectural organisations. To date, Pieters' work is scarcely used in publications.[4] While assisting with this archiving process, one of the authors of this paper identified two (among others) of the memoirs Pieters wrote as noteworthy for further research on teaching the architectural design process. The memoirs outlined the practical method vested in conceptual sketching and architectural drawing presented in this paper.

The memoirs are written in Afrikaans and the tone (narrative) of the pieces is the same way Pieters spoke with colleagues and students. It is humorous, embellished, ambitious, dramatic, egotistical, and inspirational. It is also familiar and strangely comforting to those who knew Pieters.

The memoirs were written in 2018[5] and tell of an epiphany Pieters had late in his career after a somewhat energetic and criticism-laden discussion with one of the authors of this paper. Pieters had an open-door policy and encouraged thoughts (and even complaints) from students, thereby ensuring the constant betterment of the department. The discussion the first memoir refers to took place in 2010 in the office that Pieters shared with professorial colleague Gerald Steyn. One of the authors (Pieters' thesis student at the time) visited Pieters to criticise how architectural design was taught in the department. Pieters writes of the discussion that followed and how, as a student, the author was not satisfied with his response. Consequently, Pieters writes that he ruminated on the criticism for a few days.

The epiphany

Pieters writes that his epiphany is that design can be better taught by a master designer demonstrating their architectural design process. A method not yet used to its full potential in the department and limited only to what a lecturer or a senior student can demonstrate to a student seeking help. Pieters

writes that he realised that the master should demonstrate their process in a workshop and that various masters with different approaches should be asked to present each workshop. Each master has a different refined method for the architectural design process.

As a result of the discussion and the consequent epiphany, Pieters agreed to give just such a master design workshop on the architectural design process to junior year students in the department. In the workshop, he demonstrated his method vested in conceptual sketching and architectural drawing. Most of the students in the department (junior and senior) attended. In the memoir, Pieters speaks of the success of the workshop. For this paper, the practical method outlined in the memoirs is tested to generate the research data and provoke discussion.

The context and environment best suited for architectural teaching

In the memoirs, Pieters argues against the blank slate or 'tabula rasa'[6] used by the Bauhaus foundation[7] and commonly across most architectural schools. The tabula rasa argues that a student finds their own way. Pieters argues that the best environment for teaching design to be a studio where an apprentice learns from a master. He argues in his memoirs that he finds that design is artisanship, first and foremost, for which one should learn the basics while observing a master at work.

Pieters advocates for learning environments such as the renaissance 'Bottega'[8] and 'Master and Apprentice'[9]. The renaissance methods advocate for students to observe and participate, thereby learning from how a master goes to work and how they think, argue, and conduct themselves in the design process. He writes how he has developed various methods applicable to different situations to resolve a design problem based on a process influenced by the moment, his mental state and ability, and the time allowance. Pieters then goes on to state his process in six steps as a method for the design process.

How to design in architecture – six steps

Pieters recommends the following six steps as a method he used to 'get rid of designers block' as he put it, and as a method for starting his architectural design process. As stated in Pieters' memoirs, these six steps are the steps that he taught in the master workshop he conducted in 2010.[10]

Step 1: Define the problem

Step 2: Gather the information

Step 3: Analyse the problem and the information and 'brainstorm' the case

Step 4: Develop solutions

Step 5: Gather criticism and self-evaluate

Step 6: Improve.

It is interesting to note that the above six steps encompass most creative processes, including writing this conference paper. As mentioned before, for Pieters, the creative process was facilitated by pencil and pen on paper and vested in the artisanship of sketching conceptually and drawings architecturally. He agreed with the brain-hand connection, as discussed in literature by Betty Edwards[11] and Juhani Pallasmaa.[12] Pieters believed everyone could learn how to draw, and he argued the importance of drawing to unlock creativity and creative thinking.

Pieters continues to elaborate further in his memoirs on how he goes to work to resolve a design problem, complete with prompts or notes of encouragement below each of the six steps. Due to a need for brevity and limited space, these prompts are not listed within this paper but rather used to inform the tests done where the six steps were applied to a low-cost housing unit design.

TESTING THE ARGUMENT OF THE MEMOIRS AS A RESEARCH METHODOLOGY
Testing the six steps on a practical project over two days

Step 1: Define the problem

In order to test the theory, the authors met up in Pieters' studio (or what was his Bottega) in Hatfield, Tshwane, South Africa. A low-cost housing unit plan and section at scale 1:50 previously used as a case study for another conference paper[13] were used as a design set-off point to test the six steps.

Step 2: Gather the information

The design process that one of the authors employed, and the other author observed, was to first warm up by looking through some of Pieters' architectural and landscape drawings that filled the drawers of his studio.

Figure 2. Left: Steps 1 and 3. Right: Step 2

Step 3: Analyse the problem and the information and 'brainstorm' the case

Careful to put away the drawings once information was gathered, the author imagined and hypothesised the users of the units (clients) by drawing them as sketched figures on a large A1[14] sheet of paper.

Step 4: Develop solutions.

Once the client and their needs emerged and were developed through a creative process, one of the authors started with the architectural drawing of a dwelling based on the case study provided. Using the patterns of Christopher Alexander[15] as the theoretical premise for the design, the dwelling soon became an urban kitchen not far from the road with a fireplace and a juxtaposed external room. The drawing was developed to include an overhead plane of a pergola. The section became a plan, and lastly, a perspective aerial view of the sketched unit. The process took approximately two hours.
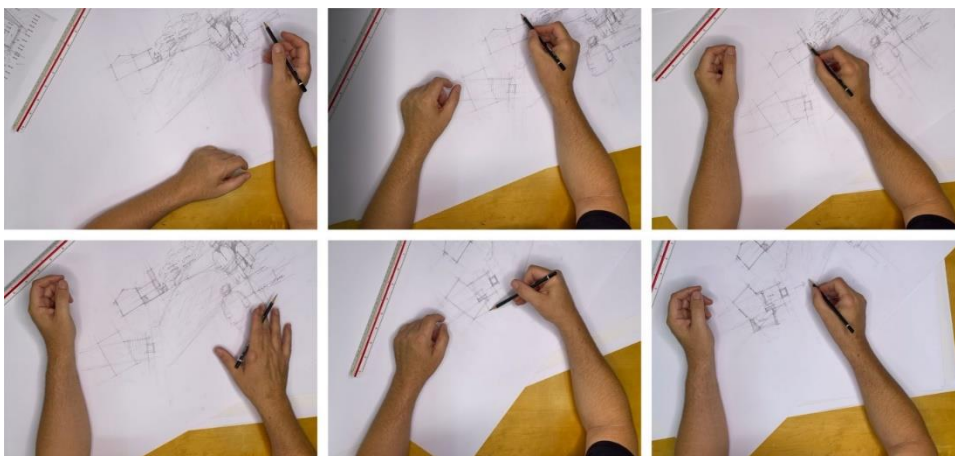

Figure 3. Step 4

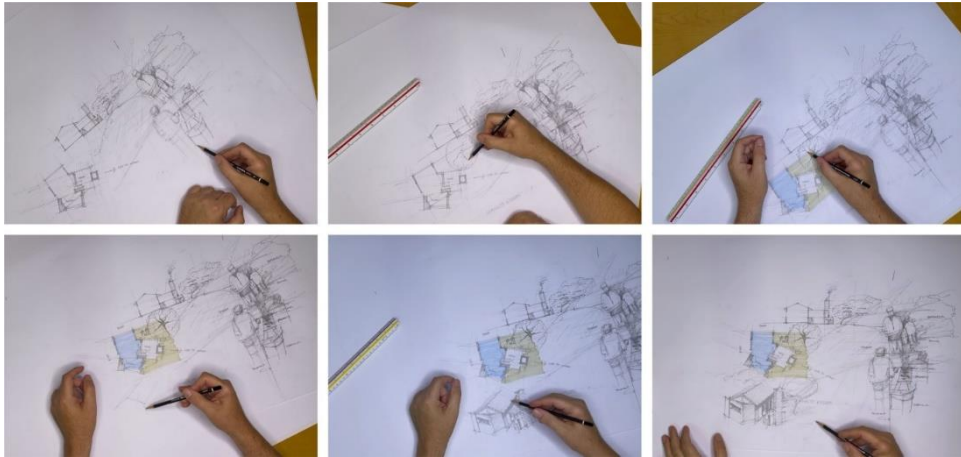*Step 5: Gather criticism and self-evaluate*

Figure 4. Step 5

Both the authors discussed, enjoyed, and criticised what was produced on day one. The seductive nature of hand-produced architectural drawings sometimes discourages criticism and rather provokes encouragement and betterment as a form of criticism.

Step 6: Improve

On day two the testing continued with a repeat of Steps 1-5 and an improvement, continuation, and addition to day one. Once again, the process took approximately 2 hours.
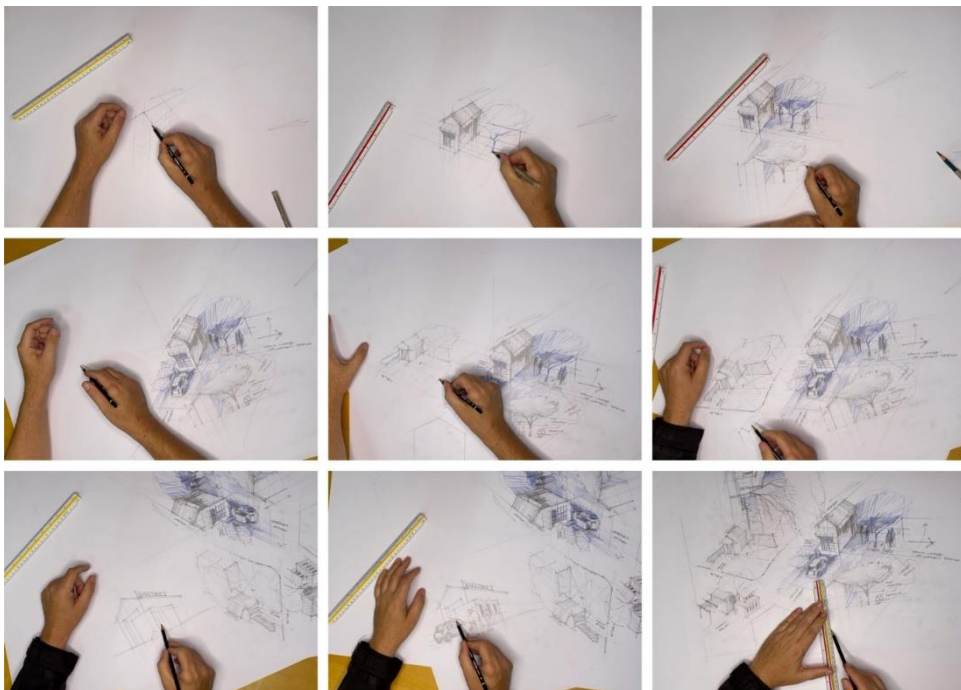

Figure 5. Step 6

ARCHITECTURAL DRAWING AS RESEARCH DATA

Figure 6 shows the research results in architectural drawings as collected over the two days.
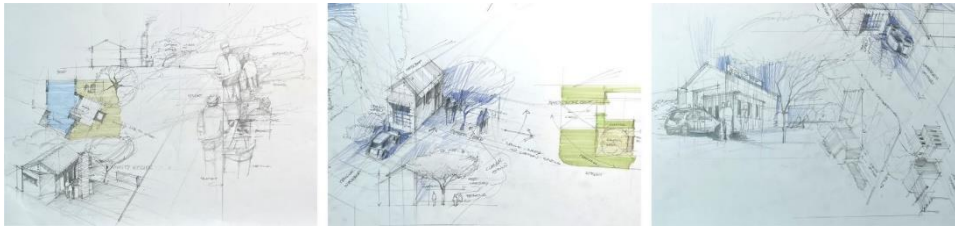
Figure 6. Left: Day 1. Middle and right: Day 2

CONCLUSION

This paper contributes to the body of existing research on the architectural design process by providing a method to guide this process effectively. As a result of the test over two days, the authors of this paper concluded that design can be taught with steps and an underlining methodology as per Pieters' epiphany and argued six steps.

Furthermore, the authors argued that each master workshop demonstrates the master's specific method and artisanship in the architectural design process. Therefore, this paper argued that artisanship development is an important part of pedagogy and encourages the development of an architectural design process. It is noteworthy to point out that the artisanship of sketching and drawing is developed the more one applies the skills, and therefore students should start using the artisanship of conceptual sketching and architectural drawing in their pre-graduate years, following Pieters' six-step method.

As a result, by the time the students become postgraduate students, their abilities will be well formed. The authors believe that this research is useful and important. Future architectural students will benefit posthumously from the teachings of Errol Pieters as published in this paper.

ACKNOWLEDGMENTS

NOTES

[1] Errol Pieters. "How to Design in Architecture ('Hoe Om Te Ontwerp in Argitektuur')." unpublished memoir, 2018. Errol Pieters. "How to Get Rid of 'Designers Block', How I Start Designing ('Hoe Om "Designers Block" Kaf Te Draf, Hoe Ek Begin Ek Ontwerp/ Ontwerp Werkswinkel Notas')." Design workshop notes, 2018.

[2] Sieg Schmidt. "A Tribute to the Life of Errol Pieters Friend, Colleague, Mentor and Inspiration, 5 April 1951–18 April 2020." *ArchSA*, February 2022. https://businessmediamags.co.za/built-environment/arch-sa/a-tribute-to-the-life-of-errol-pieters/.

[3] Désirée Pieters, and Francine van Tonder. *Errol. A life devoted to art, architecture and teaching.* Unpublished book in progress, n.d.

[4] A Google scholar search indicating only two academic journals with images of Errol Pieters' architectural drawings:
Gerald Steyn. "The Relevance of Historical Referencing in Contemporary South African Architecture." *South African Journal of Art History* 36, no. 1 (n.d.): 126–146.
Gerald Steyn. "Current Trends in South African Architecture and the Way to the Future." *South African Journal of Art History* 24, no. 2 (2021): 41–64.

[5] Errol Pieters. "How to Design in Architecture ('Hoe Om Te Ontwerp in Argitektuur')." unpublished memoir, 2018. Errol Pieters. "How to Get Rid of 'Designers Block', How I Start Designing/ Design Workshop Notes." unpublished memoir, 2018.

[6] Claire Gorman. "Tabula Rasa: Mechanism, Intelligence, and the Blank Slate in Computing and Urbanism." *Yale Undergraduate Research Journal* 2, no. 1 (2021): 4.

[7] Maristella Casciato, Gary Fox, and Katherine Rochester. "Building the New Artist." Getty.edu, 2022. https://www.getty.edu/research/exhibitions_events/exhibitions/bauhaus/new_artist/history/principles_curriculum/.

[8] Marriam-Webster Dictionary. "Bottega." Marriam-Webster Dictionary, 2022. https://www.merriam-webster.com/dictionary/bottega#:~:text= Definition of bottega,commissions of the major artist,.

[9] Master and Apprentice, Pattern 83, Alexander, (1977: 412-415).

[10] The six steps are translated from Afrikaans into English.

[11] Betty Edwards. *Drawing on the Right Side of the Brain.* New York: Tarcher/Putnam, 1989.

[12] Pallasmaa Juhani. *The Thinking Hand: Existential and Embodied Wisdom in Architecture.* Hoboken: John Wiley & Sons, 2009

[13] A low-cost housing unit plan and section at scale 1:50, van Tonder, 2022.

[14] A1 in size. An A1 size paper is 594mm x 841mm and is part of the A series as defined by the ISO 216 international paper size standard.

[15] Christopher Alexander. *A Pattern Language: Towns, Buildings, Construction.* Oxford: Oxford University Press, 1977.

BIBLIOGRAPHY

Alexander, Christopher. *A Pattern Language: Towns, Buildings, Construction.* Oxford: Oxford University Press, 1977.

Casciato, Maristella, Gary Fox, and Katherine Rochester. "Building the New Artist." Getty.edu, 2022. https://www.getty.edu/research/exhibitions_events/exhibitions/bauhaus/new_artist/history/principles_curriculum/.

Edwards, Betty. *Drawing on the Right Side of the Brain.* New York: Tarcher/Putnam, 1989.

Gorman, Claire. "Tabula Rasa: Mechanism, Intelligence, and the Blank Slate in Computing and Urbanism." *Yale Undergraduate Research Journal* 2, no. 1 (2021): 4.

Marriam-Webster Dictionary. "Bottega." Marriam-Webster Dictionary, 2022. https://www.merriam-webster.com/dictionary/bottega#:~:text=Definition of bottega,commissions of the major artist,.

Pallasmaa, Juhani. *The Thinking Hand: Existential and Embodied Wisdom in Architecture.* Hoboken: John Wiley & Sons, 2009.

Pieters, Errol. "How to Design in Architecture ('Hoe Om Te Ontwerp in Argitektuur')." unpublished memoir, 2018.

Pieters, Errol. "How to Get Rid of 'Designers Block', How I Start Designing ('Hoe Om "Designers Block" Kaf Te

Draf, Hoe Ek Begin Ek Ontwerp/ Ontwerp Werkswinkel Notas').” Design workshop notes, 2018.

Pieters, Désirée & van Tonder, Francine. *Errol. A life devoted to art, architecture and teaching.* Unpublished book in progress, n.d.

Schmidt, Sieg. “A Tribute to the Life of Errol Pieters Friend, Colleague, Mentor and Inspiration, 5 April 1951–18 April 2020.” *ArchSA*, February 2022. https://businessmediamags.co.za/built-environment/arch-sa/a-tribute-to-the-life-of-errol-pieters/.

Steyn, Gerald. “The Relevance of Historical Referencing in Contemporary South African Architecture.” *South African Journal of Art History* 36, no. 1 (n.d.): 126–146.

Steyn, Gerald. “Current Trends in South African Architecture and the Way to the Future.” *South African Journal of Art History* 24, no. 2 (2021): 41–64.

Van Tonder, Francine. “A Knowledge Management Comparison of Nine House Typologies for Varying Climatic Regions in South Africa: Managing Risk through Knowledge Management.” In *WBC2022 World Building Congress Proceedings.* Melbourne, 2022.

EXPERIENTIAL LEARNING THROUGH PARTICIPATION AND REPRESENTATION

Author:
BUD SHENEFELT, CIARA ALLEN

Affiliation:
UNIVERISTY OF NEBRASKA-LINCOLN, USA

INTRODUCTION

Architectural education is often recognized for the soft skills which it instills within students, such as creative problem solving, team-based collaboration, and design confidence. However, what is often neglected are the hard skills and knowledge of the industry that design professionals are required to use on a daily basis. An education that exposes design students to real-world projects and the specific intricacies involved would provide a more holistic understanding of the architectural industry and better prepare students to transition into their professional practice.

This paper explores the pedagogical potential of experiential learning within architectural education through the lens of a renovation to the University of Nebraska-Lincoln's Architecture Hall. As most of the inhabitants of Architecture Hall are students of architecture and other design disciplines, this renovation provides an excellent opportunity for students to learn from the professional design process due to their empiric perspective and contextual familiarity with the site.

Experiential Learning

The gap between architectural education and practice is well-known by researchers on design pedagogy, industry professionals, and students alike. Nadia Charalambous and Natasa Christou describe this gap as the division between "theoretical knowledge provided by tutors to students and the practical capabilities students require to develop in their future professional practice."[1] Dr. Ashraf M. Salama concurs, describing architectural education as largely hypothetical and suggesting experiential learning as a tool to "provide students with opportunities to understand the practical realities and different variables that affect real-life situations."[2] Experiential learning in this context can be defined by Morris Keeton and Pamela Tate as "learning in which the learner is directly in touch with the realities being studied."[3] Therefore, without implementing experiential learning within curricula, university architecture programs are neglecting to expose their students to realistic design problems and strategies to prepare them for their post-education careers.

One issue with relying on hypothetical projects to teach design is the lack of tangible constraints students are required to determine in an equally hypothetical site. Experiential learning as a solution to this issue is detailed by Harriet Harris in the form of "live projects" to provide students with the opportunity for "community-situated design response to real time challenges, allowing students to experience key aspects of architectural practice, and in doing so gain more 'practice-ready' capabilities."[4] The implementation of live projects introduces students to the specific problems that

need to be considered for an architectural project. This is done within a familiar context in which they are able to recognize their perspective as both designers and community members in their own right, capitalizing on real-world design opportunities that they can experience first-hand.

Another issue with traditional design pedagogies is the tendency to focus on design as a tool for conceptualization and communication while neglecting its role in the construction of a finished building. Experiential learning can also be used to mitigate this limitation in the form of design-build, as seen in an increasing number of university architecture programs across the globe, including the Research + Demonstration Facility at Virginia Tech.[5] This facility offers a dedicated space on campus in which students "can gain practical, hands-on architecture, design, and construction experience alongside expert faculty and industry professionals." With the inclusion of experiential learning that focuses on construction exposure students are enabled to consider the technical realities they will someday be expected to implement in practice while still undergoing their education.

Campus Construction

An opportunity for university architecture programs to simultaneously implement the above illustrated categories of experiential learning, both community-situated design and designing for construction, is to take advantage of the proximity and relevance of campus construction projects. For example, Clemson University has allowed its students to be "active participants in every stage" of "the largest campus development initiative in its history," allowing students to attend design meetings and site visits where they are able to witness the professional design process and technical realities that make up a finished building.[6] These experiences enable students to connect what they learn in the classroom to the real world and aid in their preparation for professional practice, however they are often underutilized. Michael D. Moss, president of the Society for College and University Planning, estimates that "less than 10 percent of all capital projects on college and university campuses are used as learning labs," limiting the potential for students to practice applying their skills and develop their comprehension of the architectural industry before joining it.[7] Concerns regarding safety and liability issues is one argument against the inclusion of students within design meetings and construction sites, however with communication between the university, industry professionals, and students, protocols can be created and followed in order to ensure that the process of experiential learning within campus construction projects is to the benefit of everyone involved.

Phase One: Student Shadowing

Experiential learning on the addition and renovation to Architecture Hall began with active shadowing opportunities following the selection of an architectural firm for Phase One of the project. Student participants had the opportunity to sit in on design meetings during the schematic design and design development phases, as well as were given access to project materials such as presentation slides and construction document sets. In doing so they were able to witness the intricacies and progression of the professional design process when applied to a real building they inhabit on an almost daily basis. Participants were encouraged to consider learning opportunities to disseminate to the greater college by acknowledging their own perspectives as students and what subjects they determined notable for further examination beyond the scope of what their traditional education covered.

One subject the student participants selected for college dissemination was architectural detailing due to their unfamiliarity on the significance of details as well as how to read them based on the typically more graphically-expressive, albeit technically-generic, level of detail they are expected to design to within early studio projects. Interdisciplinary collaboration through the layering of mechanical, electrical, and structural information within construction documents is also typically generalized within architectural education despite the necessity for these systems to be thoroughly considered in order to

construct a functional building. The composition of architectural details is representative of the larger disconnect between academia and practice within the industry.

The student participants strategized communicating the role of details by initially studying the details in greater depth and subsequently using them to digitally model the addition in which they reside using realistic construction materials. In doing so they were able to visualize the finished product of the design as well as what lies behind its exterior façade in order to make it functional. The students then created renders using graphic standards they were accustomed to within their education in order to effectively communicate the compositional layout of structure without losing detail.

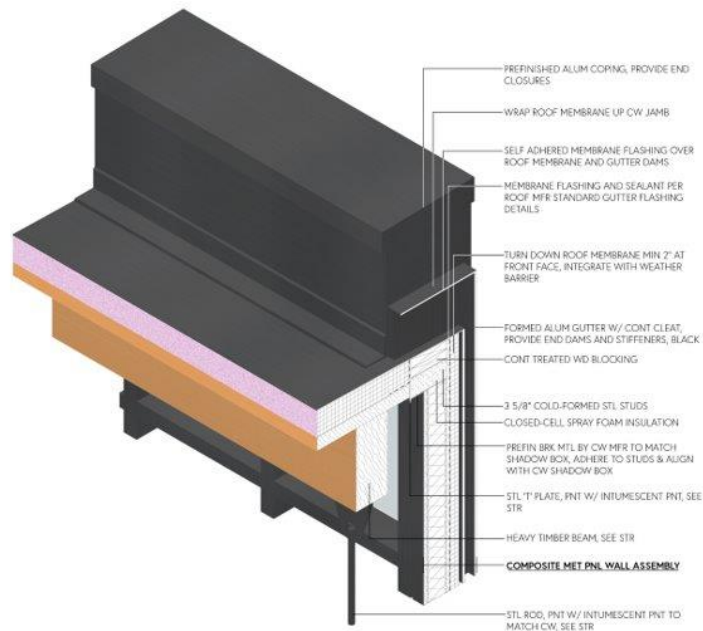*Figure 1. Student isometric section render of Architecture Hall addition.*

Figure 2. Student detail F11 with labels.

Phase Two: Student Involvement

The second phase of the design and construction of the College of Architecture included the addition of new studio spaces, additional lecture halls, and student gathering spaces. For this phase of design, students were invited as advisory members in the selection process for the new architectural and construction teams for Phase Two of the renovation. This process included students' recommendations based on the submitted architectural proposals and qualifications for the given phase. Their ranking helped determine the shortlist of invited architectural firms and a similar approach was utilized to assess the construction manager shortlist. This unique experience exposed students to the process of competing for an open call for proposals. Additionally, it provided an opportunity to evaluate each firm's approach to acquiring new work and, within the process, the chance to reflect on the successes and shortcomings of the individual proposals.

Similar to a typical member of a selection committee, students were tasked with evaluating eight to ten submission proposals, with a dozen pages each. After their initial reviews, a discussion followed regarding the contributions that led to the selected shortlist. Contributors included an in-depth understanding of the site/building/context, initial approach to the project, prior relevant architectural experience, and text that supported an understanding of the site and its inhabitants, all of which underscores and acknowledges the importance of gaining a diverse understanding of design and conveying ideas through various methods such as diagrams, text, renderings, and photography. The student advisors also acknowledged anonymity's role in the selection process and the limited number of voting reviewers, some of which might prioritize experience or budget over design.

Engaged Scholarship

Remarks made by Ernest Boyer to the Association of American Colleges in 1988 illustrate that what we urgently need in the academy are scholar-citizens – people who are committed to building an intellectual community that is not limited to the classroom.[8] Capitalizing on this design opportunity provides architecture students with a unique engaged scholarship of learning potential. By modelling an approach from the perspective of the engaged scholar, one can conceive of an architectural model of education capitalizing on the approach of outreach and considering the community of co-creators present within the field, while also exploring potential for innovation within education as well as industry.

When engaging the design process, it is evident that there is never a singular perfect solution, but an infinite number of solutions with their individual pros and cons. The success of a project relies on the active coordination of design within the constraints of time, budget, and knowledge. For architecture students early on within their education, experiential learning reveals the multitude of individuals from various trades actively involved in design and execution of a building. With direct access to the renovation site and project materials, students better understand the importance of visual communication and the role of drawings in the overall project's success. Additionally, the comprehensive quality of construction documents reveals the rigor, level of detail, and thoughtfulness architects have designed to and the purpose of drawings beyond conceptualization. As one of the student participants engaged in the College of Architecture's renovation pointed out, "On-site experience allows us to understand the importance of detail. This project is unique because students are engaged in the process, from conception to completion - including design, CDs, construction, etc., which we don't even get during a two-month internship."

With education's strong emphasis on design, the shadowing process reveals additional architectural opportunities which are less design-driven but equally crucial to the success of a project. Unlike student design competitions, the selected firm is rarely chosen on their design skills alone, which in many ways opens alternative and equally essential career paths for students in the field of architecture.

Making Connections

The significance of industry connections was an unintentional outcome of engaging students in the process of interviewing, reviewing drawings, and attending site visits, and further contributes to arguments supporting experiential learning as it reveals a mutually-beneficial relationship between students and professionals. Experiential learning requires students to spend time on the site, interacting with the various professionals and trades that collaboratively coordinate an approach in order to produce a successful project. For students seeking internships and potential career opportunities, it is essential for them to pursue connections with their future peers, including but not limited to owners, architects, engineers, and contractors. Following the architect and construction manager selection interviews, one student participant shared that "the level of networking that happened by being in the selection meetings, while unexpected, was very high. I came home every day with LinkedIn emails from architects in the firms, senior principles, and construction managers." By introducing student participation within this process, students were exposed to standard project design practices while professionals were able to directly educate and network with the future employees of their industry.

CONCLUSION

According to the Committee on Institutional Cooperation, "the partnership of university knowledge and resources with those of the public and private sectors is to enrich scholarship, research, and creative activity; enhance curriculum, teaching and learning; prepare educated, engaged citizens, strengthen democratic values and civic responsibility; address critical societal issues; and contribute to the public good."[9] Informed engagement through experiential learning develops students' comprehension, skills, and professionalism within the architectural design discipline. Additionally, students exposed to the pedagogical potential of experiential learning within architectural education establish the means and understanding to reflect upon and evaluate their education and the possible paths toward a career in architecture.

During the awarded design firm's interview conversation surrounding design, budget, schedule, and procurement, the design principle for the firm abruptly interrupted everyone and rhetorically asked, "Do you know what this building wants to be?" Without waiting for an answer, he declared that this renovation was a *pedagogical project*. He imbued the significance of its architecture with the education of its future inhabitants: the students and faculty in the College of Architecture. And through this lens of pedagogy and authenticity, it was imperative that his building becomes an active resource in UNL's College of Architecture's learning environment.

NOTES

[1]Nadia Charalambous and Natasa Christou, "Re-adjusting the objectives of Architectural Education," Procedia 228 (2016): 376-377.

[2]Ashraf M. Salama, "Learning from the Environment: Evaluation Research and Experience Based Architectural Pedagogy," CEBE Transactions 3, no. 1 (2006): 66.

[3]Morris Keeton and Pamela Tate, *Learning by Experience* (San Francisco: Jossey Bass Publishers, 1978).

[4]Harriet Harris, "Live Projects Learning Capital," in Architecture Live Projects, ed. Harriet Harris. (Oxford: Oxford Brooks University, 2012), 7.

[5]"New collaborations set to boost real-world learning opportunities for College of Architecture and Urban Studies students," Virginia Tech, 5 August 2019, accessed 30 May 2022, https://vtx.vt.edu/articles/2019/08/CAUS-research-demonstration-facility-campus-collaborations.html.

[6]"Campus construction creates learning lab for tomorrow's builders and designers," Clemson University, 2 January 2019, accessed 30 May 2022, https://news.clemson.edu/campus-construction-creates-learning-lab-for-tomorrows-builders-and-designers-2/.

[7]Theresa Sullivan Barger, "Campus construction instruction," University Business, 20 August 2018, accessed 30 May 2022, https://universitybusiness.com/campus-construction-instruction.

[8]Ernest L. Boyer, "A College of Quality," in *Ernest L. Boyer: Selected Speeches 1979-1995* (New Jersey: Carnegie Foundation for the Advancement of Teaching, 1997), 58.

[9]"Engaged Scholarship: A Resource Guide," Committee on Institutional Cooperation, accessed 30 May 2022, https://rede.ecu.edu/engagement/wp-content/pv-uploads/sites/397/2018/05/EngagementScholarshipResourceGuide.pdf

BIBLIOGRAPHY

Barger, Theresa Sullivan. "Campus construction instruction." University Business. 20 August 2018. Accessed 30 May 2022. https://universitybusiness.com/campus-construction-instruction.

Boyer, Ernest L. "A College of Quality," in *Ernest L. Boyer: Selected Speeches 1979-1995.* New Jersey: Carnegie Foundation for the Advancement of Teaching, 1997.

Charalambous, Nadia and Natasa Christou. "Re-adjusting the objectives of Architectural Education." Procedia 228 (2016): 375-382.

Clemson University. "Campus construction creates learning lab for tomorrow's builders and designers." 2 January 2019. Accessed 30 May 2022. https://news.clemson.edu/campus-construction-creates-learning-lab-for-tomorrows-builders-and-designers-2/

Committee on Institutional Cooperation. "Engaged Scholarship: A Resource Guide." Accessed 30 May 2022, https://rede.ecu.edu/engagement/wp-content/pv-uploads/sites/397/2018/05/EngagementScholarshipResourceGuide.pdf

Harris, Harriet. "Live Projects Learning Capital." In Architecture Live Projects, edited by Harriet Harris, 7-10. Oxford: Oxford Brooks University, 2012.

Keeton, Morris and Pamela Tate. *Learning by Experience*. San Francisco: Jossey Bass Publishers, 1978.

Salama, Ashraf M. "Learning from the Environment: Evaluation Research and Experience Based Architectural Pedagogy." CEBE Transactions 3, no. 1 (2006): 64-83.

Virginia Tech. "New collaborations set to boost real-world learning opportunities for College of Architecture and Urban Studies students." 5 August 2019. Accessed 30 May 2022. https://vtx.vt.edu/articles/2019/08/CAUS-research-demonstration-facility-campus-collaborations.html.

KNOWLEDGE TRANSFER IN SUSTAINABLE URBAN PLANNING THROUGH COMPLEX TYPOLOGIES

Authors:
STEFAN STAEHLE, LISA SCHLABITZ

Affiliation:
KAISERSLAUTERN UNIVERSITY OF APPLIED SCIENCES, GERMANY

INTRODUCTION

Planning decisions contribute to the ecological footprint of our built environment in a significant manner. This connection leads to the demand for an alternative orientation of the entire planning and building process in practice and teaching. Instead of technical innovations, we require a cultural shift towards a culture of sustainability, which refers to the totality of a social way of life that integrates all dimensions of sustainability into routines of everyday practice.[1] A reduction in resource consumption and emissions needs a change of our everyday practices. Planning efforts must encourage these behaviours. To realize this paradigm shift, planners need knowledge about the wishes and needs of involved and affected stakeholders. This knowledge is difficult to determine in everyday planning and can only be used to a limited extent for subsequent design tasks. However, the use of *stakeholder knowledge* is elementary to establish sustainability.

Complexity as a characteristic of planning

Planning processes must be viewed as phenomena composed of multiple subsystems, which are strongly interconnected. These "linking patterns" are also a central characteristic of transformation processes.[2] Architecture and urban planning can play a decisive role in dealing with transformation processes. They already work with knowledge from different sources, i.e. technical knowledge - e.g. structural design - social science knowledge - e.g. needs of stakeholders - and cultural knowledge - such as building styles.[3] Teaching in the field of urban planning must also teach methods to reveal this knowledge to the students, make it accessible and use it for their planning practice. This triple movement can only succeed, if teaching of urban planning is no longer thought object based, but as a process in complex environments whose characteristics are redefined by the interactions of its components in every new context again and again.

Complex Typologies initiate learning processes

In order to realize sustainable planning, it is necessary to connect the complex interplay of different elements of the urban macro- and micro-level, to integrate stakeholder needs and to develop a process of knowledge transfer. What might such a strategy look like? For planners, dealing with complex knowledge is part of their everyday work. In order to make this knowledge manageable, planners work with typologies. Typologies are exemplary solutions that contain a selection of relevant information for the productive processing of a planning task. Essential to this concept is the translation of theoretical knowledge into a plan or a graphic symbol. This translation makes complex contents vivid and thus

usable in different contexts. However, while traditional typology concepts were limited to formal or organizational tasks, a *complex typology* must take into account a wide range of knowledge.

Complex typologies integrate the network knowledge of planning by involving stakeholders in planning processes. The hierarchies of traditional planning and its one-sided exchange of information are replaced by integrating planning stakeholders and potential users in participatory formats. A joint process of knowledge production by laypersons and experts as a dialogue about wishes and possibilities creates the prerequisite for a better appropriation of urban neighbourhoods. Through its openness, this approach creates the basis for a design process that makes both learning processes in urban planning and sustainability possible.

MAIN SECTION

Use stakeholder knowledge

The development of sustainable planning concepts requires participation processes, which use the experience and knowledge of stakeholders, and that do not merely engage in a quantitative assessment of needs.[4] Thus, the concept of co-production of knowledge has recently gained particular importance. This approach focuses on "knowledge being embedded in the practices and everyday experiences of those who are directly involved, such as professional experts or even civil society actors" [5] The questioning of the status of the planner as expert has far-reaching consequences. The planner is now one of many equal partners within a process. From the scientific view, the direct involvement in the process itself means a shift from "transformation research", which only analyses from the outside, to "transformative research, or science", which is involved in the process itself. [6] This paradigm shift leads to a holistic view of sustainability and refers to its cultural dimension and the change in societal values to create climate-friendly everyday practices.[7]

Typologies as a planning method

The term typology was coined by the French architect Quatremère de Quincy in the 18th century. Quatremère puts the type in opposition to the model. While the model aims at a rigid adoption of the elements depicted in it, typology must be understood as a scheme that makes adjustments possible.

Traditionally, urban planning can be characterized by the handling of complex mixed-use situations. In this context, typologies are a central tool in the transmission of planning knowledge as an intersection of different types of knowledge. Typologies operate between the poles to convey relevant information about a building task and being adaptable to different contexts. They thus integrate the two complementary aspects of openness (for the future) and comprehensiveness (collection of relevant knowledge).

These basic characteristics make typology-based strategies, in contrast to rigid planning paradigms, suitable for meeting "current, complex, and interrelated challenges in an implementation- and solution-oriented manner".[8] This inbetweenness and unfinishedness grounds the ideal of designing as an "open theory" that is "incomplete, constantly expandable" built on cybernetic principles of self-criticism by feedback.[9]

Knowledge networks, interactions and context

Interactions can be considered as a central challenge of planning processes. Complex issues cannot be captured by simplified procedures. If it is nevertheless attempted, failures are unavoidable[10]. Planning is not a seamless sequence of discrete planning steps, but rather a context-dependent "iterative process".[11]

In addition to the bifurcated structure of planning knowledge, the context-dependency of solutions also complicates the processing of design tasks. This applies to the micro (building structure, milieus) as

well as the macro level (geographic location, political system). A process of knowledge transfer, as represented by the development of *complex typologies*, must distinguish between a body of knowledge whose solution strategies are transferable and a body of knowledge in which is closely connected to its context.

The outstanding role of typologies as a visual strategy for communicating sustainability becomes visible by comparing sustainability and architecture as fields of discourse. Both possess an empty centre. They are composed of a multitude of sub-disciplines. Their specific relationship to each other forms possible expressions of architecture and sustainability. As a result, both architecture and sustainability can be charged with a variety of meanings that are highly dependent on social discourse and the context of their use. Typologies represent a way to bundle these meanings into a communication tool embedded in the design process itself.

This insight is central, as it uses the knowledge transfer strategies developed in architecture to illustrate how sustainability can find its way into design processes without relying on the specialized knowledge of individual subdisciplines.

Towards a Complex Typology

The knowledge generated in sustainability planning processes is much more diverse than the knowledge embedded in traditional typology concepts. It includes aspects of energy supply and production, socioculture in the sense of interaction between users and the built environment, ecology and economic efficiency. The integration of these parameters makes it possible to map sustainability in a multidimensional understanding. By recognizing the effect of environmental factors on the final form, typology as *complex typology* means less form than specific programming under sustainability aspects. The key factor for successful planning is thinking in systems - not a reduction to individual aspects.[12]

This paradigm shift is not limited to the field of buildings. It expands the focus to other components of neighbourhoods, which include infrastructure and landscape in addition to buildings. These areas are connected to each other through a network of interdependencies. A typology of sustainability must address these connections. We can characterize this process as *double movement* or *double manipulation*. In the sense of extension and reprogramming the traditional concept of typology.

In this understanding, the concept of typology must constantly deform itself and adapt its final shape to the specific environment. In the past, the core of typological concepts consisted of relating a set of object-like properties to a design program. At the heart of this method was the repetition of successful strategies. However, this understanding lacked the possibility to evolve and learn.
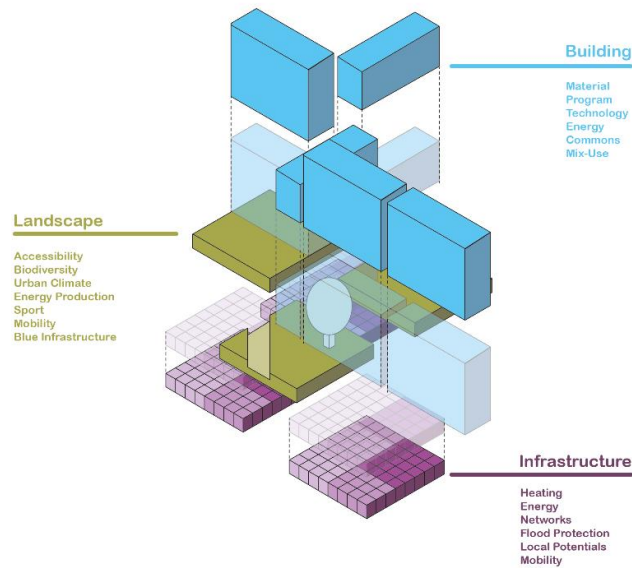
Figure 1. Elements of urban districts and areas of sustainable urban planning.

Traditional the successful usage of the typology-scheme in the original use-case justifies its use in other cases. A first step in moving away from this paradigm is to decouple program from form. A focus on programmatic aspects reinforces the role of use and users in relation to formal aspects of the design. Moreover, this paradigm shift makes it possible to think of typologies as collaborative processes that actively involve stakeholders in the development of typologies at different stages of the design process. Typologies in this understanding focus less on shape and representationality, but on processuality and incompleteness.

To realize this extended concept of typology, not only technical preconditions have to be created, but also stakeholders have to be involved in the planning process on a social level. Communication and exchange reduce the gap between laypersons and experts within the planning process. This generates and utilizes shared knowledge, which lays the foundation to a better appropriation of buildings, infrastructures and landscapes.[13]

Case-Study: EnStadt:Pfaff

The concept of *complex typologies* was developed and tested as part of the *EnStadt:Pfaff* research project and associated design-courses at *Kaiserslautern University of Applied Sciences*. *EnStadt:Pfaff* is an interdisciplinary research network with the goal of creating a sustainable neighbourhood on the former company site of the sewing machine manufacturer Pfaff in Kaiserslautern[14]. Experts in solar energy, material flows, mobility, information technology and urban planning are cooperating with the city of Kaiserslautern and public utility companies.

The research focuses on achieving carbon neutrality at the neighbourhood level by the use of an efficient energy concept that focuses on photovoltaics in energy generation and the consideration of user behaviour in energy consumption.

As part of the project, the *Institute for Sustainable Building and Design* of the *Kaiserslautern University of Applied Sciences* develops strategies for planning sustainable urban neighbourhoods. The goal is to design modules for urban districts in which innovative work and living concepts dynamically overlap. These modules are developed as *complex typologies* at the intersection of ecological construction methods, expert knowledge from the research project and the identification of stakeholder requirements. The research, which is directly linked to the planning process, not only explores the possibilities of future and sustainable typologies for urban districts, but also explores the possibilities of integrated

planning based on a specific neighbourhood development. The district scale offers the possibilities to reduce complex socio-economic interactions within cities to a comprehensible level.

At the beginning of the process, the question arose which usage programs of buildings, infrastructures and landscapes could be considered in such a programmatic context. Based on official databases, our research identifies a selection of usage programs for all three types of district elements. The shift from structure and form to usage forms the basis to overcome an object based design-approach.
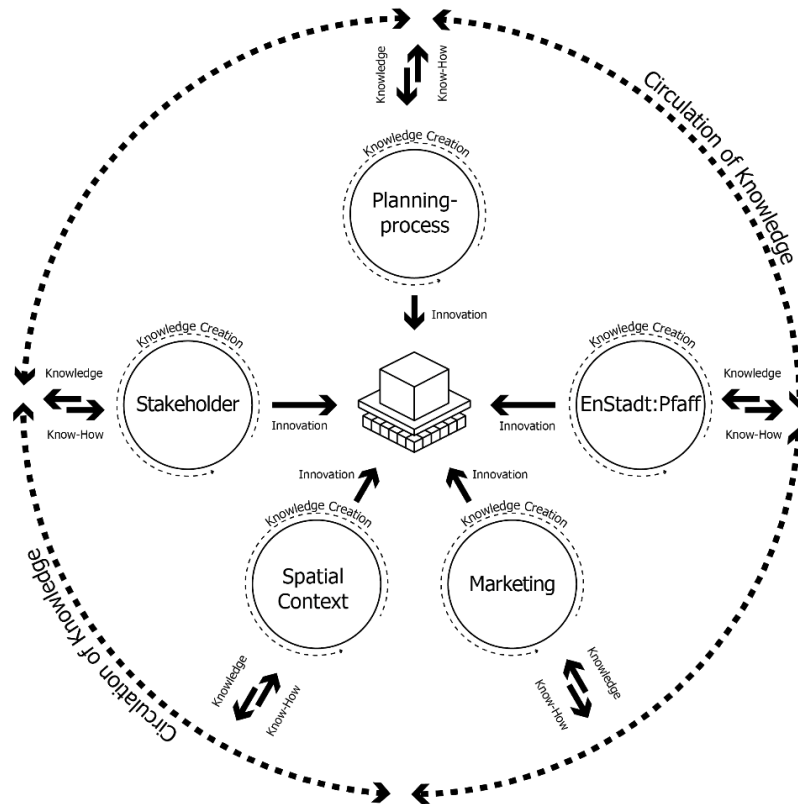

Figure 2. Relevant bodies of knowledge in complex-typology-design as part of the EnStadt:Pfaff project[15].

During the research process, the scholars collected different kinds of knowledge as instructions for the future design of sustainable neighbourhoods through *complex typologies*. Participation of stakeholders, climate change influences in urban land use planning, and the integration of scientific research in urban development processes were identified as relevant information from the planning process. The analysis of the environmental policy debate for the field of urban districts leads to the use of a multidimensional concept of sustainability. The research outcomes of the scientific project members emphasized the relevance of early stage consideration of interactions between mobility, energy and urban space in design processes. Finally the knowledge of potential stakeholders - in the case of the pfaff-district, according to the cities site strategy: technology start-ups – stresses the insight, that in the future urban districts must be understood as places to live and work, which must offer flexible and communally usable space.
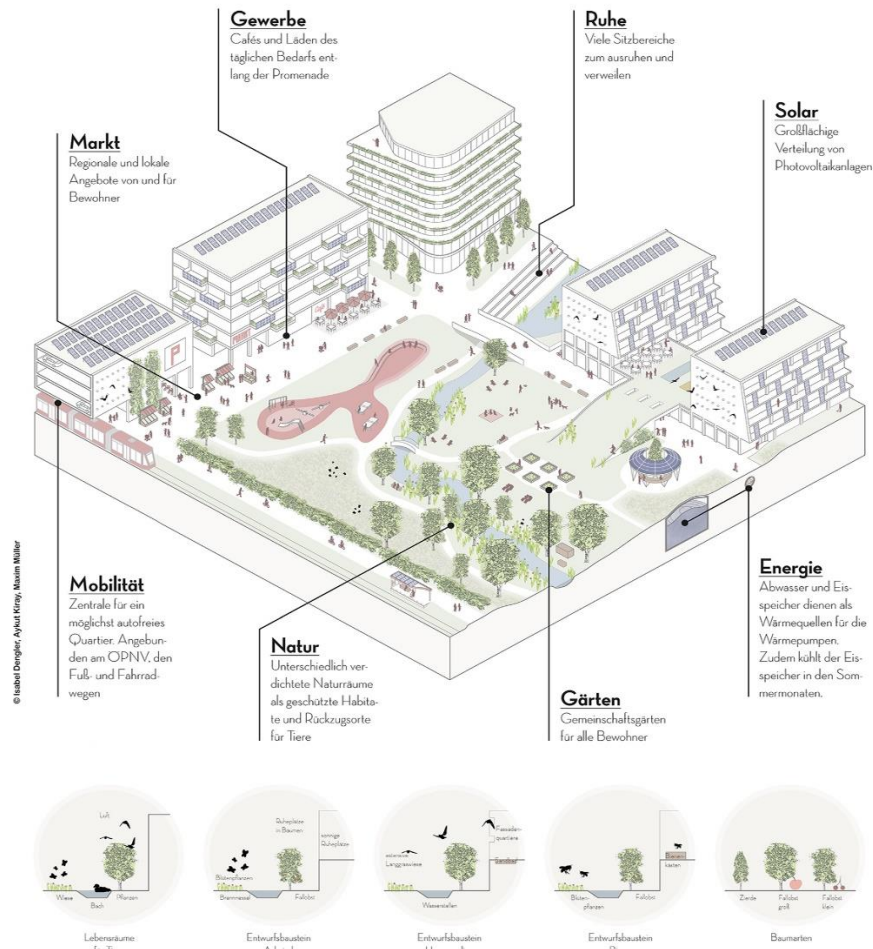
Figure 3. Complex Typology including urban production, biodiversity, energy infrastructure and mobility designed by students of the Kaiserslautern University of Applied Sciences

Complex typologies in teaching

Education in urban planning traditionally deals with the objects, structures and rhythms. Planners organize the urban space. But this paradigm leads to disentanglement of the urban elements, because it focusses more on the boundaries of this elements then on their intersection.

To realize a sustainable planning approach, four fields of action appear to be decisive for future teaching in urban planning and architecture. First the integration and definition of sustainability in architectural and urban design processes. The analysis and development of typology-based strategies. Complexity and systemic thinking on a neighbourhood scale as a basis for design. And finally shift from object-based to process-based understanding of design. This approach defines sustainable urban design as a holistic consideration of the three dimensions of sustainability.

At the same time, this concept expands the boundaries of the components of urban quarters - buildings, landscape and infrastructure - into a system-of-systems of interdependence. In this sense urban planning can be understand as process which effects extend far beyond object-based planning and construction.

However, this complex interpretation of sustainability does not have to lead to design strategies of complexity reduction or complication. Successful teaching concepts are based on a methodically productive handling of complexity in the sense of a cybernetic approach. Key to this concept are the teaching of the co-productive character of knowledge, scientific methods for knowledge accumulation, knowledge transfer in the design team and knowledge transfer to other members of the design course.

Our approach addresses the definition and discussion of interfaces between sustainability parameters in and between typologies.

Instead of formal organization, processes and intersections will be on the focus of future design strategies. Therefore, teaching *complex typologies* always means transferring knowledge into design strategies. This bold understanding of analysis integrates spatial relationships and the interactions of sustainability parameters.

These assumptions lead to a teaching approach, that combines mutual knowledge exchange, the development of co-productive solution strategies, and collaborative reflection. The goal is to perpetuate the course as a place of knowledge production and a continuous adjustment of the processing focus. Conceivably, the *complex typologies* created in the course represent a first step in establishing a database of typologies for students and scholars This database updates with each course. Through this, typologies are established as an elementary component of the future planning teaching - linking spatial production and sustainability.

CONCLUSION

Traditional concepts of typology focus on the duplication of a formal and organizational principle, but they also contain information about their social and political environment. Typologies can therefore be regarded as sociotechnical symbols. This highlights the possibilities of the concept - beyond the integration of form and structure - to translate the increase of complexity in design processes through sustainability integration into an effective planning tool.

The definition of typologies as *complex typologies* can be understood as a mapping of a complex data set. Typologies make social and organizational relationships - the program - visible in a spatial context. The design of this "Joint-Spacial-Display"[16] not only addresses the exclusive circle of planners, but offers an inclusive approach through its low-threshold nature. At the same time, broadening the scope of consideration as the concept of *complex typology* suggests, creates the need for planners to develop an expanded understanding of knowledge acquisition. However, the knowledge about the different sustainability parameters of settlement areas is not easily accessible. The development of competences in the field of scientific research techniques supports the designer's ability to act in this process. At the same time, the partial aspects of the gained knowledge must be related to each other. This requires a collaborative discourse that defines interfaces and at the same time considers the possibility of appropriating the collected knowledge for all stakeholders in the design process.

This opens the possibility to understand *complex typology* as tools of learning processes. According to Horst Rittel, planning processes possess various properties that characterize them as *wicked problems.* This characterization includes the impossibility of learning from past processes. Nevertheless, *complex typologies* make it possible to collect feedback and thus implement structures of learning in design processes.

Planning in this understanding is defined as an approximation. This process does not necessarily lead to solutions, but it makes it possible to minimize undesirable developments. *Complex typologies* do not claim to formulate solutions for planning problems, but they offer to exclude erroneous developments by collecting relevant information on certain design tasks.
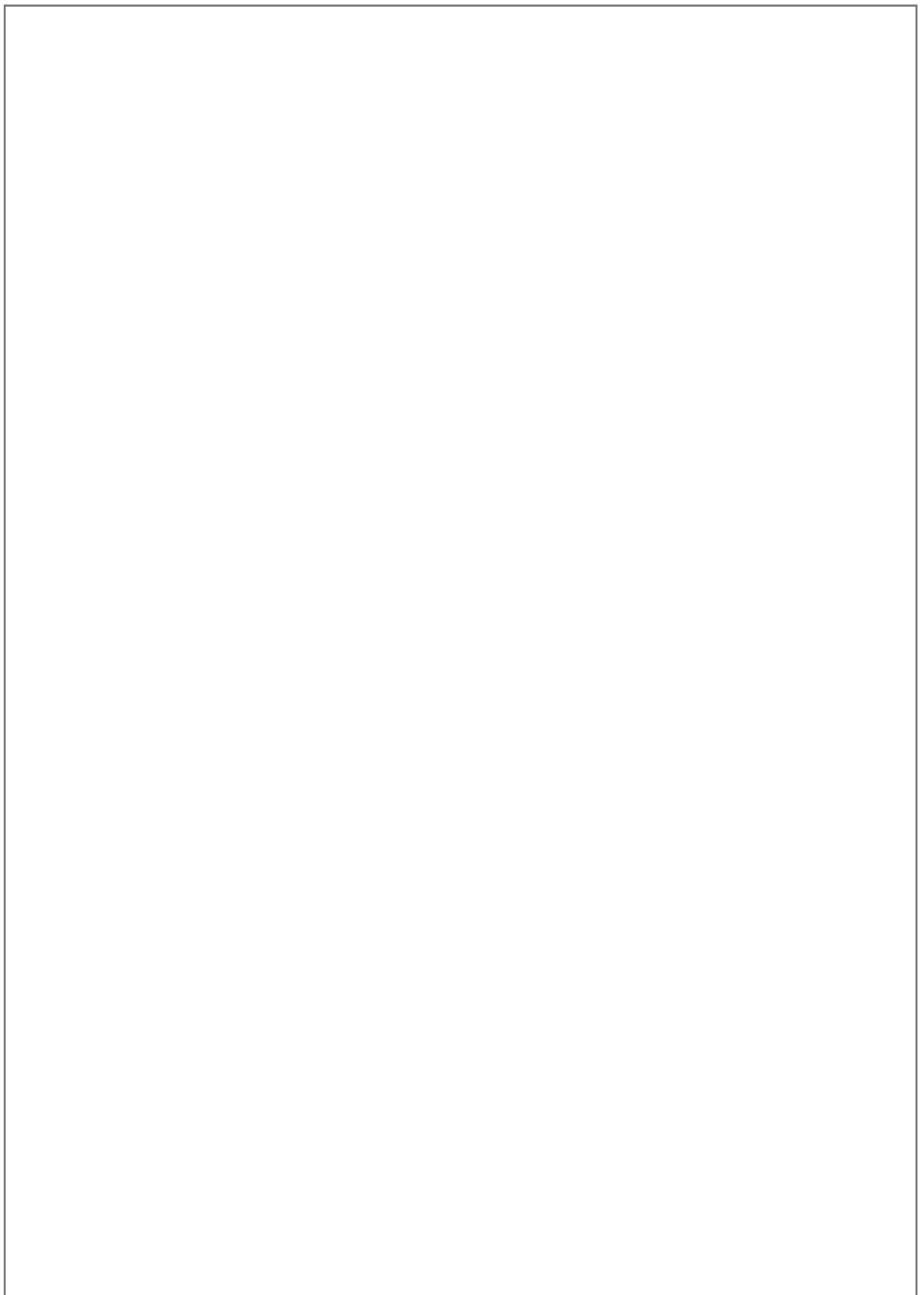
NOTES

[1] Felix Wagner, "Reallabore als kreative Arenen der Transformation zu einer Kultur der Nachhaltigkeit," in *Die Experimentalstadt: Kreativität und die kulturelle Dimension der Nachhaltigen Entwicklung*, ed. Julia-Lena Reinermann and Friederike Behr (Wiesbaden: Springer VS, 2017), 87.

[2] Uwe Schneidewind, "Urbane Reallabore - Ein Blick in Die Aktuelle Forschungswerkstatt," *pnd I online. Planung neu denken*, no.3 (2014): 1.

[3] Gerd de Bruyn and Wolf Reuter, *Das Wissen der Architektur: Vom geschlossenen Kreis zum offenen Netz,* ArchitekturDenken 5 (Bielefeld: Transcript, 2011), 51.

[4] Chris Watson, Shauna Mallory-Hill and Wolfgang F. E. Preiser, *Enhancing Building Performance* (Hoboken, N.J: Wiley, 2012), 92.

[5] Bérénice Preller et al., "Interaktive Transitionsforschung Und Wissensgenerierung Im Bereich Nachhaltiges Bauen," *pnd I online. Planung neu denken*, no.2 (2014): 1.

[6] Uwe Schneidewind, "Urbane Reallabore - ein Blick in die aktuelle Forschungswerkstatt," 2.

[7] Julia-Lena Reinermann and Friederike Behr, eds., *Die Experimentalstadt: Kreativität und die kulturelle Dimension der Nachhaltigen Entwicklung* (Wiesbaden: Springer VS, 2017), 3–4.

[8] Thomas Franke and Wolf-Christian Strauss, "Integrierte Stadtentwicklung in Deutschen Kommunen - Eine Standortbestimmung," *Informationen zur Raumentwicklung*, no.4 (2010): 254.

[9] Jesko Fezer, "Jürgen Joedickes Planungsmethodik: Die Funktionalisierung der Architekturtheorie," in *Vergessene Schulen: Architekturlehre zwischen Reform und Revolte um 1968*, ed. Nina Gribat, Philipp Misselwitz and Matthias Görlich, 1. Auflage (Leipzig: Spector Books, 2017), 262.

[10] Jürgen Joedicke, "Zur Formalisierung Des Planungsprozesses," in *Bewertungsprobleme in Der Bauplanung*, ed. Jürgen Joedicke, Arbeitsberichte zur Planungsmethodik 1 (Stuttgart: Karl Krämer, 1969), 21.

[11] Horst W. J. Rittel, "Der Planungsprozess Als Iterativer Vorgang Von Varietätserzeugung Und Varietätseinschränkung," in *Thinking Design: Transdisziplinäre Konzepte Für Planer Und Entwerfer*, ed. Wolf D. Reuter and Wolfgang Jonas (Basel: Birkhäuser, 2013), 85–86.

[12] Walter L. Schönwandt, *Planung in der Krise? Theoretische Orientierungen für Architektur, Stadt- und Raumplanung* (Stuttgart: Kohlhammer, 2002), 35.

[13] The demand for a design method that realizes the integration of a multidimensional understanding of sustainability in planning processes is of high topicality. This task gave the impulse for the development of a formalized design tool in the context of sustainable urban planning to realize *complex typologies*. The so called *extended typological view* (Erweiterte typologische Betrachtung) as a tool for the integration of sustainability aspects in urban planning processes formulates a solution approach that consciously uses design strategies in dealing with complex problems. The method defines sustainability in architectural and urban design contexts as a holistic consideration of sustainability in three dimensions. Peak values in individual areas cannot compensate for deficits in other areas. At the same time, this concept expands the system boundaries of the individual neighborhood modules: Development, open space and infrastructure to a system-of-systems of mutual dependence, since only a consideration of feedback effects makes sustainable architectural strategies possible (see Stefan Staehle et al, "Erweiterte typologische Betrachtung als Werkzeug zur Integration von Nachhaltigkeitsaspekten in Stadtplanungsprozesse" (Research paper presented at the RealCorp Conference 2020 Aachen, September 15-18, 2019)).

[14] More information about the *EnStadt:Pfaff* project can be found on https://pfaff-reallabor.de/

[15] Drawing after Elias Carayannis, Thorsten D. Barth, and David Campbell "The Quintuple Helix Innovation Model: Global Warming as a Challenge and Driver for Innovation." *Journal of Innovation and Entrepreneurship* 2, no. 1 (2012)

[16] Anna J. Heinrich et al., eds., *Handbuch qualitative und visuelle Methoden der Raumforschung* (Bielefeld: transcript Verlag, 2021), 381.

BIBLIOGRAPHY

Bruyn, Gerd de, and Wolf Reuter. *Das Wissen der Architektur: Vom geschlossenen Kreis zum offenen Netz.* ArchitekturDenken 5. Bielefeld: Transcript, 2011.

Franke, Thomas, and Wolf-Christian Strauss. "Integrierte Stadtentwicklung in Deutschen Kommunen - Eine Standortbestimmung." *Informationen zur Raumentwicklung*, no.4 (2010): 253–62.

Gribat, Nina, Philipp Misselwitz, and Matthias Görlich, eds. *Vergessene Schulen: Architekturlehre zwischen Reform und Revolte um 1968*. 1. Auflage. Leipzig: Spector Books, 2017.

Heinrich, Anna Juliane, Séverine Marguin, Angela Million, and Jörg Stollmann, eds. *Handbuch qualitative und visuelle Methoden der Raumforschung*. Bielefeld: transcript Verlag, 2021.

Joedicke, Jürgen, ed. *Bewertungsprobleme in Der Bauplanung*. Arbeitsberichte zur Planungsmethodik 1. Stuttgart: Karl Krämer, 1969.

Preller, Bérénice, Julia Affolderbach, Christian Schulz, Sebastian Fastenrath, and Boris Braun. "Interaktive Transitionsforschung Und Wissensgenerierung Im Bereich Nachhaltiges Bauen." *pnd I online. Planung neu denken*, no.2 (2014): 1–14.

Reinermann, Julia-Lena, and Friederike Behr, eds. *Die Experimentalstadt: Kreativität und die kulturelle Dimension der Nachhaltigen Entwicklung*. Wiesbaden: Springer VS, 2017.

Reuter, Wolf D., and Wolfgang Jonas, eds. *Thinking Design: Transdisziplinäre Konzepte Für Planer Und Entwerfer*. Basel: Birkhäuser, 2013.

Rittel, Horst W. J., and Melvin M. Webber. "Dilemmas in a General Theory of Planning." *Policy Sciences* 4, no.2 (1973): 155–69.

Schneidewind, Uwe. "Urbane Reallabore - Ein Blick in Die Aktuelle Forschungswerkstatt." *pnd I online. Planung neu denken*, no.3 (2014): 1–7.

Schönwandt, Walter L. *Planung in der Krise? Theoretische Orientierungen für Architektur, Stadt- und Raumplanung*. Stuttgart: Kohlhammer, 2002.

Staehle, Stefan, Joern Zitta, Katharina Buseinus, and Alexandra Rode. "Erweiterte Typologische Betrachtung Als Werkzeug Zur Integration Von Nachhaltigkeitsaspekten in Stadtplanungsprozesse." In *RealCorp 2020. Proceedings 25th International Conference on Urban Planning*, 273–83. Wien, 2020.

Watson, Chris, Shauna Mallory-Hill, and Wolfgang F. E. Preiser. *Enhancing Building Performance*. Hoboken, N.J: Wiley, 2012.

AMPS PROCEEDINGS SERIES 28