

DISTANCE LEARNING IN META-DESIGN. CONDUCTING INCLUSIVE DIDACTICS AND USER RESEARCH FOR IMPROVING THE QUALITY OF LIFE OF AUTISTIC PEOPLE WITH REMOTE DESIGN TOOLS AND METHODOLOGIES

D. Genco, V. Arquilla, F. Guaricci, F. Caruso

Politecnico di Milano (ITALY)

Abstract

The outbreak of the Covid-19 pandemic has radically affected every aspect of human life around the world, inevitably involving education and universities as well.

This paper describes how the didactic activity of the Co.Meta course responded to the emergency situation, transferring the knowledge gained in years of teaching experience to **Blended** and **Distance** learning approaches. The aim is to provide an overview of the learning methodologies of Co.Meta, a meta-design laboratory for the School of Design at Politecnico di Milano, which was able to adapt its curriculum to face the emergency. The key aspects of innovation are the challenging and highly social theme of the course, the student-centred learning approach, the multidisciplinary network involved and the didactic tools implemented.

The paper discusses the limits and opportunities of Distance Learning applied to Design Courses, comparing the results obtained during the year 2020 with the results of past editions. This paper aims to provide an overview of Co.Meta's teaching methods and to show the tools used to deal with Covid-19 emergency. Co.Meta was able to bring innovation and create a social impact even in the pandemic situation, responding to the emergency by creating a breakpoint for traditional teaching, introducing an innovation that may have radically changed its higher education system.

Keywords: Distance Learning, Blended learning, Meta-design, Innovation, High Education, Design Course, Inclusive Design

1 INTRODUCTION

The COVID-19 pandemic has created significant challenges for the global higher education community, universities had to rapidly redesign their curriculum by moving most of their academic courses online [1][2].

Some innovative and digital teaching dynamics were already in place in many universities intending to move part of their educational offering online, to allow more flexibility in teaching and learning (anywhere and anytime). However, the emergency has given an extreme acceleration to these processes, catching the university staff unprepared [3]. Indeed, online learning implies a specific knowledge of pedagogical content, mainly related to designing and organising better learning experiences and creating learning environments with the help of digital technologies, that not all professors master [4].

Italy was the first country to deal with the virus outside of China. In particular, Lombardy, the region of interest for this paper, was the first to face the restrictions needed to limit the spread of the virus. Within a week from the start of the national lockdown, most universities began online lectures in a way never experienced before [5]. Despite their hands-on nature, even the Design disciplines had to reorganize their educational program to handle the emergency. Politecnico di Milano has mobilized its best human resources to provide distance learning and train all the faculty to use online didactic tools to guarantee high educational standards even in a new and unprecedented situation. [6]. While taking place in uncertain and exceptional circumstances, this transition has allowed universities to experiment with innovative forms of teaching and achieve satisfactory results [6].

According to Rapanta et al., many aspects of teaching and learning in an online environment are similar to education in any other formal educational context. Still, the dynamics and relationships between teachers and learners can be profoundly different, as well as the tools used for learning [4].

This rapid transformation also and above all impacts teachers, in fact, learning principles that see teachers as '*designers*' of processes tailored to meet students' needs are even more critical. Consequently, teachers are responsible for providing clear learning objectives, carefully structuring learning content, moderating and controlling workload, and proposing activities relevant to the desired learning outcomes [4].

This paper presents the experience of the Co.Meta course, a project-based course in the field of design discipline in which interpersonal, collaborative and hands-on activities are fundamental as well as research on-field and relationship with the user. During the Co.Meta course it was possible to experiment with different didactic approaches such as **Blended learning** and **Distance learning**.

In the following paragraphs, an overview of Co.Meta's teaching methods will be given, focusing on tools used to deal with the COVID-19 emergency. The Co.Meta course is an excellent example of emergency response creating a breakpoint for traditional teaching, capitalizing on previously adopted innovative solutions and introducing new ones that can radically change the way it delivers education.

2 CO.META DIDACTIC METHODOLOGY

The Co.Meta - meta-design course for the 2nd year of Bachelor's degree programme in Industrial Product Design at the Politecnico di Milano School of Design - aimed at developing conceptual ideas to improve the quality of life of people with ASD (Autism Spectrum Disorder).

The Co.Meta course, whose name is the acronym of two words Co-design and Meta-design, aims to transfer students' knowledge, tools, and methods related to the preliminary design phase of new products and services. Co.Meta, as its name suggests, is based on the meta-design process.

Meta-design is a fundamental discipline for the Politecnico di Milano present in all the bachelor's curricula offered by the School of Design.

Meta-design is something that precedes actual design and is a method that can be described as a "*generator*" of design actions that, at different levels, sets constraints or provides guidelines for new scenarios [7]. Giaccardi and Fisher argue that Meta-design is a unique design approach that deals with opening up solutions rather than returning complete solutions and aims to create social and technical frameworks in which new forms of collaborative design can occur. In short, the Meta-design process aims to define the main elements to be developed in the design phase; these elements constitute the *Rules and Grammar* of the project [8].

Meta-design is a fundamental design research activity to achieve *meaning-driven* [9] where the "*meaning*" of a product is understood as the "*why*" behind it. Therefore, meta-design allows approaching design from its "*reason why*" by returning meaningful outputs [10]. Thus, the course aims to give students the tools and method to design meaningful products.

In the course vision, this output can be achieved through the assessment of:

- **User:** to identify new needs and outline new meanings. This approach could be compared to the human-centred design process [11] and is a way to ensure that final solutions remain connected to the people for whom they are designed.
- **Technology:** knowing what can be developed and humanising technology to build natural experiences and interaction.
- **Market:** making the product economically and intrinsically attractive to adapt to a sustainable production model (socially, economically and environmentally).

In Co.Meta's vision, the output required from students is not a finalized product or service but rather a thinking process leading to the definition of a concept, detailed in a brief or meta-design grid, where many products or service ideas can be derived from the different application of various styles, materials or technologies [8].

As already mentioned, the Co.Meta course applies the methodology of meta-design to a project for users with ASD. The topic that young designers must deal with is very challenging because, as many specialists say, there is no single type of autism, but each individual is unique [8]. Therefore, designers should start designing with an individual user in mind and then try to extend the value of the project to other individuals with ASD, applying the principles of Design For All and the methodology of Inclusive Design [12], which they will learn during the course.

The didactic approach of the course makes it clear that design cannot cure autism, but it can succeed in improving fundamental aspects of daily life for people with ASD and their caregivers, either parents or therapists.

In order to help students get in touch with reality they are asked to design for, Co.Meta, since its first edition in the academic year 2012-2013, involves different actors from the ASD world, such as associations, psychologists, teachers and caregivers. Professionals and experts support the professors' staff and allow students to do **on-field research** by visiting ASD centres, talking to professionals and directly interviewing people with ASD. In addition, professionals from the Co.Meta network guides the students during each phase of the course. Professors undertake to organise periodic talks with professionals and speeches during classes. Professionals also participate in the students' concept presentations, giving them timely feedback on the proposed design ideas and advice on improving their concepts to meet the user's needs better. Thanks to the challenging and highly social topic, the student-centred learning approach, the multidisciplinary network, and the professional research tools, Co.Meta was able to bring innovation and create a social impact even in the pandemic situation.

2.1 Co.Meta during the COVID-19 emergency

Co.Meta is a well-structured course that has evolved over nearly 10 years, consolidating result-driven tools and methodologies for its purposes. From year to year, new and more effective elements from a real context (project-based learning approach supported by an extensive network of partners and experts) and new teaching tools (blogs, project management tools and finally the MOOC) have been adopted in order to make the teaching more productive. During the course, theoretical knowledge intersects with practical tools, in *learning by doing attitude*, which allows students to learn methodologies but above all to apply in a dynamic and collaborative environment.

As the course structure had already been tested and found to be effective, it was decided not to change it in response to the health emergency, but instead simply adapt it to the distance learning. The path of Co.Meta can be divided into three main phases:

- **Observe:** in which, together with a warm-up phase and learning from state of the art, students carry out user research and observe the context in which users live, identifying an area of opportunity in which to design.
- **Identify:** in which students identify a type of product and benchmark it. Then students will be guided in the ideation and definition of the concept idea.
- **Meta-design:** definition of the product user service and market production scenario according to the meta-design approach. The final output is a meta-design grid that summarizes the work done, considering all the parameters analysed in the project idea.

The ninth edition of Co.Meta took place in September 2020, when the first wave of the virus was under control. For this reason, following the Politecnico di Milano COVID-19 Emergency program, lectures were mostly conducted in a blended mode (between online and face-to-face lectures at the university). After few weeks from the start of the course, due to the second wave of the virus, we were forced to convert all the activities fully online.

The diagram below (figure 1) shows how the course path was adapted to the pandemic by comparing the eighth and ninth editions of Co.meta.

Co.Meta's teaching staff was not completely unprepared to handle the digital transition as, even before the coronavirus outbreak, the Co.Meta course had always relied on Blended Learning practices. The course has always been supported by an online e-learning platform called POK (Polimi Open Knowledge Platform) that offers MOOC (massive open online course) in addition to the use of digital tools integrated into traditional teaching.

The blended learning approach has proven to be very effective in actively involving students. **Blended learning** can be defined as “*systems that combine face-to-face instruction with computer-mediated instruction*” [13].

As the Co.Meta course is based on a student-centred teaching method, the flipped classroom approach has always been adopted. The **flipped classroom** requests students to acquire basic knowledge independently and put it into practice by sharing it with the class and teachers. These innovative teaching methods pushed students to use more of their knowledge in deeper thinking and further problem solving [14].

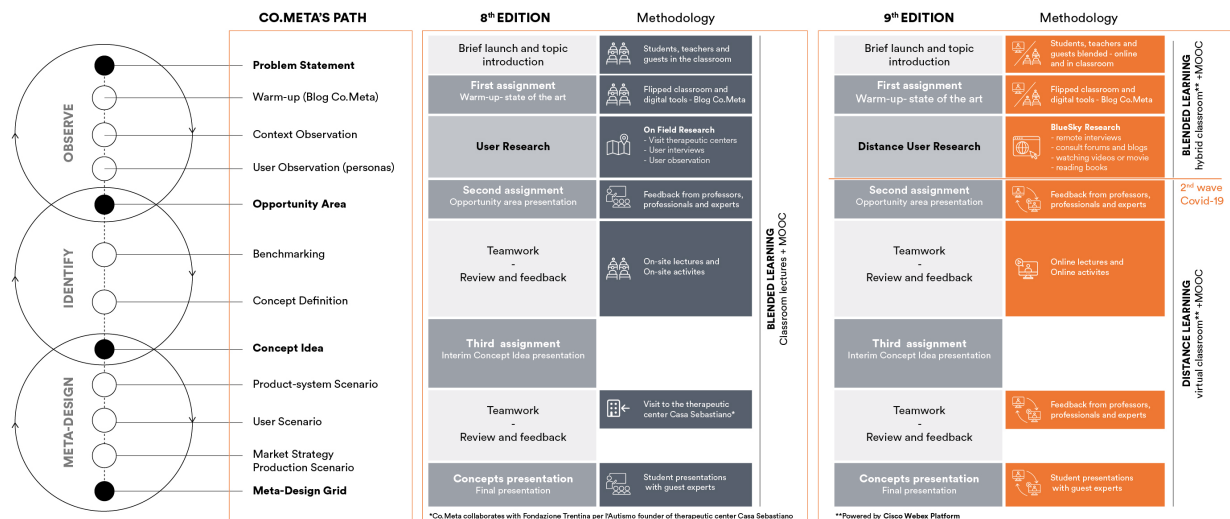


Figure 1. Co.Meta path and methodology comparing the eighth and ninth editions

In this paper the term '*Distance Learning*' refers to learning which is mediated by the Internet. It refers to a type of teaching and learning in which the learner is at the professors' distance and uses technology to access the learning materials and interact with the professor and other learners [4].

Facing the online transition was more difficult for a design course rather than for theoretical disciplines for which this was already an established practice. Owing to the nature of design courses, based on design workshops, group work and learning by doing, with the use of specialised equipment and laboratories and strong interpersonal interaction, the transition from face-to-face teaching to the virtual classroom has led to significant problems and challenges [15]. To address this challenge, during the pandemic the approach taken by Co.Meta was a mix of synchronous and asynchronous learning [6]. The synchronous mode consisted of classroom lectures alternating with online lectures. The decision to go for synchronous mode was taken with the aim of recreating as much as possible the social interaction among students and between students and professors, with the possibility of interventions and questions, verbally or even in chat [6].

The physical classrooms have been replaced by digital platforms offered by Cisco (figure 2), divided into:

- **General plenary room** used both by professors to conduct lectures but also to manage collective sessions, such as moments dedicated to project presentations, and to send broadcast communications.
- **Teamwork virtual room:** since Co.Meta is a course structured to have students work mainly in teams, virtual classrooms were created in Webex Teams, each dedicated to a specific group of students. These private rooms, open to professors, made it possible to give the teamwork guidance on specific issues and review the work throughout the process.

Moreover, for the first months of the course, the didactics was managed by alternating online and on-classroom lectures. During the first days of the project launch, the physical presence in the classroom was preferred. However, students were guaranteed to follow the lectures also remotely thanks to the hybrid mode. Hybrid classrooms were therefore used in parallel with virtual classrooms:

- **Hybrid classroom:** After the first wave of the coronavirus and with the gradual reopening in September 2020, all the Politecnico's classrooms have been equipped with systems that allow to have both online and offline students at the same time. Classrooms were equipped with cameras and environmental microphones and systems connected to the Cisco Webex virtual classrooms. In this way, Politecnico di Milano allowed students, unable to be present in the classroom (because they were in quarantine, because they were immunocompromised or because they lived in other cities) to follow the lectures at a distance. Unfortunately, this system was used until October because of the second wave of the virus in Italy, which again forced to move the education fully online

this has undoubtedly increased professors' workload but, at the same time, gives them the opportunities to learn more tools and different ways to manage the didactic.

3.1 Weakness

Given this assumption, one of the main limitations is undoubtedly the **lack of field research and study of users**. User research is the systematic study of target users and their needs in order to add realistic contexts and insights to design processes. In doing so, designers adopt various practices that allow them to explore the context in which the user they are designing for lives and identify his/her needs. Field research is important to reveal valuable information that can be incorporated into the design process [17].

Especially for a topic such as autism, for which designers need to have a deep knowledge of the users' needs and understand how they move and interact with the environment and the stakeholders in it, the lack of research and direct observation of the user can be a limitation that compromises the quality of the design ideas. For the designer field research is also an indispensable sort of "*in his/her shoes*" exercise that not only has the very practical goal of leading to meaningful observations and insights, but it allows young designers to approach to such socially relevant theme more deeply, more emotionally involved, possibly triggering the questioning on their role in the society and maybe find an authentic motivation that goes beyond the final mark.

In past editions, thanks to the network of companies and associations with which the professors' staff collaborate, students have always been given the opportunity to visit therapeutic centers and to interview or observe people with ASD and their caregivers. The Coronavirus compromised any possibility of carrying out these visits and meeting the users.

Therefore, students used other means to gather information about users by applying blue-sky research. For instance, students have conducted remote interviews with caregivers and experts on the topic; have consulted forums and blogs devoted to autism; have watched web videos or movies depicting possible behaviors; have read books in which the main characters were people with ASD. These alternative research methods to gather user's information have been adopted to fill the void left by field research in the design process. In addition, the teachers provided the students with the material produced by field observations in previous years. As is often the case in design, limits have become opportunities for students who have managed to embrace them. Unexpected themes emerged that would have been impossible to deal with using a traditional research approach because they pertain to the private sphere that a researcher in the field, even an expert one, can hardly grasp, such as the relationship with sex. These themes are, however, effectively dealt with in literature and film and can be inspiring.

Another big issue is related to the problems directly connected with the provision of online distance such as the **inadequate tools and the loss of concentration**.

Students have some difficulty in having adequate individual conditions that allow them to work optimally. The difficulties are in terms of both equipment, such as a personal computer or a stable internet connection, and creating a protected and quiet environment that facilitates their focus. For instance, many students found themselves forced to share the space with their families, which could distract and take attention away from their tasks.

During class hours, it proved very difficult to keep students focused in front of a screen for many hours a day. The rhythms that the course usually has in face-to-face teaching proved to be too heavy for the students. In fact, one of the major problems connected with distance learning is precisely the difficulty in maintaining concentration and fatigue due to the devices used.

Zoom fatigue is a recognised condition. *Zoom fatigue' describes the tiredness, worry, or burnout associated with overusing virtual platforms of communication* [18]. Popular media have picked up on this phenomenon worldwide. Some have suggested that micro delays in audio and prolonged attention to low-resolution, poorly lit portrait images of participants contribute to fatigue [19].

Another issue related to the extensive use of screen devices is that those are designed to provide constant feedback from various applications that constantly send notifications (e.g social media, emails, other apps, etc...) that fragment the attention span.

This relates to another problem regarding the perception of workload. After the end of the course, in the evaluation questionnaires, completed by the students, it was found that for them the workload required to successfully complete the course was considered too demanding. In fact, given the limitations of teaching entirely online, students felt that the demands made by professors on the outputs to be delivered required too much effort. If what emerged is compared with the students' evaluations of previous years, this excessive perception of the workload is particularly evident.

Another important limitation of distance learning, which unfortunately cannot be easily overcome, is the **lack of interaction between students in the classroom**, peer learning and group working.

Although students work in teams, and thus interact with peers, during traditional instruction the social dynamics simultaneously involve their relationships with teammates and other students in terms of peer learning and adaptability. The interactions within the class trigger mechanisms of mutual creative influence and the exchange of opinions and ideas between peers, important to clarify doubts and to create brain storming diamonds capable of transmitting innovation. Obviously, the class dimension was lost and the moment of confrontation with colleagues' work was almost totally lost. The peer comparison is essential to get valuable results and shared by the entire class.

This lack of social interaction among students also affected the quality of the social interaction with professors. We sometimes felt a sort of polarization between us, the professors, and them, the students, creating the perfect ground to peer-to-peer background information exchange that sometimes overrode the possibility to ask for clarifications directly to professors.

Online distance often creates a much **stronger empathy barrier** between students and professors than traditional teaching. This is because a screen always mediates the interaction between the parties. Unfortunately, online teaching does not help particularly shy or lazy students who already have low-profile in the real classroom and risk becoming "*invisible*" with distance learning. This is because, it is easier for professor to identify problematic situations in the traditional classroom; in classroom the professor receives much more feedback from students' behaviour, especially non-verbal feedback, difficult, if not impossible, to obtain online. Fortunately, this problem was solved by the Co.Meta course thanks to the division of the class into small working groups (maximum 4 students per team). In this way, the professors dedicated time to each individual team, and it was therefore easier for them to identify potentially problematic situations in the class. Additionally, after the first open review period with all staff present, each team was assigned to a specific professor based on their project topic. Students perceived this as a clearer perspective highlighting the need to have during distance learning accurate input. Looking at the learning pathway, this reduced the enrichment of ideas and openness, but it definitely helped give students more detailed and more consistent support review by review.

In conclusion, the most significant limitation is the **lack of sociability**, which is very much affected online. Social relations are compromised at various levels, both in the broader level of the relationship between professors and class and in the relationship among group members. Especially in the last case, it was a barrier that made the difference in the course experience. Although the team works met in virtual rooms, the group dynamics were compromised, which did not help a more fruitful exchange of ideas. To be precise, team meetings in virtual classrooms, although more efficient, lacked social pleasantries, such as frequent breaks and informal chatting, which strengthen group dynamics and individual's sense of belonging to that group.

Moreover, another aspect that compromised the generation of disruptive ideas in some cases was the **lack of stimuli** from the external environment. For a designer, it is crucial to be in contact with the external environment in order to get inspiration and to expand his ideas. An uninspiring environment or even living in the same room all day long can cause a flattening of ideas. Often ideas arise from shifting the point of view on something and changing the place physically helps to see uninvolved other possibilities. It seems that moving the body does help to move the mind as well.

Consequently, the almost total lack of social relationships has compromised the development of students' soft skills. Skills that the university environment and group work foster but can be heavily compromised in effectiveness and impact in a fully online environment.

3.2 Opportunities

As already mentioned, distance learning offers opportunities, which could be points of reflection for future educational provision. The main benefits inherently relate to the digitization of the teaching method and the digital tools used.

Recording all lectures, specifically the theoretical ones, helped the students study and keep track of the discussed topics. Having the recording of the classes is very important for both teachers and students. Students can refer to the lecture both as a study tool and as a support for doubts and misunderstandings, thus relieving teachers from an unnecessary repetition of the topics covered. Teachers can refer to the recording later to keep note of questions and doubts emerged from students in order to improve the way new knowledge and concepts can be introduced, explained and exemplified. This can of course be great value in understanding how information can be transferred efficiently and successfully but also what communication tools and visuals are more effective to keep and maintain a good level of attention and engagement. Since all teaching was done digitally, the material produced was also digitized creating a shared **repository** of student progress and outputs. This has reduced waste (e.g., the reduction of printouts of material for project reviews) and made it possible to keep track of and archive all material produced by students. Specifically, in the design course, the digitalisation of outputs has been particularly appreciated for the increase in representation skills that students have demonstrated in material return. Distance learning, which compromises specific relational dynamics, has forced students to produce more precise and more "*talking*" outputs from the first design ideas. This was done to facilitate communication with professors as students often sent chat files to professors to ask for advice and feedback. Therefore, the outputs shared via chat had to be clear enough to be understood without further explanation. This aspect demonstrated a much better output of the final material than in the other years of the course, where sometimes students, relying on in-presence communication, could afford to explain their ideas only with sketches on paper that were not helping them in the first place to have a deep understanding of the idea. This difference was noticeable not so much in the final deliverables as in the students' work in progress material.

Moreover, the team's digital rooms made it possible to save chats with professor's comments and file sharing. The chats became real **online repositories** showing all the progress and all the materials produced by the teams. These repositories are helpful for professors to evaluate the progress of the students and give more focused feedback. At the same time, students could always use that written reference to stay focused on our guidance toward a precise goal for their work and efforts. This is particularly important in a meta-design course where tools are used indeed to extract useful insights, but also to train students in adjusting all the time both the scope of the research and the nature of their design goals.

Online chat has proven to be a useful tool that makes it easier for students to interact and ask real-time questions during lectures. With chat, students feel more relaxed and freer to talk than asking questions during traditional lectures. The chat also allows students to ask questions instantly, at the moment of doubt, without waiting until the end of the lecture. In fact, although the professors will read the questions at the end of the lecture, the student can write the request in chat at any time. In addition, the always-on internet connection and screen sharing helped students and professors to manage their mutual discussions and their **synchronous collaboration**.

Visual support and real-time sharing guided the brainstorming moments. In terms of both synchronous and asynchronous collaboration, the use of the Miro platform has been particularly effective. This tool has allowed the collaboration of teams in brainstorming sessions but also in the generation of ideas. In fact, in addition to being used synchronously by multiple users, the whiteboards could be shared with professors. Another benefit of Miro, which is not to be underestimated [20], is that it works from a browser and does not need to be downloaded.

Other benefits relate to the way the course was run and how the Co.Meta staff organized the teaching activities.

To overcome the impossibility of a physical meeting and make students feel more supported in their learning processes, professors held much **more frequent evaluations** of students' work in progress, giving them constant feedback, even outside of class time. This broke the old concept of the design course where students get feedbacks live once a week at revisions and introduced a reduction of distance between students and professors' feedbacks, creating an environment where exchange of points of view and ideas was freer and faster.

In conclusion, the distance learning experience was advantageous to learn how to **organise the day's activities systematically**, with a tighter schedule, alternating face-to-face lessons with moments of punctual team support, thanks to active learning methods and frequent moments of sharing with the whole class to test the students' attention and learning level. It was also necessary to define some rituals and predetermined collective moments during the day's programme as three main fixed

moments: 1) a collective meeting in the morning to give the guidelines of the day and introduce the day's lesson; 2) a moment before the lunch break for discussion, open to questions and doubts; 3) a final moment with a balance of the day and a summary of the next lecture activities.

It may seem insignificant but having these three fixed moments helps to mark time and consolidates habits, simulating the condition in presence. A detailed programme of activities to be carried out together or in separate groups is provided each day [15].

4 CONCLUSIONS

Remote work is becoming the new normal [20], and even after the end of the pandemic, some dynamics that we were forced to use because of social isolation will remain in our daily lives.

The experience of Co.Meta has shown that a strong preparation and a well-organized structure of the course allowed to obtain satisfactory results even with distance learning after an initial moment of uncertainty. Although some essential elements of the design process, such as live research with users, were missing, the outputs that students produced at the end of the course were very satisfactory. The students, adequately followed by the teaching staff, were able to investigate the topic of autism deeply and maturely, generating meaningful concepts.

Compared to previous editions during the ninth edition, students have shown a greater awareness of inclusion, exploring new issues and generating concepts with a substantial social value. The concepts developed are moving more and more in a *design for all* direction, approaching the world of autism in a highly inclusive way, removing stigmas and taboos. One of the most appreciated concepts developed by the students investigated the sexuality of people with ASD during the delicate phase of transition to puberty. Even technology, if it is present, is used with greater awareness and attention by designers. In the projects presented, technology is embedded, not pervasive, but humanized. Moreover, the projects are increasingly moving towards a product-service dynamic that not only thinks about satisfying needs at a specific time, but the project aims to accompany the user in a logic of continuous and lasting improvement of his quality of life, taking into account all the stakeholders involved.

These results were certainly possible because of the constant feedback the faculty provided to students. *Feedback is an important part of the design process. Frequent check-ins for feedback prevent designers from going too far in the wrong direction* [20].

As in traditional didactics, even in distance learning, the choice of tools is crucial for the student's learning objective to be satisfied. This totally online experience has allowed the design course to experiment and evaluate different platforms to deliver didactics and experiment with collaboration tools, evaluating their benefits and limitations.

The Politecnico di Milano School of Design's curriculum believes strongly in the on-site dimension and is committed to providing a safe return to the classroom for all of its students. Particularly for design courses, it is very important to ensure that future generations of designers receive an education that is not completely online. However, Covid-19 has brought a level of innovation that is bound to grow. For the future, the real challenge will be finding the right balance between online and on-site [5], also in the design field.

REFERENCES

- [1] J. Crawford *et al.*, "COVID-19: 20 countries' higher education intra-period digital pedagogy responses," *J. Appl. Learn. Teach.*, vol. 3, no. 1, 2020, doi: 10.37074/jalt.2020.3.1.7.
- [2] L. Mishra, T. Gupta, and A. Shree, "Online teaching-learning in higher education during lockdown period of COVID-19 pandemic," *Int. J. Educ. Res. Open*, vol. 1, no. June, p. 100012, 2020, doi: 10.1016/j.ijedro.2020.100012.
- [3] A. Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, "The difference between emergency remote teaching and online learning.," *Educause Review*, 27 March., 2020. <https://er.educause.edu/articles/2020/3/thedifference-%0Dbetween-emergency-remote-teaching-and-online-learning>.
- [4] C. Rapanta, L. Botturi, P. Goodyear, L. Guàrdia, and M. Koole, "Online University Teaching

- During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity,” *Postdigital Sci. Educ.*, vol. 2, no. 3, pp. 923–945, 2020, doi: 10.1007/s42438-020-00155-y.
- [5] T. Agasisti and M. Soncin, “Higher education in troubled times: on the impact of Covid-19 in Italy,” *Stud. High. Educ.*, vol. 46, no. 1, pp. 86–95, 2021, doi: 10.1080/03075079.2020.1859689.
- [6] R. Fedele, “Quale didattica universitaria per gli anni post-covid ? Quale didattica universitaria per gli anni post-covid ?,” *LaCroce Quotid. Digit.*, 2021.
- [7] E. Giaccardi and G. Fischer, “Creativity and Evolution: A Metadesign Perspective.”
- [8] V. Arquilla, G. Simonelli, D. Genco, and F. Guaricci, “Innovative Learning in Metadesign. an Inclusive and on Field Didactic and Research Approach for Designing Meaningful Products and Services for Autistic People,” *INTED2019 Proc.*, vol. 1, pp. 8983–8992, 2019, doi: 10.21125/inted.2019.2236.
- [9] R. V. Donald A. Norman, “Incremental and Radical Innovation: Design Research vs. Technology and Meaning Change,” vol. 30, no. 1, 2014, doi: 10.1162/DESI.
- [10] I. VITALI, V. ARQUILLA, and I. RIFINO, “Design for Meaning of Smart Connected Products,” *Conf. Proc. Acad. Des. Innov. Manag.*, vol. 2, no. 1, 2019, doi: 10.33114/adim.2019.03.251.
- [11] IDEO, “Service Design Course: Human-Centered Service Design – IDEO U.” <https://www.ideo.com/products/human-centered-service-design> (accessed May 09, 2021).
- [12] Microsoft, “Microsoft Design.” <https://www.microsoft.com/design/inclusive/> (accessed May 12, 2021).
- [13] C. R. Graham, “Blended learning systems: Definition, current trends, and future directions,” *Handb. blended Learn. Glob. Perspect. local Des.*, no. January 2006, pp. 3–21, 2006.
- [14] M. N. Tsai, Y. F. Liao, Y. L. Chang, and H. C. Chen, “A brainstorming flipped classroom approach for improving students’ learning performance, motivation, teacher-student interaction and creativity in a civics education class,” *Think. Ski. Creat.*, vol. 38, no. 162, p. 100747, 2020, doi: 10.1016/j.tsc.2020.100747.
- [15] M. Parente, “E-LEARNING METHODS FOR UNDERGRADUATE AND POSTGRADUATE COURSES IN DESIGN DURING THE COVID-19 EMERGENCY.”, *EDULEARN20 Proceedings*, pp. 8250-8257. <https://library.iated.org/view/PARENTE2020ELE>
- [16] “Storie di Innovazione Didattica: Domenico Brunetto – blogmetid.” <http://blog.metid.polimi.it/?p=577> (accessed May 06, 2021).
- [17] “What is UX Research? | Interaction Design Foundation (IxDF).” <https://www.interaction-design.org/literature/topics/ux-research> (accessed May 05, 2021).
- [18] “A Neuropsychological Exploration of Zoom Fatigue.” <https://www.psychiatrytimes.com/view/psychological-exploration-zoom-fatigue> (accessed May 06, 2021).
- [19] “Zoom Fatigue: What We Have Learned.” <https://www.insidehighered.com/digital-learning/blogs/online-trending-now/zoom-fatigue-what-we-have-learned> (accessed May 06, 2021).
- [20] “Remote Design Work: Top Challenges.” <https://www.nngroup.com/articles/remote-design-challenges/> (accessed May 09, 2021).