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Rethinking Experiential Learning in Design Education

The Shift of the Systemic Design Course to a Multimodal Online Learning Environment

Alessandro Campanella, Eliana Ferrulli and Silvia Barbero
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The outbreak of the Covid-19 pandemic has generated serious consequences on the higher education sector, highlighting its existing vulnerabilities and forcing it to face complex challenges. However, the current situation can also be seen as an opportunity to deeply rethink the learning activities and the environments in which they are carried out, whether online or in the classroom, designing long-term innovation plans that extends beyond the end of the crisis. The paper aims to explore the process of redesigning an experiential and social learning course for an online learning modality. The reported case study, the Systemic Design course held in the M. Sc. in Systemic Design at Politecnico di Torino (Italy), was analysed in order to identify and address its main challenges, related to the redefinition of its learning activities and the improvement of the interaction and cooperation between the different actors in a context of social distancing. The project led to the adoption of new strategies and tools, tested on the course itself.

Keywords: Systemic Design; Systemic Education; constructivist teaching; experiential learning; social learning.

1. Introduction

The current Covid-19 pandemic has generated significant consequences on most aspects of our lives. The need for social distancing has imposed the substantial, quick, and unplanned reorganization of many human activities, sometimes determining a strong shift from their traditional forms.
In this scenario the educational sector suffered heavy consequences, from primary to higher education. Teachers and students were forced to overnight change strongly consolidated habits and to shift from a physically shared learning environment to an online one, in order to ensure continuity in the educational processes.
Online learning is a well-established practice that has seen a remarkable development over the last decade, also thanks to the increasing growth of Massive Open Online Courses (MOOC) platforms (Yuan & Powell, 2013; Liyanagunawardena, Lundqvist, Mitchell, Warburton & Williams, 2020).
The forced transition to online teaching and learning has encountered various critical issues under many aspects, from the social to the technological, methodological, and organizational point of view, mainly due to the substantial unreadiness and inexperience of the actors involved in the process (Wunong, Wang, Yang & Wang, 2020). This condition has significantly accelerated, albeit not spontaneously, the adoption of online educational forms, offering an unrepeatable opportunity to test and experiment innovations capable of generating long-term effects on the educational sector.
For what concerns higher education, some examples of how different courses have been adapted to better fit the new global scenario can already be found in literature. However, this adaptation process entails further challenges in the case of experiential courses, in which the activities and the interaction within the teaching space are essential elements of the learning experience. Some useful examples can be found in relation to STEMM disciplines, requiring extensive use of specific equipment to carry out hands-on experiments. Bhute, Inguva, Shah & Brechtelsbauer (2021) describe different online and hybrid modes for those disciplines and they also define the tools and the resources needed to enable the transformation towards new learning

environments.
However, narrowing the research to experiential courses belonging to the field of design, it emerges that the literature is still incomplete and fragmentary, mainly because of the recent and unprecedent time in which those processes took place.
Consequently, this paper aims to specifically focus on the online transition of experiential design courses in higher education in order to determine which design actions become necessary when the condition of unity of place-time-action is deprived of its first element, the physical space. This question is addressed through a specific case study, the Systemic Design course held at Politecnico di Torino (Italy). This course is characterized by a peculiar learning approach and social structure and it offers a unique opportunity to tailor an effective online learning experience.
The paper is structured as follows. The case study section is dedicated to an overview of the course, with a particular focus on its educational approach. The following section defines the methodology used to design the transition from a physical to an online environment and the three identified challenges. In the fourth and fifth section the project is presented and its outcomes are reported and discussed. Finally, the main findings and limitations are defined in order to state the challenges and opportunities related to the current scenario, aiming to set new trajectories for the Systemic Design education and, in general, for experiential courses.

2. Case Study

The relevance of the presented case study is given by its learning environment, which was historically meant as the context in which relations between the actors of a learning community take place and not just as a space providing tools and equipment useful for the fulfilment of specific activities.
The Systemic Design course takes place in the last term of the Master of Science in Systemic Design "Aurelio Peccei" at Politecnico di Torino. It is part of the Open Systems module, consisting of four strictly connected courses providing theoretical, methodological and design tools to face complex problems related to the environmental, social, and economic sustainability of a given scenario, with a holistic approach. The four courses are Procedures for Environmental Sustainability, Economic Evaluation of the Projects, Theory and History of Systems and Systemic Design. The courses work together to create a cross cutting and transdisciplinary learning environment, according to the definition of Piaget (1972).

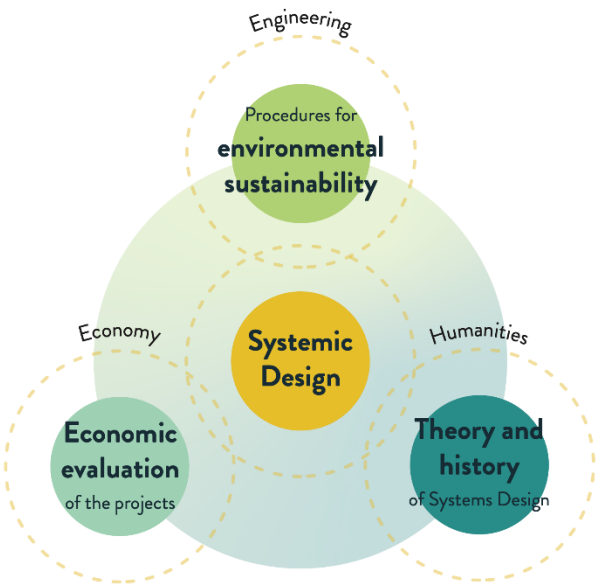

Figure 1. Representation of the four courses of the Open Systems module

The Systemic Design course has a twofold nature: it coordinates the other disciplines and it is primarily involved in the development of the projects carried out by international students in a real experimentation lab. The course aims to design the flows of energy, matter and information of a given productive process and its context in order to generate a new open and autopoietic system based on the relationships between its actors, in which the outputs of a process become inputs of another one (Bistagnino, 2011). In this perspective, the Systemic Design methodology (Bistagnino, 2011; Battistoni, Giraldo Nohra & Barbero, 2019) is taught, which is readapted into four key moments, given the specific educational context:

1. **The Holistic Diagnosis**, a mapping of the state of the art in which a quantitative and a qualitative analysis of the context is performed at different levels of investigation (social, economic, environmental) and visualized via infographics and gigamaps.
2. **The identification of challenges** of the context **as opportunities** for the new systemic project.
3. **The Systemic Project,** redesigning flows of energy and matter and valorising the waste as a resource.
4. **The Study of the Outcomes**, evaluating the benefits for the territory at different levels (social, economic, environmental).

This methodology allows the student teams to work on real case study companies and to face a direct and effective learning experience, shortening the distance between academia and the productive world. Since 2018 more than 60 partner companies settled in Piedmont Region (Italy) have been actively involved in the course, cooperating with students to redesign their productive model. Those companies span from small to large enterprises and belong to different sectors, including agri-food, textile, building and construction, engineering, cosmetics, and others.

The educational approach of this course is strongly influenced by Systems Thinking theories and practices, deeply rooted in the theory of complexity, which evolved on the basis of Von Bertalannfy's General Systems Theory (1968) and which influenced the Cybernetics Theory, the works of Odum on ecosystem ecology (1975) and Capra's living systems (1997). Moreover, it is connected to the Constructivist Theory of education, in particular for what concerns the contributions of John Dewey (1938), Jean Piaget (1950) and David Kolb (1984).

With this strong theoretical and methodological background, the key features of a Systemic educational approach can be summarized as follows:

- It aims to develop a holistic, critical, and connected mindset in the learners.
- It identifies the experiences as sources of learning.
- It generates circular flows of information and knowledge instead of linear ones.
- It is based on the active role of the actors of the educational process and their mutual relationships.

For what concerns the given case study, those principles have shaped the structure and the methods of the course and are put into practice with different solutions and strategies (Battistoni & Barbero, 2017).

The transdisciplinarity of the module allows the enrichment of the four involved disciplines thanks to their mutual influence and contamination, creating new fluid relationships between the different contributions (Celaschi, Formia & Lupo, 2013; Peruccio, Menzardi & Vrenna, 2019). Moreover, this process contributes to the development of co-disciplinary skills in the learners (Blanchard-Laville, 2000). Such an asset is fundamental for the role of the Systemic Designer intended as a mediator between different disciplines (Celaschi, 2008).

In order to create an experiential learning environment, the Systemic Design course adopts a learning-by-doing approach, derived from the theories of John Dewey. As he stated in "Experience and Education" (1938), fruitful experiences can positively influence the learner's development, both in the short term (with their agreeableness) and in the long term (with their impact on the future experience, the so-called experiential continuum). Those principles are applied in the course with a project-based learning, allowing students to directly approach the real world and its complexity. Experiences are not limited to the above-mentioned situations, in fact every activity, from the group work to project reviews involving students and teachers, becomes a learning experience capable of developing some useful skills in the students.

Lectures are also designed as condensed methodological contributions, in which students can build new knowledge by inter-relating the new content with their previously acquired notions without falling back into a transmissive, hierarchical, and passive learning modality. This required the re-definition of the role of the professor, who becomes a mentor and a facilitator of the learning process (Forbes, 1994), adapting his approach towards the learners according to the specific activity carried out in the class (Kolb, 2017).

All those features help to emphasize the importance of relationships within the physically shared educational space, in bidirectional flows: among student teams and professors, among professors and among students, giving shape to an active educational community which is the foundation of the course itself.

However, the social distancing has dealt a heavy blow to the course, depriving it of its physical learning environment and jeopardizing its success. Consequently, the need to design innovative solutions to deliver the course in an online mode has emerged, answering to the weaknesses of current experiences where the traditional educational model has simply been proposed in an online version.

3. Methodology

Given the background stated above, the course has been redesigned taking advantage of the Holistic Diagnosis tool (Battistoni, Giraldo Nohra & Barbero, 2019). The first step consisted in fact in the analysis and the

visualization of the whole module, taking into account the actors, their activities and interactions, the structure and the timeline of the courses, the teaching contents and methodologies and the required deliverables. Therefore, three main challenges have been identified:

1. Redefine the way in which the educational activities are carried out, in order to maximize interactivity.
2. Preserve and improve the effectiveness of the interactions among the actors of the course.
3. Identify new ways to ease remote activities such as group work, cooperation, and discussion between peers.

The following steps of the methodology consisted in the research, the comparison and the definition of the best strategies and tools to face the previously mentioned challenges, which were then integrated in the new educational model currently being tested in the course.

4. Project

In order to address the challenges of the online transition, different methodological, organizational, and technological solutions (De Rossi & Ferranti, 2017) have been analysed, following these selection guidelines:

- the active involvement and collaboration of the actors must be preserved;
- the activities must be conveyed in ways capable of guaranteeing their effectiveness;
- the activities must be characterized by a strong coherence and continuity;
- the tools used in the course must be highly integrated;
- the experience must be accessible without strict technological requirements.

The following paragraphs better explain how the challenges outlined in the methodology section have been addressed.

4.1. Redefine Activities

The first action aimed to increase the duration of the relational moments through the definition of a new balance between theoretical lectures and project reviews. A flipped classroom approach has been consequently adopted, turning a considerable number of lessons into short methodological videos released on YouTube. A Q&A session is scheduled after the release date of each video in order to ensure a deep understanding of the contents.

The videos, starring the course teaching team, are shot with professional equipment and are enriched by texts and animations, emphasizing the key concepts. Their maximum length, about 7 minutes per each unit, was determined on the average student engagement in MOOC videos (Guo, Kim & Rubin, 2014).

A large number of hours, previously occupied by lectures, is now dedicated to the “Systemic Design Talks” in which international experts are involved to deepen the course methodology with their contributions and through open discussions.

Figure 2. A frame retrieved from a Systemic Design lecture, released on the Systemic Design Lab YouTube channel (https://www.youtube.com/channel/UCQSHSdMlqXgG-uSbay8TUqQ/about)

4.2. Improve Interaction

In order to grant a high level of interaction, it was necessary to integrate other tools in addition to the current video conferencing platforms, aiming to shorten the distances and facilitate communication between all the actors involved, even beyond the lesson time.
Consequently, Slack, a business collaboration tool, was selected and transferred to the educational context. This platform allowed the creation of thematic channels for the different courses, workgroups, and topics as well as private ones, allowing new moments of discussion and insights.
Compared to traditional emails and to the Politecnico learning platform, this tool provides greater speed and more communicative possibilities, as well as integrations and bots. If properly exploited, Slack also allows to emphasize the boss-less approach, enabling a more informal communication between professors and students.

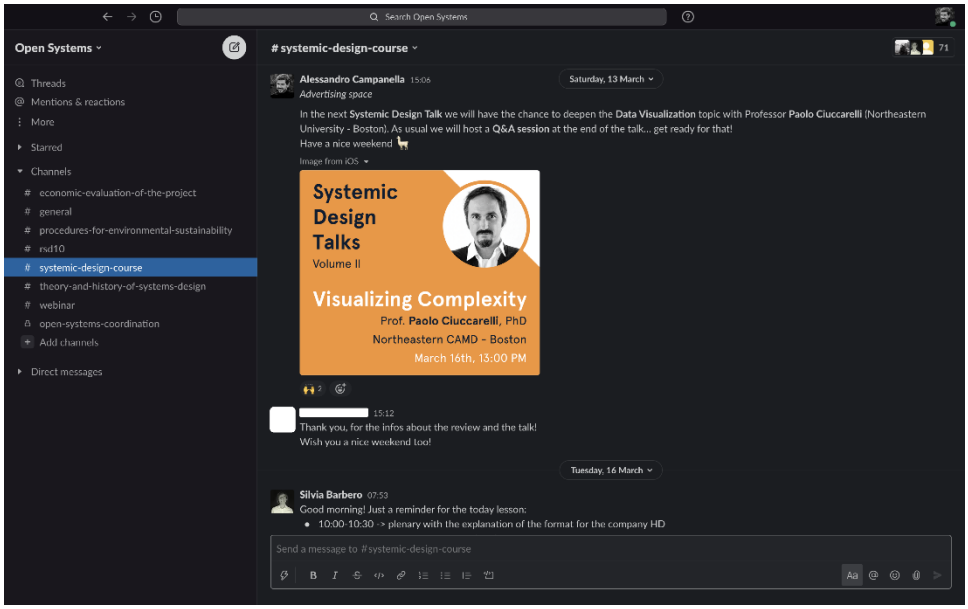

Figure 3. A screenshot of the Open Systems Slack workspace

4.3. Ease Remote Cooperation

The analysis of the activities of the working groups allowed to identify those most influenced by social distancing, that is visual mapping of territorial gigamaps and systems. The first stages of the activity often made use of sticky notes and freehand representations in order to build non-linear and interconnected visualizations (Sevaldson, 2011), then processed with vector graphics software.
The Miro board has the right features to bridge this gap, in fact it provides a shared and multi-user virtual space in which students can view, manage, connect, and comment the analyzed data and their visualizations, ensuring an effective and simultaneous teamwork experience.

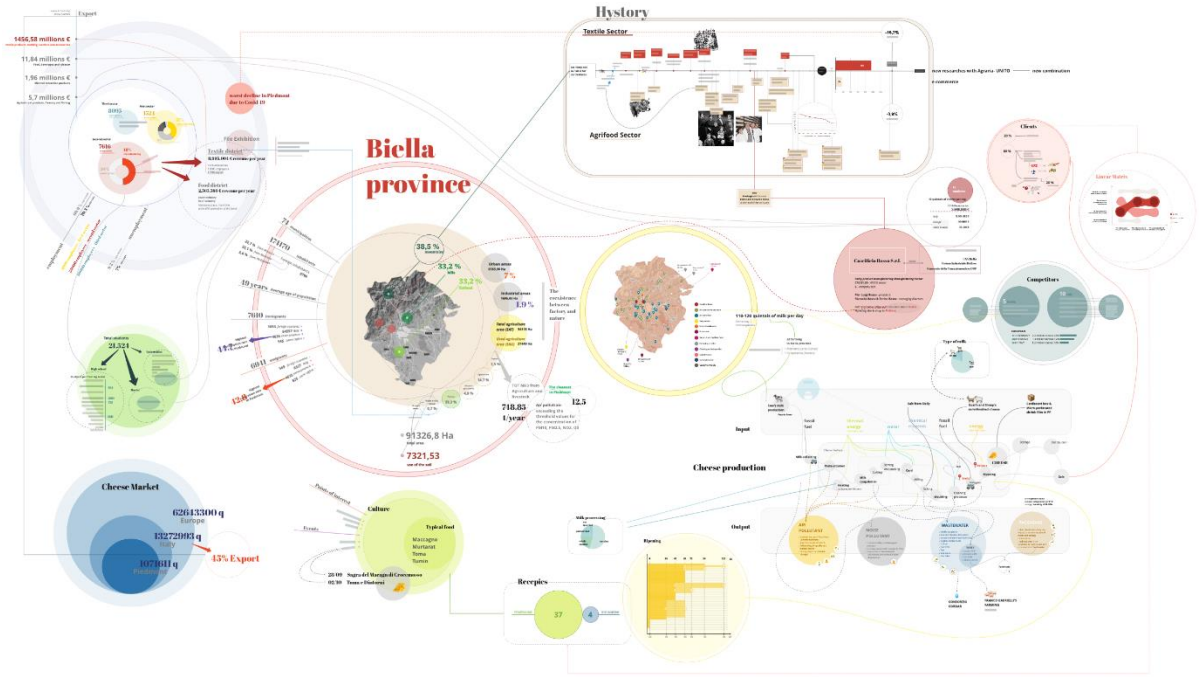

Figure 4. A territorial gigamap made on Miro, courtesy of A. Marchesi, F. D. Moldovan, M. Puglielli, W. Tonelli, M. Troppino and X. Wu.

5. Project Outcomes

The redesign of the Systemic Design course has been completed in January 2021 and it has been tested for the first time during the 2021 semester (March – June). In order to evaluate its results, two different approaches have been adopted: the first one consists in the teaching team's constant collection of qualitative and quantitative data on the overall learning experience, which have been analysed and compared with the ones gathered during the previous course editions, while the second implies questionnaires and open discussions aiming to better understand student's opinions and feelings.

Based on empirical data collected during classes and on questionnaire results, students reported a high rate of satisfaction concerning the clarity and quality of the video lessons. Thanks to the theoretical and methodological background provided through the video contributions, they have proved to be able to confidently master the methodological contents and to apply them into their projects. In the same way, Systemic Design Talks have been appreciated by the majority of students, who frequently interacted with the various international experts during the Q&A sessions hosted after each Systemic Design Talk.

Concerning the use of Slack, a high percentage of daily active users has been reported (90%-100%) and almost 30% of them were posting and interacting on a weekly basis. This tool has been exploited by the teaching teams of the whole module to quickly update the class about their courses and to frequently give them detailed information about the schedule and the required deliverables. Regarding the interaction between teachers and students, many of them took advantage of this tool to directly connect with the teaching team, explaining their doubts and asking for clarifications and advice.

Anyway, despite its evident strengths, Slack has never been exploited by the students to openly discuss and conversate about topics related to the course itself. It is therefore evident that this kind of online platforms are not the best tool to host and support those activities, for which, according to the students themselves, physical presence is still an essential element. This reticence has also been noticed during the Q&A sessions held on Zoom, in which some students struggled to overcome the psychological barrier represented by expressing their opinion in front of their classmates during an online lecture. Instead, the introduction of poll and open questions supported by tools like Mentimeter contributed to lower the psychological barrier, thus facilitating interaction during these sessions.

Miro, instead, played a key role in the whole module. It allowed the groups to reach an outstanding level of visualization richness and complexity, especially if compared to the works produced in the previous editions of the Systemic Design course. Obviously, some groups encountered several difficulties in carrying out their projects remotely, but the vast majority recognised that the widespread and systematic use of Miro really changes the experience of the online course for the better, as it represents a highly efficient tool to work on

complex data without meeting in person.
Combining all those considerations, a promising scenario can be envisaged: the selected tools and strategies are generating positive effects on the educational environment, actively contributing to shorten the gap given by the absence of a real shared space. The integration of the recorded video lessons, the weekly reviews and the interactive live discussions are witnessing to be a useful way to preserve the relationships among the actors of the course, while supporting the effectiveness of the interactions and the activities.
Anyway, some of the natural nuances of human relationships, typical of the experiential and social learning environment, tend to emerge with greater difficulty in such virtual contexts. Despite having little apparent relevance, the informal interactions established between students in the physical space are important catalysts of possible relationships. Indeed, these interactions help to weave connections between groups, to confront each other, to overcome common problems or simply to socialize and empathize as actors belonging to a common social context.

6. Conclusions

The current pandemic has posed major challenges in the educational field. In the case of the Systemic Design course, run at Politecnico di Torino (Italy), these have been addressed as opportunities to innovate the learning experience on the basis of consolidated educational methodologies. During course redesign phase, new strategies and tools have been identified to reshape the activities and to support interaction and collaboration.
It is possible to state that the main limitation of this new solution lies in the difficulty, given by the virtual environment, to encourage spontaneous and informal interactions. In this regard, the digital solutions introduced in the course are fundamental and efficient tools and, at the same time, barriers that often stand in the way of informal and instinctive communication. Despite the exceptional results reached by most of the groups under the lens of the project results, the lack of a common and physically shared experience determined a less solid and remarkable connection between the teams. This is evident from the tendency to individualism that has sometimes been developed by the groups, a phenomenon that was much less prominent in the previous editions of the course.
Another criticality can be found in the lack of unified digital solutions integrating the different tools required by the case study course, even among the most popular Learning Management Systems. Consequently, the forced adoption of different standalone tools has sometimes resulted in a fragmented user experience.
The research also highlighted that it is necessary for professors to quickly acquire new digital and communication skills to better involve and engage the students. These new skills imply the essential and critical ability to innovate and change well-established habits (Humphreys & Hyland, 2002).
Moreover, the holistic diagnosis performed on the systemic design class in a pre-covid scenario enlightened how the physical structure of the class and the distributions of the furniture hampers the relational dynamics at the base of this course. Thus, the future return to physically shared spaces will have to imply the re-thinking of the learning environments. The same analysis can be performed in other educational environments, highlighting challenges and opportunities, also considering that many of the obtained results will persist beyond the current crisis.
The case study has indeed some limitations, as it refers to a specific educational environment. However, most of the proposed solutions can be easily transferred to other courses and disciplines implying practical knowledge. In conclusion, this work aims to contribute to the discussion around the topic of online education in experiential design courses based on social interaction, favouring the comparison and sharing of possible innovative solutions.
Despite its limitations, the main contribution of this paper stands in the proposed model of integrated knowledge, strongly grounded on the Systemic Design methodology, which:

- redesigns the traditional learning experiences and environment, through a wise combination of synchronous and asynchronous activities, in order to maximize interactivity;
- preserves and, sometimes, improves the effectiveness of the interactions among the actors of the course, through communication tools;
- Identifies new ways to ease remote activities like group work, cooperation, and discussion between peers through collaborative virtual boards.

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Alessandro Campanella
Politecnico di Torino, Italy
alessandro.campanella@polito.it
He is a Research Fellow at Politecnico di Torino (Department of Architecture and Design). His current research focuses on the development of innovative educational approaches for Systemic Design in the academic field, implemented in the master's degree program in Systemic Design at Politecnico di Torino. In addition, he is collaborating on a multidisciplinary European acceleration program for SMEs supported by a MOOC platform.

Eliana Ferrulli
Politecnico di Torino, Italy
eliana.ferrulli@polito.it
She is a PhD student in Management Production and Design at the Politecnico di Torino (Department of Architecture and Design, 2020-2023). Her doctoral research focuses on fostering industrial innovation towards a Circular Economy framework, with particular attention to reinforce the connection between consumers and companies in building more resilient socio-technical systems, through Systemic Design.

Silvia Barbero
Politecnico di Torino, Italy
silvia.barbero@polito.it
She is an Associate Professor at Politecnico di Torino (Department of Architecture and Design). She is a lecturer of Product Environmental Requirements at the Design and Visual Communication degree and of Open Systems at the Systemic Design Master's degree at Politecnico di Torino. She is also responsible for the stage & job design curriculum. Her research mainly focuses on Systemic Design applied to territorial sustainable development.