Adapting Active Learning in Presence to Distance Education: Effective Strategies from Four Cases in Higher Design Education

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Abstract
From 2020, education had to rapidly adapt to the massive employment of distance learning. The adaptation of design teaching at university level seemed to be particularly challenging because of its orientation towards project-based and active learning. Design students engage in learning by doing, being supported by the interrelation with teachers and classmates within the classroom. This approach is rooted in the art and craft teaching, historically hinged on studio pedagogy where the direct teacher-learner relationship is a key element of learning. Besides, design education strongly relies on peer learning, which naturally occurs within the physical space. Also, design learners deal with concepts related to the perception of forms, colours and spaces, which can be critical when mediated by a screen. All these disciplinary and relational implications defy design teachers to adapt to distant learning. Through action research, this paper presents four design-related courses that were adapted to distance learning. Being originally in presence, at different programme levels (i.e. Bachelor, MSc), in two universities and countries (i.e. Politecnico di Milano, Italy; UAHC, Chile), these courses implemented different teaching strategies that make them succeed in keeping the active learning approach. They possibly achieved even better results than in the previous years, in terms of participation, engagement and outcomes. An analysis of the four courses, the teaching strategies implemented, and results are described, with the aim of providing an aid to teachers from project disciplines, for the adaptation to distance learning of courses with a strong focus on practice and presence.

Keywords: Higher Design Education, Project-Based Learning, Active Learning, Distance Learning

Introduction

In 2020, due to the global contingency arising from the COVID-19 pandemic, most productive and training activities were strongly affected. Higher education institutions, in particular, had to react promptly to this crisis for the continuation of teaching, which, until then, had relied on face-to-face activities or laboratory work that required physical interactions. Most higher education institutions suddenly embraced remote education, rarely considered in the pre-2020 context, and therefore not consolidated in its implementation, infrastructure, and academic culture. Consequently, this teaching modality created unprecedented challenges for educators to adapt their didactic strategies, which had to be rethought in terms of teaching activities and assessment methods. Moreover, instructional designers had to consider the influence on the learning experience of two new phenomenons: the massive employment of technologies in education and the social distance.

Researchers (Dewstow et al. 2000; Guangul et al. 2020) have documented some of the most common difficulties of teaching online: (i) there are more inter-group problems; (ii) the drop-out rate is higher than usual; (iii) access to technology and internet can vary greatly between students; (iv) there can be many differences between students concerning technological skills; (v) the technological infrastructure problems of faculties; (vi) lack of students' commitment to submit assessments; (vii) academic dishonesty regarding assessment. Additionally, Kebritchi et al. (2017) have integrated most of these considerations into three main critical aspects related to instructors, students and content issues. Learners' issues included expectations, readiness, identity, and participation in online courses, while instructors issues comprise changing faculty roles, transitioning from face-to-face to online, time management, and teaching styles. Content issues encompassed the role of instructors in content development, integration of multimedia in content, role of instructional strategies in content development, among others.

These aspects are particularly challenging in design higher education due to mainly two issues: (i) the discipline orientation towards design-based learning (DBL), an approach founded on the active learning philosophy, and framed into the broader approach known as problem-based learning. Design-based learning is a hands-on learning activity. It engages students in solving real-life design problems or tasks, facing the detection of specific needs of potential users, studying the context of the proposed issues, and using design activities to solve the problems (Gómez Puente et al., 2013). Design students learn by doing, supported by the physical interrelation with teachers and classmates, mainly within the classroom space. In design schools, DBL has a strong social dimension, as it often includes collaborative learning tasks; it is not rare that students develop their design projects through teamwork, exploring alternatives, making use of multiple solution methods, selecting the criteria, and providing feedback to each other on their assignments (Chang et al. 2008; Denayer et al. 2003). A design studio course or lab space with collaborative, project-based research drives many reputable design programmes worldwide.

The second challenging issue (ii) regards direct perception and materiality. Design is fundamentally an activity aimed at shaping informed perspectives and approaches on the creation of artefacts. For this reason, design knowledge is constructed through experimentation by testing theories in some materially manifested form (e.g. concepts with tangible outcomes for evaluation: a device, an app, a system model, a video). In DBL, students and teams are encouraged to deeply investigate materials, visual resources such as colour, texture, perspective, motion, behaviour, and ergonomics. When teaching is provided

from intangibility and mediated by a screen, the effective delivery of quality content might be threatened since students (and educators) are distant from the direct perception of visual or physical phenomena.

From all of the above, the following research question was posed to address these relevant issues: what didactic strategies can be implemented to adapt design courses to the new distance education scenario? How might design educators preserve an active learning and project-based learning approach in their teaching strategies?

As the researchers are highly involved in teaching activities of design courses and had a first-hand experience of these issues, this paper aims at answering the questions by analysing their developed teaching strategies to overcome them.

The Context: Four Design-related Courses

The teaching strategies implemented during 2020-2021 in four design-based courses were analysed (Scheme 1), including remote active learning. The analysed courses are part of design curricula in two higher education institutions of Italy and Chile. Two courses were delivered at the bachelor level, while the other two at the master level (see x-axis in the scheme). The courses analysed at the fundamental or bachelor level were *"Colour"* and the *"Visual Elements Design Studio"*; those considered at the advanced or master level were *"Design Theory and Practice"* 'and a *"Seminar on Teamwork"*.

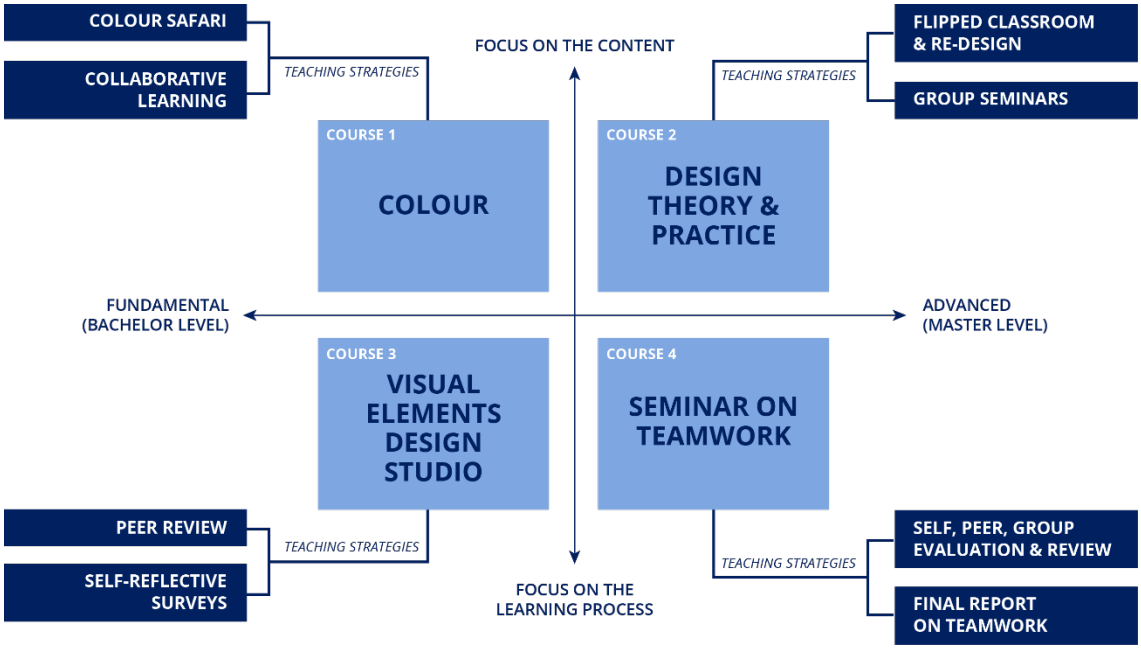

Figure 1. The Research Context, Courses Cases Study and Teaching Activities

If the x-axis represents the level of the program where the course was delivered, the y-axis represents the considered teaching activities focus. "Contents" and "learning process" were identified as two distinct types of focus of the activities under examination. Indeed, active-learning strategies implemented in courses 1 and 2 (on the upper part of the scheme) had a strong focus on improving the delivery of the disciplinary content. On the other hand, the strategies selected within courses 3 and 4 (on the lower part of the scheme) focused on improving the learning process. This distinction is particularly relevant in project-based learning since the specific disciplinary knowledge is just as crucial as being acquainted with

the design process. With all of the above, the specific case study regards two teaching strategies for each course.

Case Study: Courses Activities

Course 1: Colour

The Colour course is a shared course for the Arts & Crafts programme and the Design in Performing Arts programme of Universidad Academia de Humanismo Cristiano, in Chile. Ingrid Calvo Ivanovic is the responsible teacher, and 35 students were enrolled on the 2021 spring semester. This course focuses on recognising the colour phenomenon, from its observation to its inclusion in design practice. The course introduces learners to a methodology for the professional application of colour, starting from design needs, colour conceptualisation, and colour assessment within the final product. The teaching strategies analysed were *Colour Safari* and *Colour Semantics through Collaborative Learning.*

Activity 1 – Colour Safari

The "Colour Safari" is a series of exercises that consisted of the students playing at "capturing colours" within the everyday environment of their homes. Students received a commission for each course's content, hunted the required colours with their smartphone cameras, and then shared the results in an online folder with their classmates. Before 2020, instead of collecting colours by taking pictures, students had to reproduce with coloured pencils the hues they observed by walking outdoors and observing the city's landscape. As human urban mobility was considerably reduced during the pandemic lockdown, and it also affected the access to buy colour materials (pencils, paints, canvases), this didactic activity was highly affected.

Some of the pros of teaching online were:

- Equalising previous skills (while using coloured pencils require some practical skills that not all students may have, the use of photo cameras lowered the technical difficulty without affecting the acquisition of the content)
- Enhancing the students' perception of their environment (by proposing the appreciation of home environment "*with renewed different eyes"*)
- Sharing materials online, making classmates results available for all
- Recording lectures helped students with intermittent access to the internet
- Students perceived exercises as "catching game" instead of assessment (the perception of *learning by playing*)

Some of the cons of teaching online were:

- Not seeing the physical work of students or seeing colour with different light and screen conditions (colour relativity as a critical issue)

The Lessons Learned for the Future were:

- The further realisation of the activity (in presence) will consider a mixed approach between photos and physical materials collected in the home environment
- Rising students' awareness of colour relativity and motivating reflection on the matter

Activity 2 – Colour Semantics Through Collaborative Learning

The second activity regards "Colour Semantics". As colour associations and meanings strongly depend on cultural agreements and collective consciousness, an increase in group work was proposed for this content unit during the course's redesign and adaptation. The inclusion of a collaborative task aimed at actively engage students in learning theoretical-based content. During the activity, students discussed with their teams the individual and collective associations of specific colours with emotions, concepts, moods and cultural identification. The inclusion of free digital tools or apps favoured online collaboration and mutual support among teammembers. Some of the tools used for the activity were: Google Jamboard, Socrative, Kahoot, and Canva. Before 2020, this course did not consider group work in any of its activities.

Teaching Online Pros
- Using free digital tools and apps to grant inclusive activities
- Optimising time management (in the arrangement of group work)
- Allowing students to share their environment despite the distance

Teaching Online Cons
- Missing the value of being together physically

Lessons Learned for the Future
- The further realisation of the activity will still consider working in teams in presence with the aid of free digital tools and apps

Course 2: Design Theory and Practice

Design Theory and Practice is part of the Master of Science in Design and Engineering at Politecnico di Milano, Italy. Lucia Rampino is the responsible teacher, and 108 students were enrolled on 2020 fall semester. The course aims to stimulate critical reflection by understanding how design has evolved from its birth to nowadays, going through four perspectives: technical, human, digital and social. To this extent, the course heavily adopts active learning through seminars, flipped classrooms and group discussions.

The teaching strategies implemented in this course analysed here were *Flipped Classroom and Re-design*, and *Students Seminars*.

Activity 1 – Flipped Classroom and Re-design

Students were required to prepare for the lesson in advance in this activity, reading the contents before class time. During class, the main contents of the lesson were recalled and openly discussed with the teacher. Then a project-oriented group activity was done by students to connect theory with practice. Before 2020, these activities were paper-based, and the outputs were collected physically.

Teaching Online Pros
- Sharing materials online
- Optimising time management
- Reducing problems regarding physical space (for such a large number of students)
- Optimising students' organisation in groups

- Optimising the visual quality of students' outputs

Teaching Online Cons
- Face-to-face interactions were missing
- Some internet or connection issues were informed

Lessons Learned for the Future
- The further realisation of the activity (in presence) will prefer gathering students in the same room, but materials (e.g. inputs, outputs) will be shared online
- Groups will present their outputs through materials delivered in advance through a shared folder

Activity 2 – Students Seminars

Specific lectures were dedicated to thematic seminars where groups presented a critical discussion on a topic given by the professors. Before 2020, students decided groups and communicated them to the professor, who often had to manage the inclusion of students left out from communicated teams. Moreover, the groups delivered the presentation slides as they present them in class.

Teaching online Pros
- Setting a delivery folder reduced organisation issues on the day of the seminars
- In order to optimise the organisation in teams, professors decided the groups based on students' previously declared interests.

Teaching Online Cons
- There were no cons reported in the remote teaching of the activity.

Lessons Learned for the Future
- The further realisation of the activity (in presence) will keep both improvements (shared delivery folder and students' groups decided by interests)

Course 3: Visual Elements Design Studio

This course is part of the Bachelor Program in Product Design at Politecnico di Milano, Italy. Silvia Ferraris is the responsible teacher, and 55 students were enrolled on 2021 spring semester. The design studio develops in-depth the use of visual languages and related tools and techniques to represent a design project through the development and interpretation of perceptual mechanisms and chromatic systems. The aim is to integrate communication skills with the ability to translate elements of design analysis and synthesis visually.

The teaching strategies implemented in this course were *Peer Review* & *Self-Reflective Surveys.*

Activity 1 – Peer Review

Before 2020, this activity consisted of displaying the student works on the classroom desks, then walking around and leaving a ballot close to the student's preferred work. From 2020, students vote online after looking at their classmates work in a shared folder.

Teaching Online Pros
- Optimising time management
- The voting process became anonymous
- Sharing materials online, making classmates results available for all

Teaching Online Cons
- Not being able to see the materiality on the physical work of students
- Seeing with different light conditions to those from the students
- Not being able to see the physical work from different angles or perspectives

Lessons Learned for the Future
- The further realisation of the activity (in presence) will prefer presenting the work in the classroom, but voting online
- Photos of the results will always be shared online from now on

Activity 2 – Self-reflective Surveys

The second activity was the performance of self-reflective surveys, where students were encouraged to reflect on their learning process by writing down some notes about the experience they had while doing their homework; their achievements in terms of theoretical, practical and soft skills; their critical insights about any failure or disappointment they had. Before 2020, these notes were collected in individual envelopes named by student's nicknames.

Teaching Online Pros
- It was easy to manage students' responses (through digital documents)
- The whole process became more effective than before (time, assessment, management)

Teaching Online Cons
- Access to the internet is mandatory

Lessons Learned for the Future
- The further realisation of the activity will continue to be digitally conducted by using smartphones inside of the classroom and supported by institutional wi-fi

Course 4: Seminar on Teamwork

This course is part of the Final Project Work Design Studio of the Master of Science in Design and Engineering at Politecnico di Milano, Italy. Francesca Mattioli is the responsible teacher, and 55 students were enrolled on the 2020 fall semester. The seminar aims at fostering the development of collaborative competencies. Since the course approach is project-based and collaborative learning, the seminar activities aimed to foster awareness and critical reflection on teamwork.

The teaching strategies implemented in this course were *Self, Peer and Group Evaluation & Reviews,* and a *Final Report on Teamwork*.

Activity 1 – Self, Peer, Group Evaluation & Review

After mid-term presentations, students individually perform a self, peer and group evaluation which is later on shared and discussed with the rest of the team. After this moment of group discussion, a review is organised with the professor to report emerging group issues and future strategies to improve teamwork. Before 2020, these activities were non-structured.

Teaching Online Pros
- Optimising time management
- Less physical materials to manage
- A more formalised path and planned reviews were implemented
- Providing recorded guidelines and instructions to students made understanding easier

Teaching Online Cons
- Direct teacher observation and establishing relationships with the teams and students were missing
- Informal or not-structured student-student and teacher-student interactions were missing

Lessons Learned for the Future
- The further realisation of the activity (in presence) will continue to be a formalised path with dedicated reviews.
- Recorded explanations and evaluations will be kept

Activity 2 – Final Report on Teamwork

The activity was first included in the online edition of the course and consisted of students' delivery of a final group report to assess and present the way the team worked throughout the semester.

Teaching Online Pros
- Formalised moments for groups assessment were implemented
- Groups were autonomous in managing their time and deciding when / how to do the activity
- It was possible to monitor teamwork even from a distance

Teaching Online Cons
- Direct observation and establishing relationships with the teams and students were missing

Lessons Learned for the Future
- The further realisation of the activity (in presence) will keep the delivery of a digital report and will integrate it with the direct observation of students during class time

Emerging Considerations and Discussion

Distance learning showed a considerable advantage on time optimisation in all courses analysed. The use of clouds services provided a valuable space to share materials and recorded lessons online, which helped improve the organisation and give students more permanent access to knowledge.

Without any doubt, two of the most critical points in the distance learning of design are the impossibility of:

- observing the students' work physically (prototypes, models, materiality)
- observing students while working together

However, adopting a blended learning approach for future realisation of the courses analysed could be key to match this critical point and the significant support of digital tools used for the teaching activities.

The current distance learning scenario has forced teachers and students to observe how specific processes and digital tools can support classroom teaching, accelerating the consolidation of digital literacy in educational environments, which began at the end of the 20th century. By working on this study, the researchers found themselves surprised about how easy it was to implement these changes, but, interestingly, the limits of the courses' previous activities before online teaching had not been noticed before the remote teaching situation. The process of being forced to adapt these activities to the current scenario has now disclosed the opportunities that may help to improve the quality of design teaching.

In the four courses analysed, teachers adopted a proactive and understanding attitude towards the difficulties that the new context could mean for the students, and they looked for ways to facilitate their learning, thinking about their needs and interests. This attitude could be vital to creating a supportive and inclusive environment within the virtual classroom.

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