Onboarding Future Systemic Innovation Designers Through Informal and Collaborative Activities

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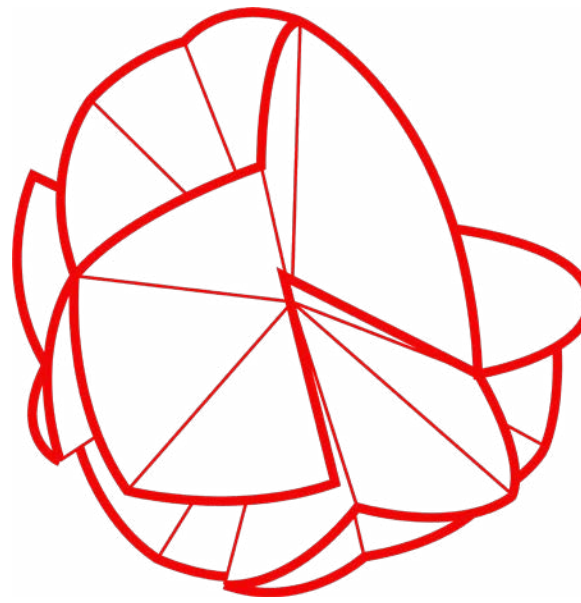

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New Education Pathways for Future Designers in a Changing World

Onboarding Future Systemic Innovation Designers Through Informal and Collaborative Activities

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Abstract
The contribution presents a collective learning system developed by the Innovation Design Lab team within the Innovation Module of the Master's Degree in Systemic Design of the Politecnico di Torino.

A strategy aimed at the development of all those soft skills useful to bring out the potential of the individual's contribution in projects of entrepreneurial, innovative, and sustainable impact.

The research shows the results of educational methodology that integrates digital ecosystems and collaborative tools, highlighting how, from the students' visions, emerges the urgency to design new future-oriented teaching-learning practices.

Keywords
Education
Systemic innovation design
Team building
Soft skills
Tools

Introduction

Technology is an agent of change within education, potentially transforming traditional modes of teaching and learning (Selwyn, 2019). Faced with new or unforeseen scenarios, experiences, skills, and methods, it seems outdated. If sudden changes in contemporary society have made — in the recent past — the educational system partly obsolete, the impact of the pandemic has been disrupting, making a complete redefinition of the educative act as urgent as ever. In other words, digital learning has been a logical approach worldwide to facilitate adaptation to a new normal and enhance educational quality (Humayun, 2020). What future lies ahead and what role remote teaching will assume — synchronous, asynchronous, or blended — is still difficult to predict today. However, the real challenge will be to treasure the experience of this period and to think about what elements of the formation of the future will be able to find in the digital system an effective and efficient tool for the personal enrichment of everyone.

The opportunity to apply an educational methodology that integrates digital ecosystems and telepresence equipment is increasingly attractive, with countless applications and possibilities to engage students in blended contexts. Digital learning created promising opportunities for educational institutions; however, there were challenges relating to technology, courses, instructors and learners (Händel et al., 2020; Shehzadi et al., 2020). The problems of implementing applications on teachers' and students' devices, limitations of technology platforms, quality of the internet, learner-teacher interaction, and limited training of teachers and learners regarding the online learning system influenced the effectiveness of learning in a digital environment (Dinh & Nguyen, 2020). In addition, the ability to adapt to immediate changes in a new situation would affect the future of online learning.

The contribution presents a collective learning system developed by the Innovation Design Lab team as part of the Innovation Module in the MSc degree program in Systemic Design at the Polytechnic of Turin. This strategy focuses on replicating and adapting teaching methods in a blended format to reinforce transversal skills crucial for fostering individual contributions in projects with entrepreneurial, innovative, and sustainable impacts.

Theoretical Framework

The design of a learning pathway is based on the knowledge that a class of students forms a community that generates a flow of ideas (Pentland, 2015). Collaboration between students during community building, team building and group work stimulates the exchange of skills and backgrounds, fostering collaborative and idea-generating processes. The educator plays a crucial role in designing collective learning experiences, using methodological and pedagogical tools to facilitate the circulation of ideas and guide innovative and design processes within student teams. Visual design, when used effectively, improves accessibility, stimulates interest and involvement and helps students make connections between ideas (Lohr, 2008, p. 15). The

pandemic-induced shift to virtual learning necessitated a re-evaluation of learning experience design. The use of visual languages and communicative processes, mediated by interfaces and human-device feedback, is crucial for effective learning event design. Graphic design principles make information more accessible and engaging (Lohr, 2008, p. 7).

Designing practical learning experiences in a digital environment requires strategies and content that support step-by-step learning events and provide clear rules and instructions to reduce confusion. Confusion can lead to frustration and negatively affect the educational value and overall perception of the learning experience (D'Mello & Graesser, 2012). For this reason, visual design and modular design techniques are employed to create digital content that aligns with the graphic and systemic design world, incorporating analogue and digital technologies and expressive languages. Research on text segmentation, spacing, typographic signals and semantic visualisations inform the educational basis for designing ways to help students understand text (Hartley, 1985; Mayer, 1984; Park & Hannafin, 1993). Distance education emphasises interactions between different parties and through various channels to enhance students' involvement in the learning process (Moore, 1989; Riggs, 2020).

The hypothesis is that integrating collaborative learning methodologies, visual design principles, and the effective use of digital tools within educational settings offers valuable opportunities for innovative and engaging learning experiences. This approach enables the development of essential skills, promotes an entrepreneurial mindset and prepares students to navigate the complexities of a rapidly changing world.

Educational Context

In the context of the Master's Degree Programme in Systemic Design, the focus is on developing designers who can collaborate effectively across disciplines and drive innovation in key areas (Gaiardo et al., 2022). Integrating the Systemic Innovation Design Methodology (SIDM) into the module promotes core competencies such as creativity, flexibility, adaptability and entrepreneurship (Gaiardo et al., 2022). The course explores productive, social and economic innovation with a multidisciplinary approach, particularly in food-related changes within a particular territory (Gaiardo et al., 2022).

In line with the educational scenario, the Innovation Design course embraces the learning by design method, a design-based approach that integrates design principles and practices into the educational process (Papert, 1991; Kolodner et al., 2003). The course aims to create a dynamic and interactive learning environment by immersing students in authentic design experiences and applying the Systemic Innovation Design methodology. This approach nurtures creativity, critical thinking and problem-solving skills (Gaiardo et al., 2022; Kolodner et al., 2003).

The collective learning system developed by the Innovation Design Lab team exemplifies the integration of learning-by-design methodologies within the Master's programme (Gaiardo et al., 2022).

By incorporating the principles of visual design and modular design, the educational experience becomes more engaging and accessible to students, enabling them to tackle complex design challenges and apply their knowledge in practical contexts (Lohr, 2008; Gu et al., 1997). Through collaborative projects and hands-on activities, students develop a deep understanding of design concepts and acquire the skills and mindset necessary for entrepreneurial, innovative and sustainable projects (Gaiardo et al., 2022). Promoting creativity, critical thinking and problem-solving skills, this approach provides students with the skills they need to succeed in a rapidly changing educational landscape (Kolodner et al., 2003). The integration of new digital tools and teaching methods in learning by design allows educators to adapt and provide students with up-to-date learning experiences to new design possibilities and the diverse needs of new generations of learners.

Methodology Description

Designing Learning in a digital environment

The model described expresses different pedagogical approaches to enhance transversal competencies mediated by digital tools: telepresence, simultaneous collaboration, and synchronous and asynchronous communication. In the education sector, large classes remain a popular method of instruction worldwide because of their cost efficiency (Yardi, 2008). An advantage of digital technologies is that they are highly scalable, can be improved from the assets already in place, or refer to a more extensive range of participants without additional investment and materials. In contrast, physical assets need to be rearranged and renewed according to the management and spatial requirements of the class each time they are held.

A collective learning system to enhance educational blended paths

To address the pandemic changes, the contribution presents a study on a teaching-learning model by developing a series of complementary activities to the course. The organizational process has also focused on some digital tools capable of amplifying collaborative and productive processes without ever losing that part of physical interaction.

The activities aspired to provide participants with opportunities for informal learning and to contaminate the course's critical concepts by integrating some soft skills of the methodology used (Gaiardo & Tamborrini, 2015) and, more generally, of the study's objective. In this way, it has been possible to relate the development of those skills to specific notions, together with the methods that are part of the methodological approach.

Sixty students represent the classroom sample, many attending the first year of the MSc degree. Each one of the planned activities was submitted during specific phases of the course Fig. 1. The aim was to stimulate the community's processes and prepare students for the subsequent phases of the development of the final project.

Summing up, activities 1, 2, 3, and 4 focused on enhancing individual and collective awareness of innovation's concept, which defined the class background. Activity 5, the Food Design Lab, aimed to expand participants' knowledge and critical thinking through a participatory and collective process, recreating learning conditions by doing and incorporating physical and analogue design processes to observe their emotional and cognitive impact.

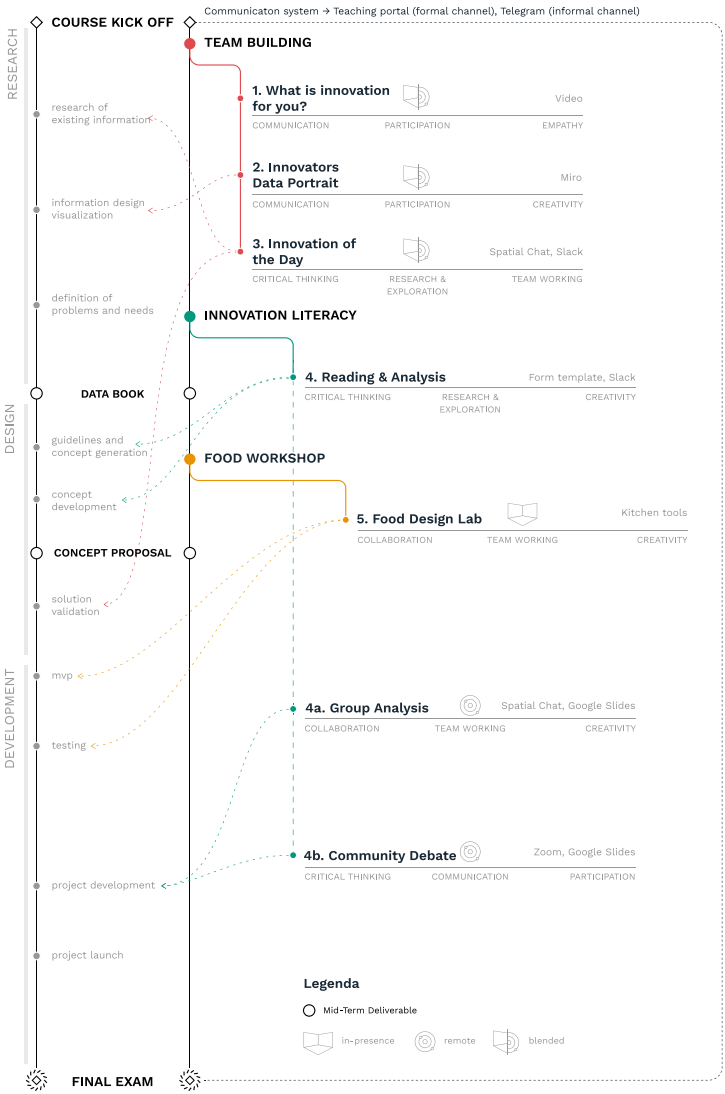

Fig. 1
Sofia Cretaio. *Learning path and activities*. Collective learning system to support the Systemic Innovation Design Methodology. Ph. Innovation Design Lab, 2021.

Knowing the context of action is the first step to developing innovative and sustainable outputs. The same principle is applicable in the construction of relationships within a university course: therefore, the first step was to get to know the students, asking them to answer, through a short video, the question "What is innovation for you?". By limiting the criteria for the realization to a minimum, students were free to narrate their idea avoiding the embarrassment of public speaking.

The question was then deepened in a second ice-breaker activity that introduced one of the first approaches of the SIDM: information visualization. Inspired by Giorgia Lupi's Data Portrait project, students were asked to portray their innovation idea using square and replicable elements. The activity, although individual, was carried out through a collaborative board on Miro Fig. 2, a meeting point between students in the presence and remotely.

The result is a visual curriculum in which the translation of personal information into data has generated a synthetic and inclusive language (de Freitas et al., 2021) of their course expectations.

Once the concept of innovation was defined, a more practical application of the topic was developed by proposing a series of Innovation of the Day research for cases study.

The activity required the random arrangement of groups and introduced to the students the second step of the SIDM: the search for qualitative resources to support the design-phase analysis. In this scenario, the involvement of students took place in a virtual space: Spatial Chat, a platform that allows — through avatars — to move in a digital environment like in a physical one.

Later, students were introduced to the design and development phases through a practical workshop focused on food matter. The theme "Visual Power of Food Surplus" allowed the participants to deepen the topic of food waste from a design perspective.

The students, organized in mixed groups, had to work with surplus products, overturning their semantic and aesthetic characteristics and applying the steps of the SIDM: from the concept ideation to the development and prototyping Fig. 3.

Later in the semester, the focus was moved toward students' ability to develop critical thinking. The activity of Innovation Literacy has required them to read a book that addresses the topic from different perspectives — food, data, society — and then outline a critical analysis.

The activity took place in asynchronous and synchronous moments, combining individual steps with moments of teamwork; the students, now accustomed to working with selected teammates, had to reorganize into temporary groups depending on the book read to complete in a limited time, an overall review Fig. 4. The result of the meeting was poured into a set of shared slides that were then discussed collectively through questions that challenged the thoughts of individual students and the design solutions now being developed Fig. 5.

Furthermore, as part of this activity, students could express their understanding and interpretation of the books by creating customised book covers. These graphic interpretations allowed students to explore the books' themes further and express their ideas visually, thus enriching their learning experience and contributing to the collective discussion.

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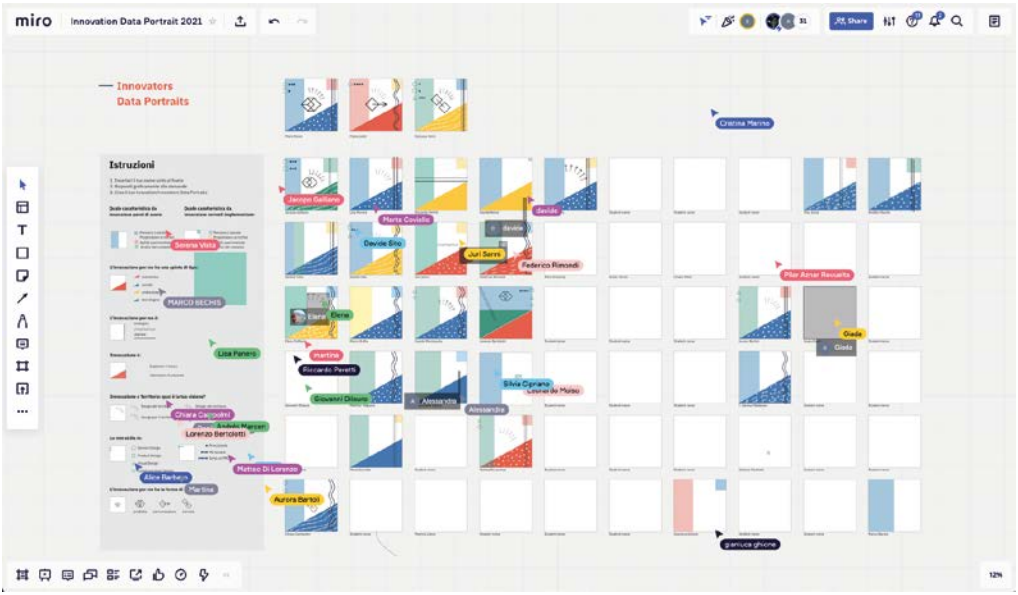

Fig. 2
Chiara Remondino. *Data Portrait Activity*. Simultaneous creation of data visualization using a Miro Board. Ph. Innovation Design Lab, 2021.

Fig. 3
Leonardo Moiso. *Food Design Lab Workshop*. A design team experiments with shapes, food and kitchen tools. Ph. Innovation Design Lab, 2021.

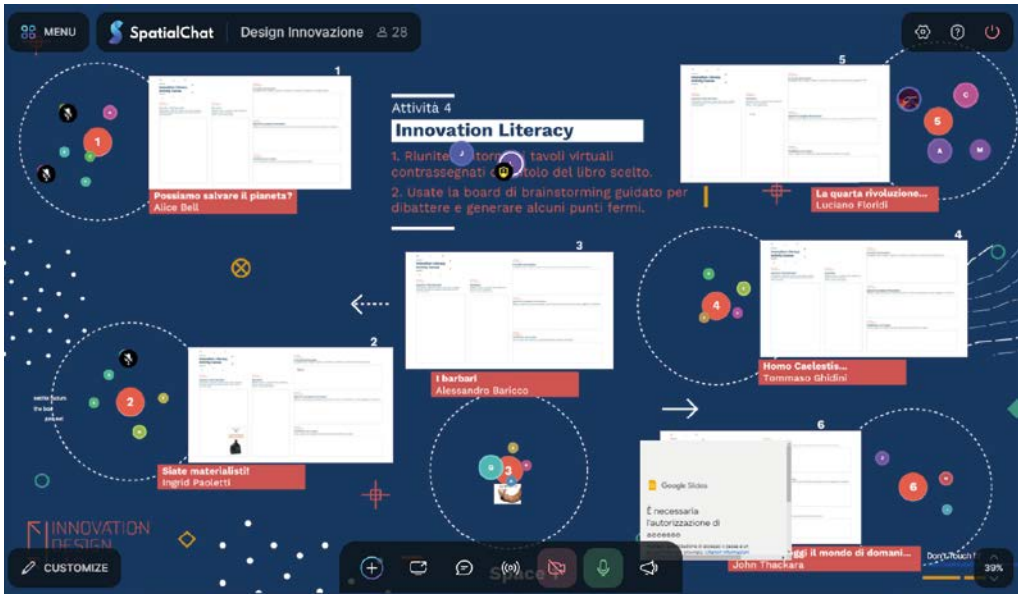

Fig. 4
Leonardo Moiso. *Innovation Literacy Activity*. Working in groups using Spatial Chat. Ph. Innovation Design Lab, 2021.

Fig. 5
Sofia Cretaio. *Innovation Literacy: community debate*. Students presenting their alternative covers to the original book. Ph. Innovation Design Lab, 2021.

The activities described align with the components and learning objectives of the Innovation course. This course aims to cultivate a multidisciplinary understanding of innovation and its impact on technical, productive, social and economic aspects. The multidisciplinary laboratory is an essential component of the course, which serves as a platform for integrating input from different disciplines. The activities described in the article, such as developing soft skills, integrating collaborative digital tools and applying the Systemic Innovation Design Methodology (SIDM), directly contribute to achieving the course's learning objectives Fig. 6. The activities also emphasise the importance of combining analytical skills with design thinking.

- The first activity focuses on community and team building, creating a sense of belonging among students and fostering practical teamwork skills.
- The Data Portrait Project engages students in visualising and representing information through creative and meaningful data portraits describing themselves and their skills.
- Innovation of the Day Research encourages students to explore qualitative resources and conduct research to support their design analysis.
- The Food Design Workshop combines analytical skills in reading the territory and social issues with hands-on design thinking. Students work with surplus food products, applying the Systemic Innovation Design Methodology to generate innovative design solutions that address the issue of food waste.
- The Innovation Literacy Activity strengthens critical thinking skills by giving students diverse perspectives to analyse and discuss. Through reading and asynchronous and synchronous discussions, students challenge their thoughts, contribute to design solutions, and expand their understanding of innovation from different angles.

The activities integrated into the course aim to stimulate active learning and interdisciplinary collaboration and foster design skills. This engagement gives students a comprehensive understanding of innovation and the skills to address real-world challenges innovatively and sustainably.

Evaluation Method

The evaluation method employed in this study aimed to assess the proposed pathway's effectiveness and associated activities. At the end of the learning journey, a survey was submitted to a sample of sixty students, primarily first-year MSc degree students. The survey encompassed targeted questions addressing key aspects of the methodology, including the effectiveness of team building and team working phases, the perceived importance of these processes, experiences during the community-building phase in light of pandemic conditions, evaluations of the Data Portrait activity and the functionality of the Miro application, perceptions of the practical approach in the Food Design Workshop activity, and feedback on critical thinking

Fig. 6
Leonardo Moiso. *Learning path tools and soft skill*. Modularization of the learning experience and tools used to enhance digital and soft skills. Ph. Innovation Design Lab, 2021.

development and outcomes in the Innovation Literacy activity. This comprehensive approach enabled a thorough evaluation of the activities' effectiveness and their impact on students' learning journey.

The survey included several key questions addressing different phases and activities:

- *Team Building and Team Working*
  1. How effective were the activities in promoting collaboration and teamwork?
  2. To what extent did students perceive these phases as important in the learning process?
- *Community Building Phase*
  1. How did the conditions imposed by the pandemic impact the intra-group relational aspects?
  2. What were the main challenges encountered during the community-building phase?
- *Data Portrait Activity*
  1. How did students evaluate the usefulness and functionality of the Miro application for achieving the course objectives?
  2. In what ways did the experience of creating Data Portraits enhance their understanding of the communicative impact of language through data?
- *Food Design Workshop Activity*
  1. How did students perceive the practical approach to the Systemic Innovation methodology?
  2. What were their opinions on using expired packaged food for an "aesthetic" design and prototyping activity?
- *Innovation Literacy Activity*
  1. How did students perceive the development of critical thinking and Innovation reflections in this activity?
  2. What were some notable outcomes or insights generated during the design solution generation and pre-concept development phases?

Results and Findings

The results indicated that the activities implemented in the pathway served as a distance learning solution, promoting interaction

between the students and enabling the continuation of teaching activities while preserving the learning objectives and enhancing digital and transversal skills. Integrating activities to support team building and team working proved effective in emphasising the importance of applying a method to these processes. The survey responses of the entire student sample revealed a high perceived importance for teaching team building (score of 3.91 out of 5) and team working strategies (score of 3.71 out of 5), emphasising the need to establish a dedicated teaching method for design courses in a blended environment. However, the community-building phase, which focused on relational aspects within the group, received a lower score of 2.80 out of 5, indicating its criticality and susceptibility to the challenges imposed by the pandemic conditions.
In the *Data Portrait activity*, students expressed the importance of acquiring skills in using Miro, an application with functional features that facilitated the achievement of course objectives. They also recognised the value of understanding the communicative impact of language through data while acknowledging the need for further theoretical knowledge in this area.

The *Food Design Workshop* received positive feedback for its practical approach and ability to foster new interactions within the class group. Over 90% of the student sample appreciated the hands-on experience and the opportunity to directly apply the design method using workshop materials and tools and have fun. However, some participants objected to the use of edible materials for an "aesthetic" design and prototyping activity, despite the inclusion of expired packaged food.

The *Innovation Literacy* activity was evaluated positively for its contribution to developing critical thinking and Innovation thinking. It was noted that this activity had exciting spin-offs in generating design solutions and pre-conceptual development phases, further underlining its effectiveness in promoting creative thinking and problem-solving skills.

The results of the paper's evaluation indicate that the activities of the proposed pathway were well received by the students, with positive results observed in terms of interaction, skills enhancement, practical application and development of critical thinking. The results regarding the quality of the project outputs and final assessment examinations remained in line with previous years of this course. The applications selected for the Systemic Innovation Design training model offer high visual customisation, allowing the learning designer broad organisational and communicative creativity of the content. At the same time, students are active participants in the learning process, developing descriptive and design outputs in groups that feed into the knowledge system of the class.

Conclusion

The article assesses a methodology applied in a digital learning setting, demonstrating that it promotes student interaction and upholds learning goals. It amplifies digital and cross-disciplinary skills, enriching the overall learning journey. The study highlights the vital role of educational methodologies in shaping digital environments, with the

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designer's expertise playing a pivotal role. Future research directions could explore the potential for further refinement of the methodology and adaptation to different educational contexts. Investigating the long-term impact of the methodology on students' skills development and exploring its scalability and transferability to other disciplines will be the focus of future explorations. Furthermore, practical applications of the methodology could extend beyond the academic context, finding relevance in professional development programmes or lifelong learning initiatives, where incorporating digital tools and educational methodologies can improve individuals' skills in a rapidly changing digital landscape.

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DIGITAL SPECIAL ISSUE 1

The 8th International Forum of Design as a Process, themed "Disrupting Geographies in the Design World" was held in Bologna from 20 to 22 June 2022. The event was organised by the Advanced Design Unit of the Alma Mater Studiorum – Università di Bologna, Department of Architecture, in collaboration with two partner universities: Tecnológico de Monterrey (TEC) and Pontificia Universidad Católica de Chile.

The Forum engaged speakers from the Global Design community, expanding the original vocation of the Latin Network for the Development of Design as a Process to include researchers and designers of the Mediterranean Area, Middle East, IOR (Indian Ocean Region), and Global South regions. The goal was to share new perspectives on imagining design futures in a responsible and just perspective, at the forefront of change, while building strategic partnerships and creating accessible knowledge.

Structured around three pillars — seminars, workshops, and exhibitions — the Forum hosted meetings, reflection opportunities, networking activities. It involved designers, scholars, young researchers, design entrepreneurs, in an experimental format.

Speakers' contributions not only inspired the practices of the designers' community, but also resonated with students and the broad audiences. The presentations explored intersections of materiality and culture, post-coloniality, decoloniality, gender studies, and other areas of human thought and action which seek to analyse, question and challenge the disruptive geographies in the world, today.

The papers submitted to the five tracks proposed are published in the Digital Special Issue 1 of *diid. disegno industriale – industrial design*, celebrating during those days its 20th anniversary and serving as the fourth partner of the event.

The Editors
Erik Ciravegna, Elena Formia, Valentina Gianfrate, Andreas Sicklinger, Michele Zannoni

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