WHICH PROXIMITY IN DESIGN EDUCATION?

A Contemporary Curriculum

EDITED BY
RITA ASSOREIRA ALMENDRA

SUPPORT MATERIAL

ROUTLEDGE

Which Proximity in Design Education?

This book explores various pedagogical viewpoints and dialectical positions within the field of design education and the concept of proximity it has established with industries and manufacturing.

Which Proximity in Design Education? frames a wide range of approaches in design studios on undergraduate, graduate, and postgraduate levels and their capacity to render meaningful and novel attitudes and actions beyond the classroom. The urgent call for resilience in the way we lead our lives has brought our global boundaries and social tensions to the forefront of the conversation, and there is a generation of students fully aware of our collective responsibility in this decisive decade. As such, educators need to rapidly adapt to new tools and ways of teaching design, whilst also being challenged on how to educate the designer for the pressing tasks of the near future. It presents optimistic solutions for how education can support renovated mindsets and efforts towards common goals.

This book contains distinct visions of the world and its problems relating to proximity in design education. As such, the chapters present diversified solutions to these issues, which will be of interest to teachers and researchers working in design education.

Rita Assoreira Almendra is a Full Professor at the Lisbon School of Architecture (FA-ULisboa), where she is Head of the Design Department and coordinates both the Design Doctoral Program and the nucleus of Design at CIAUD research centre. She holds a PhD in Design (2010) from FA-ULisboa, and a Master's in Design Management (2004) and an MBA with marketing specialization (2002), both from the Catholic University of Lisbon. Rita has worked for more than 20 years as a design researcher and educator, with numerous publications and master's and doctoral supervisions in this field. She is the founder and coordinator of the Research & Education in Design research group [redes.fa.ulisboa.pt], and was responsible for two editions of the *International Conference on Research and Education in Design*.

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Contributors

Rupa Agarwal is associated with the National Institute of Fashion Technology, India. Her expertise lies in curriculum design and creative pedagogies. At present she is part of the core committee to develop the curriculum of Design Thinking for classes 6–12, which is being facilitated by Department of Skill Development, Ministry of Education for Central Board of Secondary Education (CBSE).

Rita Assoreira Almendra, CIAUD, Research Centre for Architecture, Urbanism and Design, Lisbon School of Architecture, Universidade de Lisboa, Portugal. Almendra is a Full Professor at the Lisbon School of Architecture (FA-ULisboa) where she is Head of the Project Design Department, and coordinates both the Design Doctoral Program and the nucleus of Design at CIAUD. She holds a PhD in Design (2010) from FA-ULisboa, and a Master's in Design Management (2004) and an MBA with marketing specialization (2002), both from the Catholic University of Lisbon. Rita has worked for more than 20 years as a design researcher and educator, with numerous publications and master's and doctoral supervisions in this field. She is the founder and coordinator of the Research & Education in Design research group [redes.fa.ulisboa.pt], and was responsible for two editions of the *International Conference on Research and Education in Design*.

Arlete Apolinário is a Junior Researcher at IFIMUP/FCUP who specializes in materials physics (nanomaterials) and engineering mainly focused on advanced energy materials, such as third-generation solar cells: nanostructured semiconductors. She has a strong background as an autonomous user in several advanced types of equipment (e.g., SEM, AFM, STM, DRX, SQUID).

Rui Barreira, CIAUD, Research Centre for Architecture, Urbanism and Design, Lisbon School of Architecture, Universidade de Lisboa, Portugal. Barreira uses drawing as a means of recording and researching his teaching and design practice. He portrays the cultural, social, and geographical differences of the educational institutions where he wanders and teaches. Currently a research fellow at the FCT, his main line of research is the application of drawing to

theoretical teaching, creating connections between design, education, art, and philosophy.

Susana Barreto is a design educator and researcher. Susana is a professor in design at the Faculty of Fine Arts, University of Porto, where she is currently in the coordinating team of two research projects, Wisdom Transfer: Towards the scientific inscription of individual legacies in contexts of retirement from art and design higher education and research, and Anti-Amnesia: Design research as an agent for narrative and material regeneration and reinvention of vanishing Portuguese manufacturing cultures and techniques. Susana's research interests are focused around the role of culture in graphic communication, cross-cultural design, image globalization, visual methods, and design ethics.

Ricardo Bonacho holds a PhD in Food Design and Gastronomy. He is a full-time assistant professor at the Faculty of Social Sciences and Technology and the Online Faculty of the Universidade Europeia. He has also held positions at other educational institutions and is involved in research and non-profit organizations in the field of food design and gastronomy. He is cofounder of FORK (Food Design for Opportunities and Research) and the Food Design Lab Lisbon.

Carla Cadete completed a PhD in Design at Aveiro University (2009) and a Bachelor's in Communication Design at the University of Porto, Faculty of Fine Arts (1991). Course leader (2015 to 2023) and Associate Professor of Communication Design undergraduate degree at Lusófona University. Principal Investigator of "Design as a means of preventing childhood obesity" which won the FAZER+ 2022 Award.

Susana Campos is an artist and researcher with an engaged interest in the value of artistic practices and their role in bridging social inequalities within an increasingly multicultural landscape. Departing from creative intuition, her foremost paths of inquiry are art-based, practice-based, and practice-led research. She has recently created a research group joining academics from art and design with the aim to explore methodologies in transdisciplinary research and to establish the requisites for scientific validation of non-traditional research outputs.

André Casteião is an Assistant Professor at the Federal University of Cariri – UFCA, Juazeiro do Norte CE. André has a PhD in Design from the Faculty of Fine Arts of the University of Porto, Portugal; Master's in design from Unesp in Bauru, Specialist in Design Management from UEL-Londrina, and graduated in Design from the Belas Artes University Center of São Paulo. André works in the following lines of research: Design Management, Social Design, Sustainable Design, Universal Design, Innovation, Problem Solving Methodologies, and Design Thinking. André also has experience in Distance Learning and Tutoring.

Violeta Clemente is an Assistant Professor at the University of Aveiro and coordinates Lab OIKOS at the ID+ Research Institute. She holds two PhDs (Education, 2016; Design, 2023) and is a convening member of the DRS Special Interest Group in Design Education. Her research focuses on Design and Technology education, creativity, and design methodologies.

Pelin Efilti is currently working as a Research Assistant in the Department of Industrial Design at Istanbul Technical University (ITU), Turkey. She received her MSc (2019) and PhD (2024) from the Industrial Product Design Programme at ITU. During her doctorate, she carried out academic studies as a visiting researcher at Aalto University, ENCORE Research Group. Her research interests include participatory design, design education, and pedagogy.

Mariana Eidler is a food designer, teacher, and researcher, and holds a PhD in Food Design and Master's degrees in Branding and Communication. She is Director of the Food Design Lab and Study Abroad at ELISAVA, Barcelona, and the Co-Founder of FORK (The Fork Organization). She creates partnerships between Food Design projects and institutions and develops sustainable projects in Food Design as art director at @tactica.barcelona.

Fabio Enrique Fajardo is currently a professor in the Department of Physics at Universidad Nacional de Colombia. His current areas of interest are the design of low-cost experiments for teaching physics and working with communities on appropriable technologies.

Maria João Félix, PhD in Design, is a professor in Higher School of Design, Cávado do Ave Polytechnic Institute. She is an academic and designer whose career has been marked by a deep commitment to the fields of industrial design, education, industry, circular economy, and sustainability. She is currently in the final stages of her postdoctoral research in Design, titled "Bioneurodesign: from noetics to supermodernity", at the Lisbon School of Architecture, reflecting her dedication to pushing the boundaries of design and practice. In a pivotal role, Maria João Félix serves as the founder and General Chair of the international conference "Design Commit 2024", a platform that bridges the worlds of design and industry, fostering collaboration and innovation.

João Batalheiro Ferreira, Assistant Professor at IADE – Faculty of Design, Technology and Communication, holds a PhD in Design from Delft University of Technology. His research explores teacher–student communication in design studios. He has authored numerous scientific papers on teaching, creativity, and design theory, and a book on writing for designers.

Pedro Ferreira is a PhD student in Design at the Faculty of Architecture of the University of Lisbon since 2021, supported by a research grant from the Fundação para Ciência e Tecnologia. In 2019, he completed a Master's Degree in Product Design and Development at the Polytechnic Institute of Cávado and Ave, which sparked his interest in Design Research, especially in the Selection of Materials

(Methods and Tools). The terms frequently used to contextualize his scientific production are: materials selection, methods, and product design.

Gabriele Ferri, Assistant Professor at the Eindhoven University of Technology, focusing on Justice and Transforming Practices. Collaborating with repair cafés, hackerspaces, and makerspaces, he mentors students in ethically aware projects and addresses design-driven injustices. Previously, he co-coordinated and then directed the MSc Digital Design at the Amsterdam University of Applied Sciences.

Gabriela Forman is a multidisciplinary designer, scientist, and professor at the Lisbon School of Architecture, interested in the development of products and processes following Nature's rationale. Her work is focused on sustainable design practice and education as well as the application of biological sciences and the Circular (Bio)Economy model to rethink materials.

Koray Gelmez is currently working as Associate Professor in the Department of Industrial Design at Istanbul Technical University (ITU), Turkey. He received his BSc from the Department of Industrial Design at Middle East Technical University (METU); and his MSc and PhD from the Industrial Product Design Programme at ITU. His research interests include design education, design pedagogy, learning, reflective writing, and graphic design.

Paul Geurts, MA, is the Coordinator of the Master Digital Design program at the Amsterdam University of Applied Sciences. As an interaction designer turned educator, he is exploring ephemeral interfaces through a small research grant. Paul combines his passion for teaching with his research interests to develop innovative teaching methods.

Gabriela Gomez is a professor and researcher at the Autonomous University of Aguascalientes, Mexico, at the Design Science Center, in the Industrial Design bachelor's degree program. She has a Master's Degree in Industrial Design from the National Autonomous University of Mexico. Her main areas of interest in research are: Education in Design Education and Design History. Her latest publication focuses on the work of Jesús F. Contreras, a 19th-century designer in Aguascalientes, Mexico.

Rodrigo Hernández-Ramirez is a Senior Lecturer at The School of Architecture, Design and Planning at the University of Sydney, specializing in Interaction Design and Design Research. Rodrigo's research stands at the intersection of design, philosophy of technology, and New Media. His interests include Design Ethics, Privacy, and Digital Aesthetics.

Lotte Agnes Lausen holds a Master's Degree in Philosophy Of Education and a PhD in Educational Design Research. Currently she works as an independent researcher in collaboration with Danish and international researchers in the areas of atmospheres, play, and experience in Higher Education.

Ricardo Lopez-Leon is a Lead Researcher-Lecturer at the Design Sciences Center, Autonomous University of Aguascalientes, Mexico. Has a PhD in Art and Sciences for Design by Autonomous Metropolitan University and is a Level 2 researcher at National Council of Science and Technology, a leader of the Integral Design Studies researching group, member of the Master in Arts faculty, member of the editorial committees of different international Journals, editor in chief of *Artificio*, a scientific journal for the Sciences of the Anthropic Environment, international lecturer participating in conferences around the world, and an author in several international publications, focusing on the last years to research in Visual Literacy, Design Theory, and Design Education.

Pierre Yohanes Lubis is an industrial design teaching fellow at the Department of Design, the University of Waikato, New Zealand. He is very much interested in sustainable design, product service system design, and human-centred design as well as the intersection of design as a discipline with economics, politics, and philosophy.

Irene Maldini, PhD, conducts critical research on the environmental impact of growing consumption and production volumes of clothing and other consumer goods. She specializes on the solutions that have been proposed to reduce these volumes at a product design and public policy levels and in assessing their effect. She has worked at Universities in Uruguay, Brazil, and the Netherlands, and is now based in Portugal working as a Senior Researcher at Oslo Metropolitan University in Norway.

Suzanne E. Martin is a design educator and researcher positioned on the boundary of disciplines, organizational domains, and modes. Her work and research seek to develop the conversation around how Design Higher Education might perform to shape our shared Critical Futures. Suzanne designs, develops, and delivers sustaining pedagogical transformation across the layers of learning organizations, by design.

Gianni Montagna, PhD in Design, is an assistant professor in Universidade de Lisboa, Lisbon School of Architecture. His research work is mainly focused on Fashion Design, its materials and techniques as a tool and innovative factor to achieve the design experience. In 2017, he co-created the conference D_Tex-Textiles, Identity and Innovation, an international textile design conference. He is also co-founder and co-leader of the Human Factors for Apparel and Textile Engineering track of AHFE International Conference. Since 2023, he is also co-creator and co-chair of IHSED 5: Fashion & Textile Design for Sustainability and Better Life track of the IHSED International Conference.

Pedro Cortesão Monteiro is an Associate Professor at FAUL/Lisbon School of Architecture and has degrees in Architecture and Design from Oporto University (B.Arch, 1990; M.Des, 1998) and a PhD in Design from FAUL (2014). Pedro was a lecturer in Design at Universidade Lusíada (1995–2020) and is

currently at FAUL (since 2009) as the coordinator of FAUL's Design undergraduate program.

Rodrigo Morais is coordinator of the Master's Program in Design & Advertising at IADE – Universidade Europeia. Rodrigo holds a PhD in Intelligence Technologies and Digital Design from the Pontifical Catholic University of São Paulo, Master's in Contemporary Communication from Faculdade Cásper Líbero, and graduated in Graphic Design from Centro Universitário Belas Artes de São Paulo.

Inês Nascimento is an architect from Lisbon, Portugal. She completed her master's degree in Architecture at ISCTE-University Institute of Lisbon, with a thesis exploring the intersection of Utopia, Architecture, and the city, particularly focusing on Lisbon. She is currently pursuing a PhD in Architecture of Contemporary Metropolitan Territories at ISCTE-IUL. Nascimento is a researcher at DINÂMIA'CET and has been involved with the COST Action "European Middle Class Mass Housing". Her primary research interests lie in Architectural Education within the Portuguese context, particularly exploring Radical Pedagogies and the application of Utopia as a methodological approach.

Pamela Nelson, is an artistic design researcher who, for the past four years, has been looking into how slowness and feminist values can be inserted into the digital design process using sewing circles and handwork as a tool. She currently works at Visual Methodologies Collective at the AUAS.

Eva Maria Oberländer holds a Master's in Psychology of Education and collaborated on several research projects with colleagues in higher education. Currently, she works as a development consultant in Denmark and an independent researcher, primarily in neuropedagogy, neuropsychology, and play.

Fátima Pombo is Full Professor of Design, director of the ID+ (Research Institute for Design, Media and Culture) at the University of Aveiro. She was a visiting professor at KULeuven, Belgium for almost a decade until 2016. Engaging in international research projects, conferences, and juries, her research and publications focus mainly on phenomenology of design, aesthetics of sustainability, interior design, and spatial design.

François Racine is an architect and urban planner and professor of urban design at the Department of Urban Studies and Tourism at Université du Québec à Montréal (UQAM). His research focuses on the evolution of urban design approaches in Montréal and their impact on the transformation of the city's urban morphology.

Juan de la Rosa is a design researcher and an Associate Professor at Universidad Nacional de Colombia. His research interests include the construction of design knowledge form a systemic perspective; participatory design for policy making; and the way embedded values of designed objects affect humans.

Carlos Rosa is an Associate Professor and Dean of IADE – Faculty of Design, Technology, and Communication at Universidade Europeia. His research focusing on design methodologies, formal systems, and communication strategies. He has also worked as a design consultant and independent designer in interdisciplinary design projects.

Sónia Seixas is a PhD student in Design; fashion and textile designer; teacher of specialization courses, Technical Higher Education (level V ECVET), and technical vocational courses (level IV ECVET); and Certified Modular Training in Fashion and Textile Design. Her research interests include design in the universe of fashion and textiles in relation to education. Graduated in Fashion Design and Marketing from UMINHO, Seixas has a Master's in Design and Product Development from IPCA, is a PhD student in Design at FAUL with a research focus in Higher Education in Textile Design, and a researcher at CIAUD. Her research interests include Design, Higher Education, and Textile Design.

Bahareh Shahri has more than 18 years of teaching and research experience within product design and creative design practice, in academia, and industry. She holds a doctorate from the Edinburgh College of Art and is currently a senior lecturer at the School of Product Design, University of Canterbury in New Zealand.

Andrés Sicard-Currea is a professor of Industrial design at Universidad Nacional de Colombia. With a PhD in Information Sciences from the University of La Laguna, Andrés has merged this view with the practice of design to lead projects focused on traditional knowledge associated with agro-biodiversity and social innovation.

Aline Teixeira Souza Silva is an associate professor at Federal University of Uberlândia. In FAUeD/UFU, Souza was coordinator of Design undergraduate course (2011–2013), coordinator of Models and Prototype Labor (2010–current), and coordinator of research group in design (2009–2010). She was collaborator professor at State University of Maringá (2007–2009). She has bachelor's degree in Product Design (UEM, 2006), a master's degree in Design (Unesp, 2009) and a PhD in Design (ULisboa, 2018). She is undergraduate courses consultant for MEC/INEP.

Enver Tatlısu is currently working as an Assistant Professor in the Department of Industrial Design at Mimar Sinan Fine Arts University, in Turkey. He received his BSc from the Department of Industrial Design at İzmir University of Economics and his MSc and PhD from the Industrial Product Design Programme at Istanbul Technical University. His interests include exploring the relationships between nature, humans, and the human-made world, with a particular focus on material and immaterial phenomena and their implications for design research, design education, and design practice.

Tuğçe Ecem Tüfek is currently working as a User Experience Designer at a tech company. She has received her BSc from the Department of Industrial Design at Istanbul Technical University and her MSc from the Industrial Product Design Programme at Istanbul Technical University. Her professional focus lies in exploring the creative applications of user research methods with a human-centred focus within practical settings.

Onur Yılmaz is a PhD candidate and research assistant in the Department of Industrial Design at Istanbul Technical University (ITU), Turkey. He received his BSc and MSc degrees in Industrial Design from ITU. He also holds a master's degree in Visual Arts and Visual Communication Design from Sabancı University. His major research interests include visual communication, user experience, and design education.

Acknowledgements

Part I

Design Proximity(ies) in Design Education

1 Draw(in)Proximity

A Drawing-Based Strategy for Knowledge Transfer

Rui Barreira, Susana Campos, and Maria João Félix

CIAUD, Research Centre for Architecture, Urbanism and Design,
Lisbon School of Architecture, Universidade de Lisboa,
Lisbon, Portugal

Introduction

> If a lion could talk, we wouldn't be able to understand it.
>
> Wittgenstein (1963, p.255)

The main argument in this chapter rests on the assumption that human experience is beyond dialect and that it should be contemplated in its entirety. When we arrive at a foreign country, for example, we are met with traditions which may seem strange to us. We might speak the language, but still not understand people we come across, even if we know what they are saying to each other. "We can't find our feet with them", as put by Wittgenstein (1963, p.225), since there are many ways of being human, and we don't necessarily grasp the core of communication through language alone. A traditional method for knowledge transfer in a higher education environment is the lecture accompanied by the projection of images, during which students usually take notes. This teaching and learning approach is described as an exhibition course, e.g., multimedia, seminars and videos. Is it still inclusive when we come up with multicultural classes and language barriers? Can our students find their feet with us?

> (…) Tolstoy's refusal to adhere unequivocally to any pedagogical theory then in vogue, influenced or not by the theories of Pestalozzi or Rousseau, stems from his general skepticism of any theory, but fundamentally from his disagreement with the assumption of the Socratic teaching method: that the student is ignorant of many things and that the master's role will be to lead it, maieutically, from a state of ignorance to one of knowledge of many things.[1]
>
> Matoso (2021, p.189)

Sometimes, teachers face language barriers in knowledge transfer. These may occur due to various reasons: problems like dyslexia, or other learning difficulties; interacting with foreign students or students speaking variations of the teacher's native langugae, which carries changes and innovations. But

the specific context of the strategy is broader and involves the subjectivities of the student and the human differences that shape their existence, those being material (class, geography), corporeal (race, gender, sexuality, disability) or circumstantial (culture, religion, life experience, interests, affinities) (Narey, 2017). By not including this subjectivity, we would be excluding those who do not fit the norm by neglecting how to optimize their results and academic performance. But we would also be perpetuating a disadvantage among "(…) those whose favored orientation to learning the one-size-suits all curriculum appears to suit—by limiting their exposure to the cosmopolitan experience of cultural and epistemological differences so integral to the contemporary world" (Narey, 2017, p.6).

The researcher teaching experience in multicultural classes with such linguistic barriers provides empirical evidence that previous lack of access to specialized teaching, cultural differences in attribution of meaning and significance to contents, or even generational evolution itself, can be confused with laziness or disinterest, leading students to demotivation and consequent withdrawal. The proximity relationship between the subject, i.e., student, and the object of knowledge, is compromised. Shortening this lack of proximity that language barriers can cause requires the redesign of communication in the classroom. According to Vygotsky, students bring prior knowledge with them, and this is combined with new knowledge acquired ugh their interaction with other people in which learning and development is based on a dialectical nature, which should be worked together in a sociocultural context (Vygotsky, 2008). Expertise is shared to negotiate and construct meaning. The development of the individual is a process in which children grow into the intellectual life of those around them (Brooks, 2017, p.26). Experience in teaching allowed us to observe that there is a gap in the process of personal knowledge construction, according to constructivist theories. As stated by Maria João Delgado:

> Knowledge is recognized as the result of the subject's interaction with the object, and cognitive development occurs through the assimilation of the object of knowledge to the cognitive structures proper to the subject and by the accommodation of these structures to the object of assimilation. Therefore, knowledge results from a process of personal construction of attribution of meanings and meanings that the subject attributes to him.[2]
>
> Delgado (2013, p.53)

This personal construction may not happen or decrease if the student's interaction with the content is diminished. If a student assimilates simply what the teacher says and this object of knowledge assimilation does not produce a meaning within their own cognitive structures, or if it this meaning is not significant, it remains as information only, vaguely contributing to personal knowledge research. Drawing in design leaves marks. A mark is a stimulus for thought, and the process of making marks-thoughts-marks-thoughts happens so fast that the delimitation of the two is almost impossible to discern, it is an intuitive and reflective ability with the medium (Kolko, 2010; Campos, 2012). Knowledge is created. And through the

process of drawing things, sequential knowledge is created as an ephemeral iteration. Drawing does not only exhibit knowledge, it creates it (Kolko, 2010, 2017, 2020).

It seems evident that this introduction is a constructivist vision of design, in contrast to an orderly and deductive design process as Simon (1996) preferred. But in the methodological crossroad between Schön and Simon, constructivist and positivist, respectively, we encounter the necessary understanding process of teaching design, as referred by Dorst (Dorst, 2015): objectivity and subjectivity, teaching and learning (Félix, 2020). By *"seeing" through drawing*, designers not only visually record information, but they also construct its meaning (Schön and Wiggins, 1992). If a teacher encourages the personal construction of contents by drawing, he is allowing an attribution of meanings and significance by the students, increasing the proximity between them through a mutual sharing of knowledge. Nonaka and Takeuchi state that when tacit knowledge becomes explicit, knowledge is crystallized, which allows sharing, the example of ideas outsourced in drawings (Nonaka and Takeuchi, 1995). As a counter-argument, we consider what Polanyi identifies as three tacit psychosocial mechanisms underlying the process of knowledge transfer: imitation; identification and learning by practice; and learning by doing (Polanyi, 1966). These are based on tradition, so they confer patterns of action, rules, values and norms. Therefore, they are unequivocally transmitted, which allows for anticipating expectations concerning the behaviour of the subjects (in this case, the students) and guiding their behaviour. In a multicultural setting, knowledge transfer must pay attention to this paradox of tradition and enhance students' personal knowledge, which encompasses their perception of reality, or tradition. In this sense, we must emphasize that drawing is a builder of representative meaning, an adjunct to language, the latter full of rules, values and norms which can even be opposed between various traditions (e.g., Arabic is written from right to left).

What is the potential of Teacher-generated drawing in overcoming language barriers in knowledge transfer in the classroom? Teacher-generated drawing has not been studied or explored as a strategy, similarly to learner-generated drawing (Van Meter and Garner, 2005). The performative capacity of drawing in the classroom can capitalize students' attention, contributing to the cognitive understanding of the different phases and contexts of drawing associated with narrative tactics that articulate text and image. This study aims to contribute to the construction and documentation of a pedagogical drawing-based strategy for knowledge transfer, evaluating acts of cognition, exploration and assimilation of concepts through students' performance and feedback.

Crossroads between Drawing and Writing

Strategy: offer students something they do not expect in a differentiated way. Plan: use drawing in the transfer of knowledge in theory teaching. Tactic: Draw theory content during class to leverage student attention and facilitate communication and recall. How? By relating the drawn content to a work of art. Mintzberg, notes that strategy sometimes has more to do with what we actually do than what we intend

to do, i.e., our actual strategy emerges as we do it and may not be aligned with the plans we make (Mintzberg and Waters, 1985). Strategy is planned but intuitively put into action. The construction of images and the descriptive reflection of language is taught through drawing (Campos, 2012, p.5). One might say that this is teaching through design. Through the study of meaning construction processes, drawing demonstrates a relationship between thought and what becomes visible. The role that drawing plays in moving (Schön and Wiggins, 1992) from simple, spontaneous concepts to more complex concepts points to higher-level mental functions (Brooks, 2017).

In *How Picturebooks Work*, Maria Nikolajeva and Carole Scott describe different types of interactions between verbal and visual components, but their focus is "counterpoint," i.e., when "words and images provide alternative information or contradict each other in some way". This is a notion that has been present since the beginning of strategy design, that images can also contradict words, distorting the meanings. But other relationships between images and text, also addressed by the authors, such as "complementary" relationships (Nikolajeva and Scott, 2006, p.110), are directed to filling the gaps left by the other mode. Several studies on design as a process of meaning-generation refer to the linguistic benefits operated by the complementary process of design, facilitating understanding and interpretation (Krippendorff and Butter, 1984; Snodgrass and Coyne, 1996; Karana and Hekkert, 2010; Krippenddorf, 2016). Assuming that text and image carry mutually dependent as well as independent narratives, the creation of the image by drawing, however, highlights the multiple coding model. Moreover, it puts in evidence the ability to memorize and understand that which is expanded by drawing in relation to reading and writing, when information is processed through drawing. Drawing involves imagination forcing our brain to create a mental image of content or an idea when we translate a meaning into a new form, that is, into an image (Fernandes, Wammes and Meade, 2018).

The retention of information by drawing results in better recall due to the way information is encoded in memory. When we draw, we involve real hand movements needed to build the mental image or what we are observing, always activating an iteration of motor action with the pictorial processing of what we are creating. Drawing researchers agree that this is a fundamental component of the learning and communication experience (Chamberlain, 2018; Fernandes, Wammes and Meade, 2018; Kantrowitz and Tversky, 2018). This intellectual and physical playful side that drawing implicates can be interpreted by students as a creative task, which leads indirectly to an increase in learning, leading to an increase in the intrinsic motivation of the proposed task (Amabile, 1983). "Playfulness and involvement. A number of introspective accounts describe the phenomenology of creativity as marked by deep involvement in the activity at hand, coupled with a kind of intellectual playfulness" (Amabile, 1983, p.86).

Gadamer constantly accentuates the vitality of the "game", "play" and "seriousness" being inseparably united, a kind of playful seriousness. The strategy based on drawing should be seen from this perspective, an inseparable association between "drawing" and "writing", two silent phenomena that express

an interiority inherent to the *Being* (Gadamer, 1997). "Art addresses us, and it is the ability of art works to bring things to mind and to hint at unseen meanings is the reason to claims that in its speculative capacities, art, functions essentially like language" (Gadamer, 1989, p.87). One could say the same about drawing: it unpacks symbolic representations by drawing upon unconscious, emotional and cognitive elements which become tangible in visual descriptions (Campos, Cappellini and Harman, 2019).

For many students, to think visually and to attempt drawing as a means of communication allows the detection of confusing spots in the appropriated content. If drawing helps in explanation, it also helps in communicating the student's own learning, communicating with himself and with the teacher at the time of the transfer being able to operate any corrections or overcome confusion (Van Meter and Garner, 2005; Frankel, 2020; Meter, List and Lombardi, 2020). "It is not just about communicating ideas to others", Frankel said. "It is also about communicating with ourselves" (Brown, 2006). The fact that teacher's dialogue with students during the drawing process enables them to determine how well the students understood the content and correct in real time any emerging misunderstandings. Frankel mentioned that one of the professors wrote: "I was able to teach the material far better after seeing the students' drawings. They revealed misconceptions in a way that text does not (…)" (Frankel, 2020, n.p.).

Cognitive acts such as evaluating, analysing, or planning, which are present in the act of drawing, are tasks that are part of explicit reasoning (Kantrowitz, Fava and Brew, 2017). Visual perception triggered through the connection of the hands, involving the body, puts drawing in the domain of embedded knowledge. The involvement of motricity, in turn, involves proprioception, awareness and control of the position and movement of our body, therefore, an action in space and inner perception, such as the heartbeat and breathing, that gives rise to our emotions (Damásio, 2020).

We can say that human hands were made to draw, and the evidence is that we start by drawing naturally before learning to write, as if drawing our way to learning writing, a sketch to get to the alphabet—not to sketch lettering, but to sketch meaning. A child does not sketch a car, she sketches the movement. Drawings made by children during their sequential development, when in "scribbling stage", are in fact meaningful experiments in representation (Matthews, 1984; Brooks, 2017). "The prevailing notion of children's drawing development is one in which the child more or less thoughtlessly assembles a vocabulary of marks which are eventually used for figurative purposes" (Matthews, 1984, p.3). Drawing is more than the precursor to writing:

> The constructs of transmediation and synaesthesia problematize the widely held belief that "drawing is the precursor to writing." Drawing is not a subordinate capacity on a continuum of writing development, but rather, drawing and visual text productions are parallel modes to multiple verbal (and other) modes. When teachers abandon support of drawing and the other forms of visual text production because of a misperception that writing is a more

"advanced" capacity, they are denying children full access to critical opportunities for language, literacy, and learning.

Brooks (2017, p.17)

The term "scribbling" means to write or draw "hurriedly or carelessly" regarding either handwriting or composition, and this is usually the sense in which people think of children's drawing throughout the so-called "scribbling stage". Then when we are scribbling as adults, this means we are returning to our childhood drawing or thoughtlessly assembling a vocabulary of marks which are eventually used for figurative purposes. And by figurative purposes, we say meaning. These drawings are part of our human experience even in adults, and each is a method of learning and communicating with ourselves (Barreira, 2021; Barreira and Campos, 2021).

Drawing the Framework

It is argued that drawing has the capacity to function as a complement to language in knowledge transfer through the suggestion of meanings and significance in its speculative capacities (Purcell and Gero, 1998; Gero and Kannengiesser, 2008).

1   A drawing in its construction process contains abstract moments. These moments serve as pause and reflection, which may favour transference. Over-contextualized knowledge can reduce transference, while abstract representations of knowledge can help promote transference. On the other hand, in this case, the transfer is seen more as an active and dynamic process than a passive end product of a given set of learning experiences (Committee on Developments in the Science of Learning, 2000).
2   Arbitrary rules, i.e., grammar and words, expose the same information to everyone. In descriptive representation, i.e., language, there are defined rules of interpretation. Interpretation can become alien, for example, if the dialect is not the maternal one. Visual descriptive representation can process information without external interpretation rules and therefore facilitate the transfer.
3   The dialogue in drawing allows the teacher to identify any confusion in the transfer of knowledge when drawing and applying correction or clarification in real time.
4   Knowledge transfer, if it is carried out through drawing, will generate an intellectual and playful environment, similar to the one involving creative teams of designers, allowing everyone to communicate through drawing and thinking "out loud", an epistemological way of design practice, bringing together the teacher and students.
5   This drawn communication activates an iteration of motor action with pictorial processing, involving emotions and feelings, senses and meanings, allowing a personal construction and approximation in a multicultural era.

One Two, One Two, Testing…

During the second semester of 2021, seven sessions of drawn theoretical content were held in a classroom, with first-year undergraduates of Art and Design, in the Theory of Art and Design course. The cohort comprised 60 students, 18 of which were not of Portuguese nationality, coming from African countries with Portuguese as the official language. Due to the safety standards imposed by the pandemic, the class was divided into two shifts, with one shift in the classroom and another participating via digital platform. Shifts ran weekly. At the end of each session, data was collected via questionnaire concerning the students' evaluation of the efficacy of the strategy in overcoming language barriers.

Sessions' Protocol

The fieldwork incorporates three moments. It begins in the teacher's notebook in the search for the narrative to follow the theoretical content taught in the classroom. Several sketches are designed according to the theme to be addressed, to be later exhibited together with the oral exhibition. At the second moment, the strategy is explained to the students, including the process of evaluation, the completion of the questionnaire, the start and end of the experiment and the consent form. The protocol is duly clarified to the group: it is not a drawing class, rather an opportunity to explore ways of combining verbal information with drawings in the sketchbook to achieve a better understanding of the information transferred. This prevents the students from withdrawing from the task, by reducing performance anxiety. The verbal exposition is then combined with the previously planned drawings, inviting the students to interpret what emerges on the blackboard, to intervene, and in parallel to make a record in the sketchbook, encouraging them to find their own connections with the contents (Figure 1.1). The invitation ensures that the focus is not on the quality of the drawing, but on the content of the drawing and the narrative it represents. The relationship between teacher and student is verbalized while discussing the interpreted connections, and the drawings made by the students are the subject of a dialogue, ensuring possible modifications dependent on the breadth of understanding of the initial drawing until the conclusion of the story involving the group in mutual care. In the third moment, the evaluation of the strategy experienced by the students is made by a questionnaire survey and collected. The suggestions drawn by the students on the blackboard are also collected, allowing a rectification or addition of new inputs, indispensable in a future exhibition, increasing the recursion of the strategy.

Sessions' Performance

Between the pauses in the drawings' construction, I walked through the room, shortened the distance between teacher and learners and approached the students, allowing them time to draw and reflect on the contents and giving me time to visualize their drawings in the notebooks. These pauses enabled the clarification

of emerging confusions and, at the same time, the correction of the drawing on the blackboard according to the feedback from the students concerning an increase in clarity. This information was then added to previous planned drawings to improve further applications of the strategy.

Sessions' Impact on Students

Data showed that 80% of the students would recommend this type of class. Some of them mentioned that they had replicated this strategy in other courses by implementing the use of the sketchbook as a learning technique through a combination of verbal and visual records. They also recognized that drawing can offer a form of communication alternative to speech, which allows them to easily consult their notebooks and improve learning through drawing. As a conclusion, they reported that the approach through drawing encourages them to better visualize and understand subjects in which they had more difficulties, helping to overcome language barriers (Figure 1.2). They considered the strategy fun and engaging, allowing a better retention of knowledge due to the playful nature of the task.

Survey Score

Question: Assess whether visual narrative in content displayed by drawing facilitated overcoming the language barrier.

> Linear scale: 0 = did not facilitate / 1 = little facilitate / 2
> = facilitated sufficiently / 3 = facilitated

Total answers : 288

Figure 1.1 Left: Drawing made on the blackboard by the researcher. Right: Drawing made in the notebook by a student. The written sequence of the board was interpreted as a storyboard by the student.

Source: Barreira (2021).
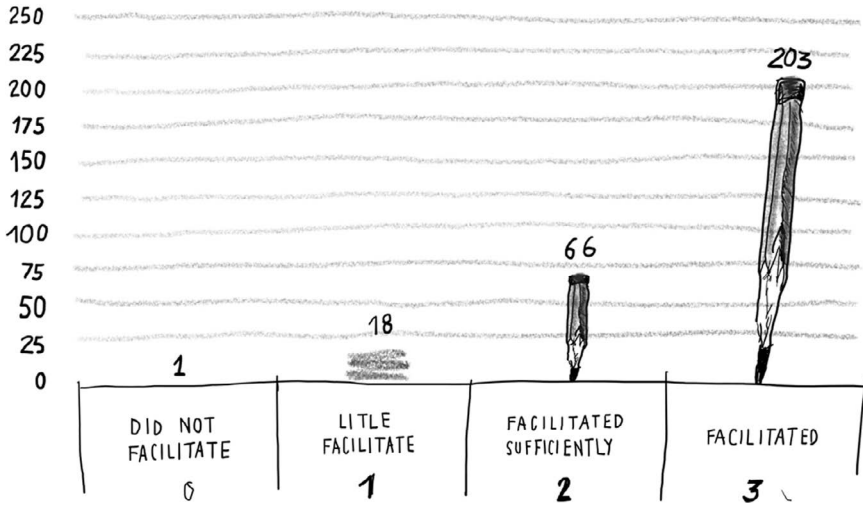
Figure 1.2 Survey results of the student questionnaires.

Source: Barreira (2021).

Conclusion

The lecture, a traditional teaching format in theoretical courses that can be described as a monologue to present information, procuring subsequent assimilation, seems to be insufficient to suit all current university students' profiles and motivations. When it does not match their needs, resulting in unproductive processes, sometimes aggravated by the break from reality provided by digital dependencies, new teaching formats can be met with curiosity, expectations, and diligence. In the case of this strategy, drawing was shown to provide sufficient ground to enable a rewarding teaching and learning experience, to allow for assimilation of information through interpretation, to help in overcoming language barriers and to provide a means for interaction and playfulness.

The results of the experiment suggest that interaction has become crucial in a fulfilling learning experience, which is consistent with the illusion of interacting full time with the World Wide Web has brought into students' lives.

Considering the challenges of modern education, where in many cases the acquisition of information is compromised when it consists of passively "receiving" transferred knowledge, the concept of "playful teaching" can be extended to models which include interpretive media such as the arts and, especially, drawing, since its link to verbal contents is well established in most cultures. This allows for expanding the formats of interaction within the field of information, aggregating knowledge in an alternative, non-digital "screen". The method still presents parallels to the type of digital activities students habitually engage in, similar to the construction of a personal "feed", since it presents the material for appropriation, implicating the students in the construction of meaning through active involvement in content production.

Discussion and Further Research

In relatively controlled environments, some learning strategies can easily be considered effective. For more effective data interpretation, this strategy must be tested in varied conditions and contexts and among diverse populations of students and teachers. It is necessary to understand the factors that may favour or prevent the application of this strategy, or in which scenarios it can be applied. The test of this strategy contemplated a timeline with the same class, measuring the connection and approximation factor within this scenario. A larger trial is being conducted for broader and more variable data collection involving more institutions, and aims to test the performance of this approach in monolithic sessions.

Although the strategy is meant to be set in the classroom, the current pandemic has allowed for the observation of the method's application online, showing that in this adverse setting, it still capitalizes the students' attention. Despite the reduction of proximity in the teacher-student relationship, in which drawing is the empathic line, such efficacy allows us to infer that the characteristic of play contained in drawing is more important than the physical interaction. However, in online sessions, the possibility of the teacher to view the students' sketchbooks and to apprehend non-verbal cues was compromised; the students still produced their content, but the latter was less informed through discussion of their visible features.

More inclusive strategies can be created in the face of multiculturalism. Drawing as a means of knowledge transfer brings added value and provides a connection between cultural and generational differences. It transports the students to a phenomenologically common place, a "drawn" childhood. Despite all its challenging aspects, and the fact that it might not suit everyone's teaching styles and options, the study highlights the fact that happiness suits the learning process, and that drawing has this gentle effect.

Acknowledgement

Notes

1 Original text:

(…) a recusa de Tolstoi em aderir inequivocamente a uma qualquer teoria pedagógica então em voga, influenciada ou não pelas teorias de Pestalozzi ou de Rousseau, provém do seu ceticismo geral em relação a qualquer teoria, mas fundamentalmente do seu descordo com o pressuposto do método de ensino socrático: o de que o aluno é ignorante de muitas coisas e que o papel do mestre será o de o conduzir, maieuticamente, de um estado de ignorância para um de conhecimento de muitas coisas.

2 Original text:

> O conhecimento é reconhecido como o resultado da interação do sujeito com o objeto, sendo que o desenvolvimento cognitivo ocorre pela assimilação do objeto de conhecimento às estruturas cognitivas próprias do sujeito e pela acomodação destas estruturas ao objeto de assimilação. Portanto, o conhecimento resulta de um processo de construção pessoal de atribuição de sentidos e significados que o sujeito lhe atribui.

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2 The New *Fado* of the Students

Proximity between Utopia and Architecture Education

Inês Nascimento

ISCTE-IUL, Lisbon, Portugal

Introduction

The world changed on a Thursday in May 1968. This global social revolution was also felt in Portugal, where its energy permeated cities, streets, schools, and the Portuguese people. The country of *fado* and of *retrotopia* was preparing to break free from a dictatorship that had lasted more than 40 years (1933–1974), and the Portuguese reality was on the brink of transformation.

This change arrived in Portugal, also on a Thursday, in April 1974, when the country's reality, regime, education, and way of life reached the utopia once envisioned by the people. These were times of experimentation, mistakes, learning, and making a difference.

Architecture was active on all fronts, responding to the prevailing atmosphere both in education and in practice, broadening its horizons with a radical posture and critical discourse. The time had finally come to turn dreams into reality and to achieve goals by bringing Architecture closer to the people and utopia to reality.

Although the potential of utopia in education has been recognized, and despite some occasional theoretical references, this concept remains largely absent from the curriculum of Architecture courses in Portugal. The same is true for the practice of radical pedagogies, which, interestingly, are now being revived outside of Academia, led by professors from Architecture schools (Correia, 2018).

The proximity between utopian and radical thinking in Architecture education gave rise to pedagogical experiences that marked the last significant innovation of this type in this context (Colomina, 2014). Today, the importance revisiting these ideas has gained traction, highlighting the need for a paradigm shift that reexamines these concepts – now distant from each other and from universities – and emphasizes the urgency of their (re)approximation through a deeper understanding and validation of their potential.

Today, the theme of the Local Ambulatory Support Service – *Serviço de Apoio Ambulatório Local* (SAAL) – is more relevant than ever, being considered both revolutionary Architecture and radical pedagogy. However, contemporary Architectural pedagogies are often described as "boring" and "dull" (Colomina, 2014, 54:00). Have the utopians lost the ability to (re)imagine radically different futures, even in education? Or have they simply lost the capacity to dream, let alone make dreams come true?

Proximity between Revolution and Utopia: The Role of the Schools of Architecture

> (…)yesterday's problems are still the problems of today, with one significant differ-
> ence: in the 1970s there was hope, there was a sense of the future (…)
>
> Bandeira & Faria (2014, p.193)

In May 1968, Paris witnessed a momentous shift as the impossible was de-
manded and imagination took power.[1] Social movements across Europe armed
themselves with utopia to confront the economic, political, and social crises, lead-
ing to the rise of student movements that sparked a worldwide social revolt. The
student-based revolution, which offered a new vision of both society and the world,
marked the May 1968 crisis (May 2 to July 23) as a pivotal moment in the revitali-
zation of utopia (Vieira, 2020). Students, seeking not power but the transformation
of society and the world, emerged victorious. By redefining the boundaries of the
possible, they hanged the world – a change we still benefit from today.

Portugal also became a stage for these student revolts, where students rejected
the pedagogies of Fine Arts, criticizing the school's methods and curriculum for fail-
ing to address the relationship between Architecture and both social diseases and
contemporary policies. They demanded that their studies reflect a vision of a new
social order.[2] Students, teachers, and architects gathered at the II Study Meeting and
National Meeting of Architects to think of – and act on – the future of the Architec-
tural training and the restructuring of Academia (Moniz, 2010). They argued that
"the University of the future should be critical and based on a large flexibility within
teaching programs, in which student participation will be of crucial importance"[3].

In this atmosphere of revolutionary excitement, Architecture fused with politics, and
countercultural social movements and radical avant-garde artistic groups emerged
worldwide, seeking alternatives and exposing narratives of utopian nature. These
imperfect and short-lived utopias transformed the urban environment in response
to the new social desires. Architecture became critical, introducing new experi-
ences that engaged in discursive activities grounded in critical thinking and in dia-
logue that questioned the practice itself.

This revolutionary and visionary influence of Architecture reached the class-
rooms through magazines introduced by teachers and through an experimental
regime – a pedagogical experience – created and implemented in Architecture
schools (Moniz, 2010). In 1970, the schools in Lisbon and Porto underwent an
innovative and radical reform (Bandeira & Faria, 2014, p.11), that encouraged "a
certain liberty in teaching methodologies, in a time of fearless experimentation"
(Bandeira & Faria, 2014, p.73). These were times to question the present, where
"the past and the future seem to be in communion" (Bandeira & Faria, 2014, p.79),
and when the social/political role of the architect awaited the Revolution to prove
itself (Moniz, 2010).

These pedagogical experiments, which played a crucial role in shaping the
discourse and practice of Architecture during the second half of the 20th cen-
tury, are understood as Radical Architecture practices, and they are radical in the

truest sense of the word – rooted in the Latin term *radix* (Colomina, 2014). These pedagogies challenge the foundations of Architecture, with a discourse – now dormant – that emerges through a contested Architecture and questions the matrix of teaching. Education positioned itself as a vehicle for subversive actions, promoting new alternative visions through progressive pedagogical initiatives (Colomina, 2014).

The proximity between the architect and the society became unquestionable, especially during a time of political, social, and economic crisis, when 25% of the Portuguese population in mainland territory was living without basic conditions (Alves, 2017). This political and social involvement of architects with the city was manifested in schools through the "refuse of drawing", leading to the "dignification of the subject" and the "legitimization of the creative act" (Bandeira & Faria, 2014, p.107). The school was in crisis (Moniz, 2010), and this crisis was intertwined with various fights – the fight for the Right to the Place[4], the Right to Housing, the Right to The City as articulated by Henri Lefebvre, and the Right to Identity (Fernandez, 2014).

Thus, Architecture became a hymn to the revolution, seen as an essential tool for improving people's lives and for the social transformation of the city, making the architect's role crucial in society. With the same desire to change the world, the country of fado began its preparations for the anticipated revolution, which would arrive five years later. Freedom came to Portugal, also on a Thursday, through the struggle for democracy, culminating in the Revolution of April 25, 1974. At that moment, experimentation became the key approach, and this change presented an opportunity to innovate and experiment (Portas, 2015).

Proximity between People and Utopia: The Role of Architecture Students

> To understand the Portuguese, you must understand "fado", the typical Portuguese entertainment. The musical expression of a basic characteristic of the people: the belief that life has destinated and nothing can change it. Fado means "fate". The Portuguese believe that things which are going to happen, will happen, and that is that. There's a fatalistic attitude, one the Portuguese accept with good humor and good grace.
>
> Dias & Chaves (2007, 02:26)

Portuguese Architecture sought to change the world before being changed by it (Nadais, 2009), and Portugal was about to change. On August the 6, 1974, SAAL was born[5] – a case of participatory experimentation[6] within the national territory. The Revolution of April 25th and the "Revolution of the Right to Housing", fundamental in the (re)definition of Nuno Portas' program, ended the prolonged anticipation that had existed since 1968[7] (Portas, 2015). This experience had already been preceded by preparatory processes and actors, leading to its rapid and implacable implementation.

The "Architecture of April 25th" emerged as a counterpoint to alternative industrial growth models, contributing to the strengthening of the popular

movement in urban areas – the *Poder Popular* – and laying the groundwork for increasingly advanced struggles (Bandeirinha, 2007). New houses and infrastructures were built, and several buildings were occupied for new social and cultural programs to support communities. Whether designed as an emergency service to contain the population's revolt, a progressive measure encouraging mobilization for better living conditions, or a combination of both, the SAAL process sparks opinions that are sometimes contradictory, sometimes convergent.

Created as a School of Fine Arts of U.Porto (ESBAP) laboratory, this utopia was "a process so credible and so frightening that had to be stopped" (Bandeirinha, 2007, p.260). However, it left no doubt that the most significant novelty of this experience was the empowerment and the proximity of people to Architecture (Portas, 2015).

In Porto, where SAAL was a standout, this pedagogical approach had already been mapped out before the revolution, through a utopia that utilized students as essential tools for its realization. The school and the students, mainly in Porto, played a crucial role in this process. The SAAL experience enabled professors and students to test political and disciplinary convictions that went beyond academic practice, allowing them to finally engage with the people and act on their reality.[8] This experiment involved 176 students, who participated in 69% of all projects, 17 of which were built, involving brigades composed mainly of students (Conselho Nacional do SAAL, 1976).

Student involvement was not limited to Architecture. It extended to neighbourhood surveys, promoting the new program, and electing an architect for each intervention. Architecture students were at the forefront of protests – in person and through the production of posters in popular ateliers in the school – in the occupation of buildings, the organization of Residents' Associations, the dissemination of cultural events, many periodic publications referring to each neighbourhood, as well as the participation and construction of housing and social equipment projects.

Simultaneously, Residents' Associations grew en masse in the city and teaching evolved further, with architects adapting their work methodology to teach populations how to "read" and understand Architecture (Bandeirinha, 2007). Now, the school, architects, Architecture teachers, Architecture students, and residents had to engage in dialogue, as it was imperative to convey knowledge clearly, ensuring that everyone understood the function of space.

Proximity between Radical and Utopia: The Role of Architectural Education

> Generally speaking, all ideas that look to the future are utopian. They are nowhere yet carried out, and that is why they are more attractive the less achievable they are. And naturally, what you must do is to be at the same time a calm person, objective in relation to the reality that exists. You can see where you are in history, and only do at that moment what the rest can respond to, however, always try to take a step forward. Always looking for the conditions for such a thing to happen.
>
> Silva (1990, 02:24)

There is no utopia without Architecture (Coleman, 2005); however, it remains dormant in the teaching of the discipline, occupying a strange absence in the curriculum of those who propose any essay on the relevance of utopian pedagogies in the teaching of Architecture and in its professional practice (Coleman, 2012). Used as a methodology and as a tool for societal transformation, it considers social, cultural, economic, political, and public health factors, existing as an instigator of real possibilities while bringing with it a social criticism, a functional will, and the desire for a better future (Vieira, 2016).

Utopia thus becomes an intrinsic part of the creative process, both in the academic context and in professional practice. Utopias truly exist, both in the imagination and in the future, and should be seen as part of the current reality rather than outside of it.[9] According to Vieira (2016), we know today that contemporary utopianism is realistic, experimental and participatory, and it can be taught through four modes of thinking: prospective, which encourages imagination and action, where the future is an object of desire that gives meaning to the present; critical, where hypotheses undergo validation processes requiring analysis of their impartiality, substance, data accuracy, and relevance, before the results can be considered true; holistic, with an awareness based on the systemic functioning of societies where hypotheses are tested; and creative, which fosters thinking of alternatives, testing multiple hypotheses, and thus escaping the replication of knowledge.

Alarmingly, universities are becoming hyperspecialized and students build their own curriculum through a menu of possibilities (Colomina, 2014), even though the problems we face today are systemic and require multidisciplinary responses, not just an alliance of disciplines (Vieira, 2020). We want our students to be innovative and to transform the future of the architect's profession, yet we continue to offer ingredients that aim at goals serving only the market, without providing the freedom to imagine alternative possibilities.

Nevertheless, we cannot guarantee that the exercise of radical pedagogies will be the answer to this issue, nor that it will lead to the practice of radical Architecture. However, these experiences represent the last real innovation in pedagogical approaches to teaching Architecture, with a bottom-up system that began with student protests when teachers were absent from schools and students refused to graduate in favour of their (op)position against the institution.

The teaching of Architecture needs to be reinvented, and perhaps together, we can co-create a new pedagogy suited to its time and (non) place. We must return to "questioning, experimenting, provoking, even if this implies the politically incorrect"[10], and a radical attitude that leads to a critique of the future and fights for the common well-being is urgently needed. A new society will only emerge through a new discourse and a new pedagogy, where creativity and innovation will be essential for this rebirth (Pirondi, 2017; Vieira, 2020), not implying the invention of something entirely new but a recombination of elements (Vieira, 2020).

But Academia is in crisis (Pirondi, 2017). We now live in a moment of mistrust and disillusionment that robs us the dimensions of dream and hope, and utopia is the fundamental element needed to overcome this (Bandeira & Faria, 2014).

In Portugal, the education of Architecture is outdated (Beirão, 2017); both institutions and the profession – with a retrograde mentality, based on models and processes that do not address current challenges (Correia, 2018) – are in crisis (Baía & Labastida, 2014), and the reflection on its repositioning underscores the urgency of a paradigm shift. However, the unexpected (re)emergence of countercultural practices, critical of the limitations of current Architectural education in Portugal, raises the question of whether it is fulfilling its mission (Correia, 2018).

Architects are no longer merely visualizing physical space; they are now required to produce new narratives about new ways of operating within new social landscapes (Cutieru, 2020). We want to reborn, and we aspire to a new vision of the world. The time has come for architects to rediscover their most valuable and unique quality – the ability to imagine a new world (Stead et al., 2020), (re)formulating questions, provoking actions or reactions, and sculpting new panoramas of Architecture (Fagundes, 2016).

Proximity between the Portuguese and Utopia: The Role of Utopians (Final Considerations)

> Portuguese will be what it has to be! You don't even have to ask if you can. (…) It's a matter of inventing the future. If you want: dream of the future, as they say. But I like to talk more like Frei Luís de Sousa says about Bartolomeu de Mártires: missing the future. Instead of missing the past – which only serves to make fado and other similar things that don't interest me at all – it's necessary to start missing the future and see what future you must miss.
>
> Silva (1988, p.158)

The Carnation Revolution found students in the streets and an empty school[11] (Bandeira & Faria, 2014). These radical pedagogical experiences took place in Portugal through a participatory process that brought utopia to life when students, teachers, and architects abandoned schools, as the time and opportunity had come to materialize policies, processes, projects, and dreams. SAAL, with all its pedagogical legacy, makes it clear that active participation is necessary for schools to have an innovative and revolutionary impact on the city and society.

"Utopia is there in the horizon"[12], it makes us move, and the modern urge to design an ever-better world continues, with no end point but with a process as our starting point. Utopia must be the engine of these processes and developments, requiring a discussion based on utopian ways of thinking and in a university where knowledge is, above all, an instrument of utopian freedom and a critical thinking. The present and future of our societies depend on Architecture as an instrument for utopia, and we need to train students to be capable of manoeuvring it.

Thus, the current challenge for our Architecture schools is to adopt a clear position, offering radical pedagogies and pedagogues capable of providing our students with the opportunity and the freedom to think and to act critically.

Here, we do not evoke *retrotopia* as nostalgia for the past, even though it is "the Portuguese utopia par excellence" (Vasconcelos et al., 2021, p.22). Instead, we reference the SAAL case, as it oscillates between a realist utopia and a radical pedagogy[13], like two oxymorons that come together, understand, and complement each other. These realistic utopias, or radical experiments, are idealistic in the dream (radical), but pragmatic in the action (in experimentation), which is exactly what contemporary utopians need: "experience the future in the present" (Vieira, 2021, p.46).

Re-imagining education is not a defeat; it is, instead, a victory. We must encourage and invest in improbable ways of thinking, or we risk creating "illiterates" who will not be able to learn, unlearn, and relearn again[14]. In short, this experience, which we remember and relive today, has its origins in much more than an ideal dream. It emerges through a concrete objective, a dream with an expiration date, which aimed to bring people closer to the discussion and to Architecture, fostering proximity between processes, architects, schools, students, the city, and the world. Architecture is, and always will be, of the people and for people. Portuguese Architecture is all of us, it's you and me. Close, together.

Notes

1 Alluding to the iconic quotes that marked May 1968, such as "soyez réalistes, demandez l'impossible" and "l'imagination aux pouvoir".

2 In May 1968, while the schools of Fine Arts in Porto convened, the lack of dialogue between students and teachers became evident. This absence of communication provoked a strong reaction from Architecture students, leading to the publication of the second issue of *Boletim ESBAP*. In this publication, they called for a meaningful dialogue between society and Architecture, and advocated for the democratization of education (Moniz, 2010).

3 Vittorio Gregotti, guest speaker at the II Study Meeting (Moniz, 2010, p.71).

4 "Before the Right to the City, there was the Right to the Place" (Costa, 2009).

5 This intervention originated from a decree issued by the Secretary of State for Housing and Urbanism, Nuno Portas. It stands as an emblematic, albeit brief, and unique convergence in the social and cultural history of Portugal, bringing together the community, architects, schools, students, and politicians.

6 "(...) everything you can think about dialogue and participation will perhaps have a very utopian aspect, very 'ideal' " (Siza, Milheiro & Dias, 2009, p.19).

7 Nuno Portas was responsible for the Division of Construction and Housing in 1962 and formed the Group of Coordination and Studies of Housing, a multidisciplinary team that included architects, engineers, economists, and sociologists (Portas, 2015).

8 "All courses carried out investigations in poor neighborhoods, or degraded housing. (…) With the 25th of April, it started to act directly, and the school turned to the outside world and interacted with the population" (Fernandez, 2014, 26:20).

9 Thesis defended by Ernst Bloch in the 1940s (Vieira, 2020).

10 Answer by Mário Ramos, a student at the time, about his ambitions regarding his schoolwork (Bandeira & Faria, 2014, p.179).

11 This experience ends on October 27, 1976, without any operation being fully completed during its active period. However, it left behind a significant legacy, with 169 operations still in progress, involving 41,665 families, 2,259 homes under construction, and 5,741 homes yet to be started (Bandeirinha, 2007).

12 Fernando Birri, quoted by Eduardo Galeano in Las Palabras Andantes by Eduardo Galeano, published by Siglo XXI, 1993 (Galeano & Borges, 1993).
13

> If radical means going back to roots, origins, and changing the system, and Pedagogies imply a system, then Radical Pedagogies is an Oxymoron. Maybe it means "transition phase", because they don't last forever, even because the system is institutionalized and is no longer radical.
>
> (Colomina, 2014, 42:25)

14 Edgar Morin, quoted by Fátima Vieira (2020).

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3 Design Educators

Collective Agents of Change

Carla Cadete

Hei-Lab, Lusófona University of Porto, Portugal

Introduction

Social Design is the axis of design that is concerned with the designer's role and his responsibility to society. The changes that have taken place over the past few decades on a global scale have implied a new performance in design, *"design has always had one elemental role as an agent of change that interprets, shifts of any type – social, political, economic, scientific, technological, cultural, ecological, or whatever – to ensure that they will affect us positively, rather than negatively"* (Rawsthorn, 2020, p.8). In the Communication Design bachelor's degree programme at *Lusófona University of Porto* (ULP), we encourage students to participate in international competitions in order to challenge them with new briefings, to stimulate creativity and to compete with students from other educational institutions and other countries. The *Skopje Poster Competition* and *International Poster for Tomorrow* focus on social and environmental themes: freedom of expression, social inclusion, the right to education, housing, work, or environmental matters. The quality of work developed by students has been frequently recognized at an international level. According to Margolin (2014), it's urgent to challenge Design schools to review the process as they socially introduce students to the world of Design (p.68). Also, the author (Margolin, 2014) highlights the importance of implementing social projects in pedagogical objectives, so students will eventually believe their ability to carry out such work in their professional lives; t is up to each one of us, designers and teachers, to act and disseminate this approach, in favour of a better world. As Papanek said, *"As socially and morally involved designers, we must address ourselves to the needs of the world with its back to the wall, while the hands on the clock point perpetually to one minute before twelve"* (Papanek, 1971, p.14). This theory was suggested in the 1970s and remains valid today. Design is an important transforming agent to promote positive solutions in current society.

Papaneck and Margolin: Teaching Design as a Social Practice

Victor Papanek and Victor Margolin were both pioneers in the need to involve students in real-world projects, preparing them as future designers invested in causes that would attempt to solve issues present in society.

Papanek (1923–1998) was an Austrian-born American designer and teacher who supported the social and ecological responsibility in product design. In his book *Design for the Real World: Human Ecology and Social Change* (1971), he was one of the first to tackle issues of sustainable and social design and suggest ways in which design could be used outside the regular market. In his book, *"he discussed opportunities for designers to work in the developing world and also to design for people in need, essentially the same population that the social work intervention model recognizes"* (Resnick, 2019, p.18). As designer, writer and activist, he made an appeal for inclusion, social justice and sustainability. His theory, opposing to the design of futile objects, was seen by him as an important factor to social well-being and as such is still relevant to design today. Papanek's projects in the 1960s often involved his students and reflected his approach to design. Roger Dalton, a post-graduate student at Manchester Polytechnic, designed a piece used in school playrooms that was later used in an increasingly urbanized Africa where playgrounds were lacking. Canes for the blind were designed by Robert Senn, a student at Purdue University, where they glow in the dark and provide a more sensitive tactile feedback for the hand. At the same university, Steven Lynch designed a reclining chair to be used in classrooms for restless children. Papanek's tetrakaidecahedral structure was designed together with students, teachers, parents and children as a movable playground structure. While Papanek was still a student, another project was developed for an international competition, a chair to relieve weight from the spinal column and distribute it over the fatty tissues of the back.

Margolin (1941–2019) was an American design historian, researcher and educator. He was a professor of Design History at University of Illinois, Chicago, where he taught from 1982 until 2006. According to the author (Margolin, 2014), if social projects were involved in pedagogical objectives, students eventually believe that they will be able to carry out work inside and outside of the classroom – "one of the school's greatest achievements, as it responds to the essential problem of finding a place for Design in a system that satisfies social needs, instead of satisfying the market*"* (Margolin, 2014, p.65). The author gives as an example *The project Design for Democracy* in which students of Illinois University redesigned the paper ballot as ballot boxes and brochures with informative material, among other communication methods. According to Margolin (2014, p.141), this project was vital in educating young students in understanding how their creations can positively change how we live as citizens. The universities should promote more writing, lectures, relationships and debates with the aim of encouraging and alerting citizens with new methods of social practices. In a conference at Ontario College of Art & Design University in Toronto, Margolin (2014, p.3) introduced the concept of "citizen-designer" in the sense that the designer plays multiple roles, each of them has its own political and social dimension. He called these roles the "Action Matrix", which he gave three levels: the micro-level is the individual action, where he includes issues such as art schools and universities; the intermediate level mediates between the individual; and the macro-level includes the government, international organizations and big corporations. According to Buchanan and Margolin (1995), "we can explore the multiple dimensions of design activity and the way it operates as a powerful instrument of social construction" (p.143).

First Practice: Ninth *Skopje Poster* International Student Poster Competition – Exhibition and Conference

Plakart is an non-governmental organization (NGO) of graphic designers based in Skopje, Macedonia. The *International Student Poster Competition* (ISPC) is *Plakart's* most successful project. It was initially organized in Skopje, in June 2008, as the first regional student poster competition that offers international promotion of ideas and visual communication, with strong emphasis on global issues. Since 2014, students from the Bachelor in Communication Design programme at ULP carry out proposals guided by professors and submit them for competition – a pedagogical practice carried out in academic context.

In 2017, through a partnership with *Plakart,* an exhibition[1] was organized in Porto – 70 finalist posters for the 7th, 8th and 9th *International Students Poster Competition*, with the support of the Ministry of Culture from Republic of Macedonia, Porto's Metro Company and the Porto City Council. The exhibition was curated by Design professors, and took place in the atrium of three subway stations – *São Bento* Station (24 posters), *Aliados Station* (26 posters) and *Marquês Station* (20 posters), between May 18 and June 21, 2017 (Figures 3.1 and 3.2). An opening conference was held at *São Bento* subway station, with the participation of Gere Posterov (*Plakart* President); Jorge Silva (Designer and teacher of Illustration Master's degree, at *Porto School of Fine Arts*) and Miguel Neiva (Designer and author of *Color ADD*, a colour code for colourblind people) (Figure 3.3). The audience was composed of several students and teachers from three schools of Arts and Design: *ULP*, Porto School of Fine Arts and *ESAP* – Porto school of Arts (Figure 3.4). The international competition focused on contemporaneous issues and since 2014, the themes were: Design for Peace (7th edition); Enabled for Disabled (8th edition); Identity in Crisis (9th edition); Artificial Reality (10th edition); and Include, Not Exclude (12th edition). As a sponsor, the Porto's City Council provided advertising space – MUPIs throughout the city to effectively publicize the exhibition – and Porto's Metro company approved three subway stations to display the posters and to hold the opening conference as well as the announcement of the exhibition on the carriage displays. The exhibition was organized with students from the bachelor's in Communication Design and Audiovisual and Multimedia Communication programme, and an interview with Gere Posterov was also carried out by a Design student. This initiative provided effective teamwork, enabling students to share ideas, debate and be part of the programme showcasing the work done by students from 10 countries – Portugal, Budapest, China, Hungary, Poland, Serbia, Turkey, United Kingdom and the United States. The diversity and quantity of the work presented played a decisive role in the public's interest in the exhibition.

This way, the university's pedagogical objectives followed Papanek and Margolin's ideal that Design should be a social agent of change. As a result, the university not only provided a great academic opportunity and social challenge, but also promoted young students as future design professionals and brought awareness to the local community about urgent universal issues.

Figure 3.1 The exhibition poster.

Source: Photo from Lusófona University Audiovisual Department.

Second Practice: 11th International Poster Competition
Poster for Tomorrow

Since 2015, the Communication Design bachelor at ULP encourages students to participate in the *International Poster Competition Poster for Tomorrow*. In the 11th edition (2020), the theme was *Fake News*, in addition to that fact students from Communication Sciences/Journalism courses were invited to prepare a class on the topic *Fake News* and present it to the Communication Design

Figure 3.2 Subway, São Bento Station, opening conference, May 18, 2017.

Source: Photo from Carla Cadete.

Figure 3.3 Gere Posterov (*Skopje Poster*) left; and Miguel Neiva (*Color Add*), right. São Bento Station, opening conference, May 18, 2017.

Source: Photo from Lusófona University Audiovisual Department.

Figure 3.4 Subway, Aliados Station exhibition.

Source: Photo from Lusófona University Audiovisual Department.

students in an interdisciplinary collaborative practice. The students showed interest and enthusiasm, and this approach proved to be successful in not only engaging students but also providing holistic knowledge. The information shared by the Journalism course was used in the creative process of Design students, and the resulting outcomes generated greater confidence, more creative and informed students, and the possibility of generating better solutions. Once again, the university founded its principles on the need to establish new collaborative working methods and encourage interdisciplinarity. In addition to specific skills, pedagogical and training practices must play a role at the service of the holistic development of their students, comprising and integrating a range of skills. Teamwork and dynamic groups help to prepare students for the job market. In the announcement of the results of the competition, three students from the Communication Design programme were selected. The poster done by Ana Janeiro[2], a student from the third year was selected for the Top 100, among 6070 submissions from 112 countries, and posters from Ana Sofia Almeida and Fernando Barbosa, from the second year, were selected for the Shortlist of the best 300. This competition gives three levels, in a total of 410 classified out of 6070: Top 10, Top 100 and Top 300. Posters were made in Design disciplines in the 2019–2020 academic year. The inaugural exhibition was held in Paris, at École Camondo, on September 16, 2021, and the posters with exhibitions around the world (Azerbaijan, Bosnia Herzegovina, Cyprus, Ecuador, Greece, Hungary, India, Iran, Italy, Kazakhstan, Mexico, Pakistan, Russia, Tunisia, Turkey and the United States). A book[3] was published with the best 100 posters in the competition.

Work Methodology

For both competitions (*Skopje Poster Competition* and *Poster for Tomorrow*), the creative process was done through *Design Thinking Methodology* with the following order: *Problem definition, Ideation, Prototype and Implementation (problem solution)*.

Problem Definition

The process began with the briefing. The topic was delivered with goals taking into account theme, available time and a schedule with all relevant dates.

9th International Skopje Student Poster Competition Briefing:

Theme: Identity in Crisis

Goal: Encouraging young talents, "Cross way of the West and the East, the North and the South, culturally, nationally, ethnically, the issue of the identity is deeply engraved in the genetic heritage of the nations and countries. It is why young designers from all over the world should be provoked to join and work on this issue and to speak-up in raising awareness of the wider public and all concerned parties. Try to create and provoke an attention that will grow in to international movement, campaign. Explain/complain/create and achieve higher standards of visual communication and visualize your thinking. As designers we are obligated to act toward solving problems or pointing out solutions. Our responsibility as designers is to state our point of view and to send powerful message!!!"[4]

Start: 29 September, 2016; delivery date: 21 October, 2016; deadline for submission: 30 October, 2016 (CET 00:00 hours); available time: Four weeks, 2 classes per week, and 3 hours per class.

11th International Poster Competition Poster for Tomorrow Briefing:

Theme: Fake News

Goal: Encourage people, both in and outside the design community, to make posters to stimulate debate on issues that affect us all, "People have always twisted the truth, or simply told lies, to get what they want (or change the world). But now we have the ability to share information faster and wider than ever before. It used to be only a few media outlets or government sources that could shape public thought, but now everyone can."[5]

Start: 07 April, 2020

Delivery date: 29 April, 2020

Deadline for submission: 20 May, 2020 (CET 00:00 hours)

Available time: Four weeks, 2 classes per week, 3 hours per class.

It is common to resort to contributions from other disciplines from the Bachelor's in Communication Design programme, or from other courses, depending

on the nature of the themes that students work on as a way to enrich and improve work: "Design must become an innovative, highly creative, cross-disciplinary tool" (Papanek, 1971, p.10).

Beyond this methodology, we always seek to value the internal network (academic resources) as a benefit and inspiration to the creative process. Our students take the advantage to be part of a university with a large offering of courses that allows the sharing of knowledge with a large impact on projects. The *11th International Poster Competition Poster for Tomorrow* is an example of this involvement of the academic community, where students from Journalism prepared a class on the topic *Fake News* to present to Design students. As result, more knowledge was gained and more ideas were generated than when Design students work by themselves. However, "most schools are still reluctant to confront the challenge of interdisciplinarity and, operating in a system based on the distinction between subjects, design teachers do not feel encouraged to establish new collaborative working methods" (Margolin, 2014, p.66).

Ideation

Ideas were generated with tools such as words, images, colours and shapes, through brainstorming, key words, action verbs, mind map, and a mood board. Students presented the creative process and a set of ideas, an exercise that starts with a divergent process to create a large range of options, key for guiding students to beginning an exploratory process (see Figure 3.5).

Prototype

Posters ideas were tested through an exploratory process. After testing their ideas, students presented the advantages and disadvantages of each possible solution in a convergent process. According to Brown, "By testing competing ideas against one another, there is an increased likelihood that the outcome will be bolder, more creatively disruptive, and more compelling" (Brown, 2009, p.67).

The strengths and weaknesses of each proposal were analysed to find the most effective way of fulfilling the initial goal. Design tools, such as: colour, contrast, balance, typography, legibility, composition, scales and materials, were considered taking into account that posters will contain a message that needs to be strong but easily understood. This phase was vital to orient student's work and to advise them accordingly, as practice-oriented initiatives are crucial in Design teaching. This phase required special guidance from the teacher, as the teacher's experience allows them to draw attention to certain aspects that often go unnoticed by younger students. Because of this, at this stage, an interim presentation and evaluation was carried out, where these factors are highlighted and usually surpassed.

During the creative process, meeting groups are held, enabling an environment for dialogue and sharing ideas, rather than issuing instructions. Creating a
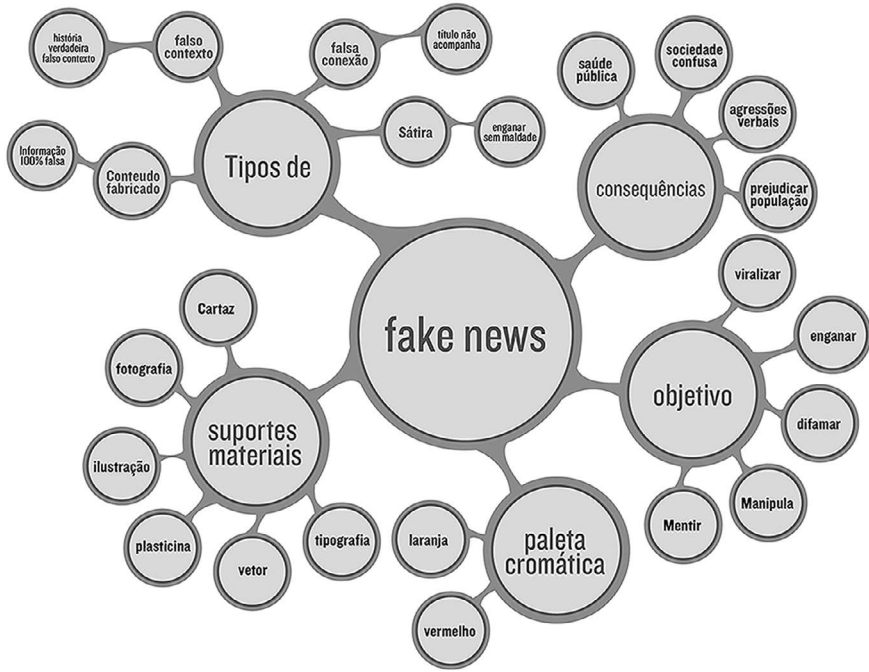
Figure 3.5 In the creative process, a mind map from Ana Rita Janeiro.

Source: Photo from Lusófona University Audiovisual Department.

collaborative class is a way to learn through engaging the class, sharing insights, and gathering feedback from the group. A collaborative process is one where everyone involved benefits from a positive discussion: teamwork is promoted, solutions are found and often lost ideas are rescued.

Implementation (Problem Solution)

The final solution was developed, finished and presented with the creative process and with all steps justified accordingly. The final assessment considers creativity, the theme/relevance, impact and legibility (Figure 3.6).

Final Considerations

This chapter presents two pedagogical practices carried out in a curricular context, in the Bachelor of Communication Design programme at ULP, inspired by the critical theory of pioneers such as Papanek and Margolin. Projects submitted in two international competitions – *Skopje Students Competition* 2016 and *Poster for Tomorrow* 2020, resulted in two exhibitions held in public spaces. The honourable mentions obtained are important for students, due to their international recognition

Figure 3.6 Ana Rita Janeiro, 11th International Competition *Poster for Tomorrow* – Top 100.

and the encouragement they provoke. However, the greatest importance is to make Design students aware of having an active role in society. In this context, posters and their dissemination in exhibitions has an important role as a means of communication with a large and different kind of public.

The results presented here are the recognition that design is not a solitary practice, but a collective process through a co-design activity acting as a catalyst for social creation and transformation. The results obtained in the competitions prove the value of the work process through a cross-disciplinary collaborative strategy. We always seek to value the internal and external network as a contribution to knowledge and inspiration to the creative process. Our students take advantage of being a part of a university with a large offering of courses that allows the sharing

of knowledge with large impact on projects. This collaborative work method has been producing results as well as a call for change, for both students and society at large, and the need to prepare students to use the tools they have to practice design for a social service. There is also a call for the possibility for Design educators to play the role of collective agents of change. These two examples attest to the existence of suitable pedagogical practices in the way we teach Design. However, there is still a lot to do.

Acknowledgement

Notes

1 https://skopjeposter.com/gallery-items/postreview-exhibition-9-spf-porto-portugal/
2 https://www.posterfortomorrow.org/en/projects/fake-news/100
3 https://www.posterfortomorrow.org/en/site/shop/view/?slug=fake-news
4 https://skopjeposter.com/projects/identity-crisis/
5 https://www.posterfortomorrow.org/en/projects/fake-news

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4 The Synergies Initiative

Enhancing Interdisciplinarity through Problem-based Learning in Design Education

Rodrigo Hernández-Ramirez

Sydney School of Architecture, Design and Planning, University of Sydney, Sydney, Australia

João Batalheiro Ferreira, Rodrigo Morais, and Carlos Rosa

Universidade Europeia, IADE -Faculdade de Design, Tecnologia e Comunicação, UNIDCOM/IADE, Lisbon, Portugal

Introduction

Deciding the most appropriate conceptual and practical tools for design education is not only a pedagogical matter, but one that requires a thorough understanding of the actual tasks that designers carry out in the professional world. Moreover, a case can be made that *educating*—as opposed to merely training—designers implies dealing with more complexity than doing so in well-established fields such as medicine or law; not because designing is somehow more important or difficult, but because the field itself is still consolidating its identity. Design education is *sui generis* in the sense that creating a curriculum implies taking a position on what design itself is, what its subjects are, and what designers should know. Moreover, design education must not only consider specific technical training, but also encompass the social, political, and cultural responsibilities of designers themselves *and* of the products and services they create.

The vast amount of literature on design education has an almost equal number of viewpoints. This is not surprising, since the core ontological problems of design remain open to rational debate because design is deeply tied to evolving practices that do not necessarily share common foundations (Monteiro, 2019; Parsons, 2015). Moreover, despite decades of advocacy (Archer, 1979), design is still not regarded as an autonomous "science". When answering how design education should "look" nowadays, authors such as Norman (2010, 2011; Norman & Klemmer, 2014) argue that the field should incorporate behavioural science, technological expertise, understanding of business, and sufficient scientific literacy. Parallel to this view, other authors (Papanek, 1984; Rams, 1983a, 1983b; Redström, 2020) advocate for the complete emancipation of design, that is, to stop regarding it as an auxiliary multidisciplinary instrument for other fields.

Our research departs from an understanding of design as a research field that requires a critical autonomous and transdisciplinary analysis of its principles from a normative and pragmatic standpoint. Our primary goal is to show how implementing projects that call for interdisciplinary collaboration can be a valuable means to strengthen the skills of undergraduate design students. In the next section, we briefly recount the main reasons why design education should be updated. Following that, we describe the "synergies", our pedagogical approach; finally, the end of the chapter presents a brief discussion of our findings so far. This chapter does not claim to "solve" design education once and for all, but merely to describe the early stages of our pedagogical experiment and share it with the design community. Our present goal is to state our position regarding design education, outline our approaches and generate debate about redesigning the future of design education in Portugal.

Why Design Education Needs Updating

Design education has changed over the past few decades, and it should continue to do so. Recently, Meyer and Norman (2020) have argued that the current design education system fails to adequately prepare students to deal with the complex challenges that contemporary and future societies face. The authors claim that the areas where designers can develop professionally have expanded from their traditional *territory* to include countless different societal issues. Consequently, they argue that design education needs to evolve to keep up with these changes and prepare students better to meet the increasingly complex demands of the global arena.

Design students must be prepared for a global society that is constantly changing. This preparation is vital. Recent reports show that technological advancements are increasing the demands for new graduates. For instance, in the McKinsey Global Institute report, "Jobs Lost, Jobs Gained", Manyika et al. (2017) argue that advances in automation technologies, such as artificial intelligence (AI) and robotics, are profoundly altering the landscape of employment, creating new job opportunities but also threatening others. Design is not immune to these changes.

The "information revolution" (Floridi, 2014) is indeed causing deskilling and job losses in certain areas. Economic data suggest that future employment may rely more on people's capacity to perform creative tasks that remain difficult to automate; thus, a case can be made that the critical professional skills in the mid- and long term are more about synthesis and interdisciplinarity; about being capable of learning complex things quickly and efficiently, but also about creatively using sophisticated tools.

These circumstances are potentially suitable for design; after all, designers are professionals used to tackling complex and ill-defined problems (Rittel & Webber, 1973) in a creative and non-linear way. The question is whether higher-education courses are preparing students for this state of affairs. Traditional design education does provide *some* of the skills necessary to deal with a changing society (Adams & Siddiqui, 2016), but most programs arguably require adjustments and updates since they largely continue to follow what Norman (2016) calls a "craft-based" approach to education.

Traditionally, design education has been carried out in art schools; and while the proximity between art and design was beneficial in the early development of graphic and industrial design, it has become heavily criticised by some of the most influential figures in design theory (see Meyer & Norman, 2020; Davis, 2020). These critics argue that educators in art-centred institutions emphasised skills (i.e., drawing and prototyping) that were useful when design was mainly concerned with creating aesthetically pleasing but functional objects. Moreover, "craft-based" education is mainly based on tacit knowledge and guild-like relationships between students and teachers, rather than standardised knowledge transmission and interdisciplinarity. The problem is that placing craft-oriented skills at the core of a syllabus leaves less space for skills that allow future designers to effectively face the growing complexity of the contemporary world: strategic thinking and critical thinking, as well as a robust understanding of systems. These skills, coupled with "just enough" understanding of scientific methods, business, cognitive sciences, and technological know-how, would prepare designers to work with practitioners from other disciplines and participate in multidisciplinary teams.

It follows that design education must offer at least introductory knowledge of areas such as technology, business, behavioural sciences, scientific methods, and soft skills. Additionally, the thinking goes, if design education were to embrace interdisciplinarity, it could offer designers the capacity to deal with teams composed of professionals from multiple areas, possesses some knowledge of other relevant disciplines, and hold a balanced and informed perspective about their current social, economic, and political challenges. This idea, that designers ought to be concerned with more than just creating pleasing and functional objects, is not new (see Papanek, 1984; Rams, 1983b).

What is more, this perspective on design education is consistent with the discipline's multidisciplinary nature. Notice how any design implies the creation of an artefact[1] to tackle human needs. As such, design must necessarily deal with the realms of business and marketing and politics and culture, among others (Norman, 2016), and the role it plays is often one of mediation and conciliating differences. With this in mind, it is clear that design can (and perhaps should) include the practical application of the knowledge of the entire university.

Therefore, we gather that interdisciplinarity is a vital issue for design education. In a broad sense, the term means integrating separate data, methods, tools, concepts, theories, and perspectives to answer a question, solve a problem, or address a topic too broad or complex to be tackled by a single discipline (Klein, 2005). For design education, this idea can be put into practice by joining students from different backgrounds and disciplines together to address the same problem and, as a result, extend their usual skills, ways of working, and perspectives (Jensen et al., 2019).

There is, of course, a broad debate about the nature of interdisciplinarity, specifically on the finer point distinctions between multi- and interdisciplinarity. However, since this paper is not concerned specifically with the characterisation of the concept, we found Margaret Boden's (1999) description of six types of interdisciplinarity useful: (1) encyclopaedic; (2) contextualising; (3) shared;

(4) co-operative; (5) generalising; and (6) integrated. In particular, our project deals with shared and co-operative forms of interdisciplinarity.

In short, shared interdisciplinarity occurs when a group comprising people with complementary skills address different aspects of a complex problem. While the group members often communicate results and monitor the project's progress, regular co-operation is rare. Co-operative interdisciplinarity describes a situation in which people from different disciplines actively work toward the same goal. A key difference is that, in this type of interdisciplinarity, people often notice their methods and concepts adjusted due to the interaction with people from different backgrounds.

Boden points out that, in educational and research contexts, interdisciplinarity is more likely to be co-operative. This is certainly the case within our school, since we adopt the Problem-Based Learning (PBL) educational format that facilitates both shared and co-operative forms of interdisciplinarity.

The Synergies Initiative

Since 2017, our institution has been developing a pedagogical experience to increase interdisciplinarity efforts across the four areas at our faculty, namely Design, Technology, Communication, and Marketing. From the start, the endeavour met some obstacles, which included changes in the coordination team, lack of participation from some teaching staff members, bureaucratic entropy, and operational and logistical trouble.

We started from the assumption that in order to act simultaneously in synergy and with epistemic autonomy, pedagogical methodologies for a curriculum in design should promote learning through direct engagement with questions and issues relevant to as many areas as possible. Given this assumption, methodologies such as Project-Based Learning and Problem-Based Learning come to the fore, as they are noted for offering (1) adequate learning goals; (2) structures that support learning for both teachers and students; (3) ample opportunities for evaluating and revising the learning process; and (4) encouraging participation and sense of agency (Barron et al., 1998).

However, after a few iterations, the initiative is now implemented as intended. Our main goal with this initiative was to offer a pedagogical experience that encourages students to address academic knowledge from multiple areas and put it into practice by participating in interdisciplinary projects, what we termed "synergies". As a result, the students should acquire an integrative understanding of the hard skills usually offered in their educational setting but also develop a versatile mindset and the crucial soft skills required to participate in a complex "real world" project.

The initiative is coordinated by the faculty's Pedagogical Practices department and brings together isolated curricular units (CU) from the four areas of our school, thus promoting shared and co-operative interdisciplinarity. An added benefit of the initiative is that it presents the PBL model to CUs that do not follow this pedagogical approach and encourages other units to experiment with this model. As an

example, current ongoing synergies include (i) Interaction Design and Software Engineering; (ii) Creative Writing, Illustration, and Web Design; and (iii) Communication Design and Marketing.

Synergies may last one semester or less within each CU, mainly depending on the learning goals and the nature of the units involved. In several cases, the synergy projects completely replace the briefs usually given in the CUs, as is the case in (i); on other cases, some of the deliverables are integrated within the units' usual class plan, which is the case in (ii) and (iii). For instance, in the Communication Design and Marketing synergy, the interaction between students of different courses is limited, which means students mostly hand in completed tasks between groups who then continue the project; in other words, each CU will be assigned a task and the output of that task turns into the input for another CU, and this process continues throughout the synergy. In this instance, we may speak of shared interdisciplinarity.

On the other hand, with CUs that follow a project-based approach, synergies are easier to integrate within the semester. In these cases, the collaboration between students is regular and intensive, which leads to co-operative interdisciplinarity. The process unfolds as follows: a semester-long brief is developed for all the CUs involved, and students are divided into mixed groups (i.e., including students from both CUs.) Each group works towards a specific result that answers the requirements established in the brief. Following an approach that resembles the Agile methodology, their work is structured as a sequence of milestones and sprints, each with a specific number of deliverables.

In terms of organisation, a coordinator was appointed to manage all the synergies. This work is supported by one professor from each of the four areas; these professors have the crucial role of bridging any communication problem between disciplines. All types of synergies require planning and considerable involvement from teachers, who act as project managers but are also responsible for timings (a crucial issue in collaborative work) and mediate potential issues among students. Finally, managing space within the faculty can be troublesome, which means scheduling may be an obstacle for group work in the integrated type.

Discussion

The philosophical roots of design can be traced back to the Renaissance (Buchanan, 2009), and a case can be made that designing, being a field fundamentally concerned with artificiality[2]—that is, with making and its possibilities (Redström, 2020), is and always has been *necessarily* interdisciplinary. The problem, however, is that being concerned with bringing new things into the world makes design a fundamentally unstable or, rather, *multistable* field. Unlike other disciplines (say, Medicine or Law), which have evolved and continue to evolve through accumulation and revision of their core principles, practices, and specialisation, design, as a discipline, seems to be in a permanent beta state. A metaphor to illustrate this distinction would be to say that established disciplines could be seen as buildings that eventually were remodelled, upgraded, and expanded, but their foundations and cornerstones remain the same. Whereas design is composed

of buildings whose foundations and cornerstones, although maintaining a certain cohesiveness, are constantly revised and modified.

In many ways, multistability is beneficial for design, as it allows it to be decentralised, flexible, and susceptible to change, and these are some of design's main strengths and, arguably, what allows it to act in as many areas as it does. However, from the point of view of education and professionalisation, multistability brings serious issues. On the one hand, having its core principles constantly challenged makes establishing a syllabus exceedingly difficult. On the other hand, the feedback loop between the "inside world" of academia and the "outside world" of professional design is in constant tension, without a clear idea of the main skills that designers ought to have by the time they finish their undergraduate education.

Creating a program in design education implies assuming a philosophical stance on what designing is and what should be; it is, therefore, a design process in its own right; one in which the outcome is not only future designers but also a version of the discipline itself. Consequently, designing an undergraduate course in design means choosing certain things in favour of others; choosing the number of constraints that students will have in terms of their capacity to follow their own path. Moreover, in the European context, the Bologna process introduced certain limitations and expectations, reduced contact hours, and privileged internationalisation. Schools thus find themselves having to decide the type and frequency of subjects that students will be exposed to under the pressure of matching the transient standards of job markets *and* the expectations and rules set by education regulators. What should be the core skills a designer should have? What should she learn first? Should her education progress from less to more complex tasks and scenarios or the other way around? Should the program privilege technical proficiency or conceptual clarity? Should she be exposed to programming, statistics, psychology, and econometry early on even though the dominating "scientific area" of design continues to be the humanities? How much history should she be exposed to? These are just a few of the questions the people in charge of developing design programs must tackle, but the most important ones will always remain open to reasonable objection: what is design, what should a designer do, and how should she proceed to do it?

Most design educators today would agree that designing is fundamentally a process of intentionally solving problems by creating a new thing while managing the constraints governing the circumstances surrounding the situation and meeting the expectations set when framing the problem. The definition is not without merit; it is sufficiently broad to include everything that designers do and constrained enough to still describe the "normal" stages of designing: problem definition, ideation, development, and implementation. The problem, however, is that when not properly contextualised, this definition risks portraying design merely as a problem-solving process that can be employed by anyone, anywhere. In this manner, design is reduced to being an auxiliary framework for other disciplines, as a mere tool. Given the importance that designing is gaining today, it is fundamental that our discipline steers as far away as possible from that characterisation, consolidating itself as an

independent field. That is to say, design has to transition from auxiliary interdisciplinarity towards autonomous transdisciplinarity, thus placing design as a field that holds its own foundations, concepts, techniques, processes, and a clear role in the professional world.

How to achieve further independence for design as a discipline, increase interdisciplinarity, and prepare students for the increasingly complex challenges brought about by current technological change are crucial problems for academic design today. From a pragmatic (Peircean) standpoint, the normalisation of design as a "science" would require aesthetics, ethics, and logic to achieve a genuine phenomenological knowledge; a vision of design that can be traced back as far as the founding of the Bauhaus school in Weimar (Lupton & Miller, 2019). The problem, however, is how to achieve this.

As noted earlier, an influential strand of criticism argues that design education should renounce craft-based learning and expose students to more analytical skills. However, in a recent conversation, Norman (2021) even hinted at the possibility of rethinking the very nature of undergraduate courses in the future, advocating that instead of structured linear learning, design education should become modular and non-linear, allowing students not only to create their own curriculum but allowing them to follow their own pace, allowing them to leave and return, re-skill and re-learn according to their needs. Thus, establishing a kind of feedback loop between academia and the "real world".

Against our best wishes as educators, embedding interdisciplinarity within design education is often complicated and problematic, as we do not have enough leeway to include subjects that are not closely related to design. Regulators and education authorities have specific understandings of what design should include, and anything that deviates from the norm is seen with suspicion. Moreover, interdisciplinary programmes are still met with low enthusiasm.

Finding something close to a "sweet spot" between the radical changes (modularity and interdisciplinarity) suggested by Norman and similarly like minds on the one hand, and the constraints imposed by the bureaucratic realities of our educational system and the expectations of our students, on the other, we settled on a feasible approach: assuming that, ultimately, what matters for design students is the potential that education has to offer in terms of genuine professional experiences. That is, how best we can prepare them to live as professionals. Furthermore, our solution involves simulating as best as we can the realities of professional design work.

However, we should acknowledge that the results are not always ideal; this approach is still under revision, and we need to monitor and evaluate further iterations to analyse a broader pool of pedagogical results. Be that as it may, this early experimentation is encouraging. It seems that the synergies initiative benefits design education in that we can simulate the circumstances that form complex—real-world—briefings and encourage students to engage in open-ended, challenging projects with colleagues from different disciplinary fields. This pedagogical experience sets the stage for students to explore complex problems in a relatively "safe" academic environment.

Conclusions

Synergies between courses within the same institution are an effective way of tackling bureaucratic entropy while simultaneously offering undergraduates training across various knowledge areas and the opportunity to develop critical soft skills such as teamwork, conflict resolution, negotiation, and time management. While the theoretical discussion on the future of design education unfolds (Spitz et al., 2021), design schools still have to address the daily challenge of providing the best possible pedagogical experience to their students. As in professional design, the design of education is often a matter of finding a "good enough" and necessarily transient solution to a complex problem.

Projects implemented under our synergies initiative can strengthen design education because they allow us to simulate some of the circumstances that designers experience in the professional world. In addition, as pointed out by Zingale (2016), this type of teaching and learning reveals that one should not only understand how things are conceived but how designers can be agents able to transform the world. Zingale still uses the term "anthropopoiesis" to demonstrate this need for transformation because, from an anthropological point of view, people can be considered incomplete and organically unfinished, requiring artificial transformations for their completeness. These "artificial transformations" stand at the centre of the synergies initiative: to allow design students to have an interdisciplinary vision of developing artefacts that will ultimately assist humans in finding their ontological completeness.

Given the complexity of these tasks, there remains much work to be done. Our project is still at an embryonic stage and still lacks empirical validation. Nonetheless, the results we have obtained so far give us optimism. The next steps in our experiment will be to systematise our process, establish guidelines, and incorporate what we have learned so far in future iterations. We will continue to report on our findings.

Acknowledgements

Notes

1 "Artefact" is understood here in a broad sense to mean any object that is the result of human skill and ingenuity, not only physical ones, but spanning spaces, images, software, systems, or environments (Marshall, 2008).
2 Notice how one of the most influential definitions of design appears in a book titled *The Sciences of the Artificial* (Simon, 1996).

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5   Portuguese Educational Practices

The Influences and Consequences in the Teaching of Design to Develop a Relevant and Contemporary Curriculum

André Casteião

Federal University of Cariri, Interdisciplinary Institute of Society, Culture and Arts, Juazeiro do Norte, Brazil

Susana Barreto

Faculty of Fine Arts, University of Porto, Portugal

Introduction

This chapter presents the results of a study on the pedagogical formation of Design in Portugal, where the three Higher Education Institutions in the North of Portugal were analysed, namely: The Faculty of Fine Arts of the University of Porto (FBAUP), the Department of Communication and Arts of the University of Aveiro (DeCa-UA) and the Superior School of Design of the Polytechnic Institute of Cávado and Do Ave (IPCA). The three institutions jointly host the Institute for Research in Design, Media and Culture – ID+. The choice for these three institutions stems from the fact that together they constitute the ID+ and the degree of importance that they exercise in the northern region of Portugal; the context and times in which they were instituted; their pedagogical characteristics and origins, and finally, for its contribution to Portuguese Design.

The analysis of these institutions is part of doctoral research that aims to propose a problem-solving tool based on the TRIZ[1] method adapted to the context of Design teaching, which can assist both managers and teachers in the continuous improvement of the teaching and learning process about Design.

The main feature of TRIZ is the ability to contribute to solving problems based on logic and data with an algorithmic structure. Thus, with a script in hand, it could be possible, according to the theory, to reach the solution of problems in a mediated way but provide repetition, predictability, reliability, and acceleration

of the capacity of the teams involved in the search for solutions to problems in a creative way. According to Silverstein, Decarlo and Slocum:

> This is what Altshuller[2] has delivered: the use of simple algorithms to solve intractable problems, resolve the most difficult technical contradictions, and enable innovative products and services. Instead of looking for answers in inconvenient places, TRIZ makes it convenient to find answers in difficult places.
>
> (Silverstein, Decarlo and Slocum 2008, p.42)

The motivation to use TRIZ as a method to solve problems related to teaching comes from these characteristics, but the application to the teaching context is not possible without the appropriate adaptations. This research considered the possibility of not excluding other forms of problem-solving but of creating relationships between mediated and non-mediated solutions.

In the construction of the thesis, essential points were identified for diagnosis and analysis of the state of the art of design teaching in Portugal, specifically in these three institutions. For the diagnosis, it was established that it would be fundamental to understand the characteristics of each institution regarding pedagogical and vocational aspects in the face of the current context of society involving technological advances.

When it comes to teaching Design in Portugal, it is necessary to understand the pedagogical and cultural influences that have been imposed over the years, culminating in the present days, with new demands, new technologies and especially new understandings of making and thinking about Design.

The methods used to diagnose the respective institutions were exploratory and carried out exclusively online because of the restrictive measures caused by the SARS-CoV-2 pandemic. The curricular plans of the first cycle of studies of the degree of each institution were analysed, as well as the number of ECTS (European Credit Transfer System) attributed to the subjects. After collecting the data, a table was created that determined the percentage and proportion of the workload of these subjects in the respective courses. The results prove the strong cultural influence, along with a differentiation of the vocations and objectives of each institution, interdependence, and complementarity of the courses, as well as a need for intervention in the curriculum according to new social and technological demands.

Cultural, Pedagogical and Political Influences

To understand the beginning and evolution of the teaching of Design in Portugal, it is necessary to look to the past and identify the cultural and pedagogical influences that are still present. The first historical indicators are the Craft Guilds for establishing the education system based on the Apprentices model and the forms of manual production of a cultural nature. In the 14th century, there were more than 100 craft guilds in cities across Europe (Wiesner, Wheeler and Curtis 2003). The craft guilds organized the first arts and craft education system, giving rise to the first drawing

schools in France, the École Royale Gratuite de Dessin, and later in England, the Royal Academy. The British, like the French, saw drawing as a prerequisite for the development of design skills in a number of sectors (Puetz 1999).

This teaching system would influence later educational models and define some practices in teaching until the 21st century. The learning system also sets the tone for the relationship between the student and the teacher, which is reflected in some classrooms of contemporary design (Davis 2017).

The influence of the Craft Guild was so strong that it reverberates today in most programs of universities of design and arts. This curricular reverberation gained strength with the emergence of the Bauhaus and its modernist agenda, which spread throughout the Western world after the Second World War.

Bauhaus is probably the best-known 20th-century approach to design education; its origins were a response to the effects of the 19th-century Industrial Revolution and the emerging conditions of the modern world.

Gropius' curriculum plan was intended to level the class differences, giving the artisan and the artist the same status in instruction. He wrote: "… we must all go back to crafts! … The artist is an exalted artisan … a base in craftsmanship is essential for every artist" (Gropius in Wingler 1976).

As in the Guild tradition, incoming students were called apprentices and promoted to officer status as they progressed through the curriculum. However, it was in Dessau that Gropius implemented a new educational framework. He transformed the institution into a Hochschule für Gestaltung (Institute of Design), which authorized the awarding of diplomas. This shift marked a departure from the traditional titles of apprentices, officers, and masters, replacing them with the more modern terms of students and teachers. This shift marked a departure from the traditional titles of apprentices, officers, and masters, replacing them with the more modern terms of students and teachers (see also Aynsley 2009; Crowston 2007).

Bauhaus pedagogy was the one that most influenced the teaching of design in the 20th century. Many schools after the Bauhaus learned valuable lessons from its pedagogical proposal. Their teachers innovated concerning the active teaching methods they adopted.

The influence that Bauhaus had in Portugal occurred around the 1960s, with the pioneers who came to constitute what we can consider the first generation of Portuguese designers. But it would be almost impossible for this generation to have an in-depth knowledge of what Bauhaus' contribution to design had been because, in general, the disclosure of its 14 years of activity was not even achieved in Europe. The departure of many of the Bauhaus professors and alumni to the United States to escape Nazism did not allow an effective consolidation of their work in the European countries where they passed (Manaças 2006).

Considering this context, we can affirm that there were no conditions in Portugal, in the second half of the 19th century and in the first half of the 20th century, for design to have an expression close to that which it had in the countries that genuinely played a leading role in its history. In fact, neither the industry was developed to approach design, nor the openness to modern movements, namely Arts and Crafts and Art Nouveau, can be considered significant since there was little

influence on our artists, craftsmen or architects. Not even the knowledge and influence of the Bauhaus were felt unless, much later, from the end of the 1950s.

Design in Portugal

The teaching of Design in Portugal officially arose after the 1974 Carnation Revolution. However, it is necessary to go back a little further in the past and understand the efforts made for Design to be established and recognized as a discipline, as well as the corresponding educational models at a time when design as a profession was already recognized in the country and was mainly taught and carried out by painters, sculptors and architects, whose experience was gained mainly through practice and the exchange of know-how with industry peers and technicians (Lima et al., 2020).

The technical and artistic education in Portugal began in 1911 with the creation of the Universities of Lisbon and Porto, with the aim of meeting the needs of industry and the demands of a changing world. A few decades later, in 1974, the first higher education courses in Design were opened in Lisbon and Porto. At the time, public policies favoured these so-called "educational reforms", but both the reforms and their implementation were only possible because Portugal had highly qualified professionals in their fields, mainly in the arts and architecture, but without specific training or knowledge in Design; this explains the strong influence of the arts and architecture in Design education (see also Ferrão 2009; Heslop 1997).

According to Davis (2017), design education will not arise from the logical progression of the curriculum based on artefact and pedagogy, nor can we define design education as a refinement of skills to produce good professionals capable of meeting political and social demands. The new political demands, such as the Bologna Treaty, demanded a new educational paradigm that, in many respects, broke with the origin of design in Craft Guilds but maintained the focus on intellectual flexibility and concern for human values.

According to Sabino (2004), in design and the arts, the negative points of the implementation of the first cycle within three years are a 40% reduction in the length of teaching time; disruption in the quality of education caused by this reduction; the generalized opening of second-cycle courses and difficulty in sequential harmonization with courses in similar areas in Europe and abroad.

There are many criticisms in academia about the effectiveness and efficiency of higher education in the model proposed by the so-called Bologna Process: in an interview conducted as part of the investigation, it was hypothetically asked if the teacher had full powers, what would she change in the teaching of design? The answer was immediate: "I would give back the formative years that Bologna took from us"[3] (see Erichsen 2007).

It can be concluded that design in Portugal is firmly established from a pedagogical perspective, thanks to the influences of artistic, cultural, and educational ideas stemming from the Guilds, artistic schools, the Bauhaus movement, and later, the Bologna Process. The curricular plans discussed later in this chapter highlight two essential factors: the standardization of curricula and the vocational profiles of each institution.
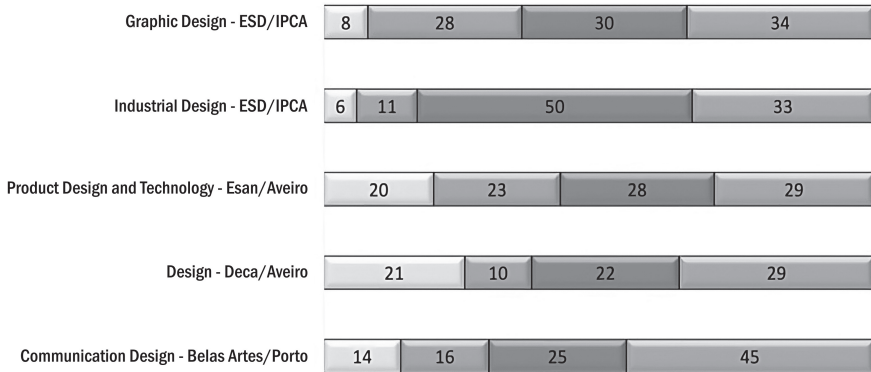
Figure 5.1 Percentage of theoretical, theoretical-practical, instrumental, and projectual-practice subjects respectively, by course.

Research Methods

Following the proposed methodological strategy, TRIZ's problem-solving method was used, which identifies problems,[4] contradictions and proposes the ideal solution. Thus, the first block of the investigation was the Higher Education Institutions of Design, intending to diagnose the characteristics and the pedagogical proposition of the courses. To this end, the curricular plans, the menus of the respective subjects and the general training objectives of the students were analysed.

Data on curriculum plans were collected via the Internet on the institutional websites of each institution analysed. After the collection, the disciplines were organized by year, by the number of ECTS, by the pedagogical characteristic and similarity of contents, thus forming four thematic groups identified and classified with colours and graphic symbols.

The subjects were grouped as follows: Theoretical, Theoretical-practical, Instrumental, and Projectual-Practice, to establish the percentage of insertion of the theme in the course and demonstrate the profile of the course and the pedagogical development required year by year (Figure 5.1).

Results

Faculty of Fine Arts, University of Porto – Creation of the Course in 1974

The Design course at the Faculty of Fine Arts was officially created in 1974 (although Design was previously taught there at the School of Fine Arts in Porto, not yet integrated into the University), being the first higher education course in Design in Northern Portugal. Currently, the degree in communication design aims to "train professionals in the various fields of contemporary communication design, developing through two complementary components: the practice, strongly associated with cultural and market realities; and the conceptual and investigative,

which allows future designers to build their space of authorship, development and criticism"[5].

The Faculty of Fine Arts is the only one that offers the first cycle with four years of training, and the optional subjects were not considered in this investigation.

When analysing the distribution of curricular components, the influence of the arts is evident – 30% of the ECTS of the course are subjects that teach Art History, History of Design and Contemporary Culture, for example. The highest percentage is from the *modus faciendi* – 70% with groups of Practical and Projectual practices disciplines. Thus, the Course has a predominantly practical and projectual focus, which favours the use of active teaching and learning methodologies, which enhance students' autonomy and critical sense, but these methodologies are little used.

University of Aveiro – Creation of the Course in 1996

The Design course in Aveiro was conceived and created after the celebrations of the Institution's 25th anniversary; in one of the interviews carried out, Prof. Dr João Mota reports that he was invited to join the faculty of the course that was being created at the time Professor João was working at Harvard, in the United States. "I accepted the invitation to return to Portugal and the challenge of starting a course with the characteristics that we thought were important". The course starts 22 years after creating the equivalent course at FBAUP. This context is relevant because most of the teachers who made up the course had completed their training at FBAUP and/or abroad. Thus, the course was born with some pedagogical strategies different from the Fine Arts. The program currently offers two training options, one in Design and the other in Product Design and Technology.

Design

The program aims at training senior technicians with the ability to design cultural interface artefacts, using drawing as an operational tools.

The Aveiro Design course demonstrates the practical-projectual and theoretical-practical approaches that encompass the highest percentage of ECTS in the course, 57% in total, but with excellent predominance year by year. The subjects in the theoretical group, 21%, are also relevant because they could be offered in a hybrid way, which could expand the students' experience in specific problem-solving disciplines.

Product Design and Technology

The Course is described "as an offer aimed at innovation, design, development and product optimization". The objective of the course is to provide specific training to students, allowing them access to the labour market in technology, industrial or commercial companies, focused on consumer products usually produced on a large scale.

The course presents the most balanced distribution of subjects in the general framework. Year by year, the distribution is quite disproportionate, but it clearly demonstrates the vocation and focus of the course.

In the first two years, the disciplines that provide "operational" knowledge to students take the lead, 60% and 50%, and in the last year, with students already trained in practice, design increases significantly.

This balanced distribution enhances the practice of innovative and active pedagogies where students develop more successfully.

Polytechnic Institute of Cávado and Ave – IPCA – Creation of the Course in 2015

The Design course at the Polytechnic of Cávado and Ave was created during the period when the Bologna Treaty was already in force in Portugal; therefore, it has already been thought of with the pedagogical structure required by Bologna: the first cycle lasting three years. It appears 40 years after the creation of the equivalent course at FBAUP and 20 years after creating the course at UA, in a social, technological and academic context markedly different from the previous two.

The program currently offers two training options: Industrial Design and Graphic Design.

Industrial Design

The degree in Industrial Design aims to train professionals capable of conceiving and developing new products for industrial manufacture.

With the objective of training professionals with specific skills to work in industries, the course basically focuses on the *modus facienti* 50% of the ECTS load; it is the course that offers the minor theoretical disciplines, only 6% of the total.

The design practice is also very relevant and proves the identity and vocation of the Institution in training students for the job market.

Graphic Design

The degree in Graphic Design aims to create qualified professionals in Communication Design, promoting student contact with companies, in response to emerging needs, in the sector of the creative and technological industries, commerce and communication".

With a focus on the labour market, the course presents a balanced distribution of subjects; just as in the Industrial Design course, the theoretical disciplines have little presence: only 8%. The other groups are balanced and represent their characteristics very well.

The complementary opportunities for this distribution translate into the offer of complementary subjects, in a hybrid way, where students can fulfil their credits at any time during the course, without prejudice to the other subjects. Figure 5.2 shows the general outcome of courses analysed.

Theoretical-Practical   Theoretical

17
%   13%

31%   39%

Instrumental   Projectual-Practice
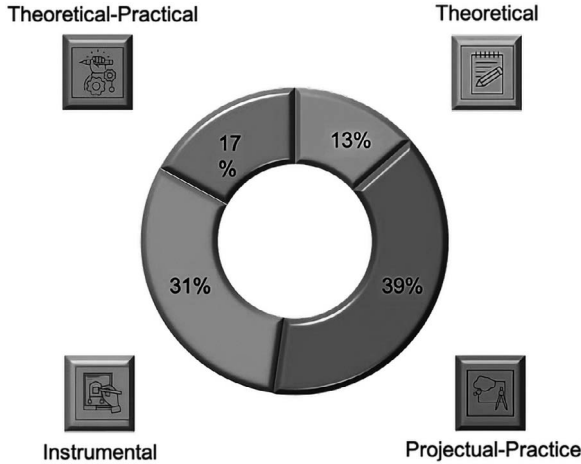
Figure 5.2 The teaching profile of design in Northern Portugal.

Conclusions

This study demonstrated that, historically, the teaching of Arts and Design in Portugal has always been linked to the needs of the State, from the Craft Guilds, through the Artistic Schools, through the ideals of the Bauhaus and reaching the post-Bologna universities. As a result of these historical and cultural influences, the curricular plans became similar, despite the differences between institutions, which explains the lag, for example, in the offer of disciplines focused on problem-solving.

In conclusion, this chapter identified opportunities for improvement in the curricular plans of the institutions and suggested that plans can be improved according to the teaching strategy and vocation of each course.

This update, if carried out, will influence pedagogical practices and teaching methods, potentiating the diversity of Design, avoiding the standardization of curricula and prioritizing innovative pedagogies that enable students to solve complex problems.

A potential was identified in offering disciplines in a hybrid form, those classified as theoretical, where learning can take place without time limits or conventional structures, relieving the pressure of the 1st cycle of three years.

To offer quality teaching that produces quality learning, the curriculum must be structured and organized in the particular context of each institution, considering traditions and their potential. According to the analysis of each institution, it is clear that the vocation and strategies are different, but the plans are similar, which makes it difficult for the student to choose where to study.

Changing and updating curriculum plans are the first steps toward pedagogical and didactic changes. To reach a high and competitive degree in higher education in design, changes will be necessary, from the curricular plans to the pedagogical qualification of teachers.

Finally, the courses are interdependent and complementary if we think from the strategic and macro point of view of Portuguese and European Design, considering the regionalism of each Institution. It is worth emphasizing the importance of ID+ as a vehicle for bringing together and dynamizing institutions through what differentiates them. This interaction promoted by ID+ within the scope of investigations in Design, Media and Culture, has, in its plurality of themes, some paths that indicate the improvement of design teaching in Portugal.

Notes

1 TRIZ is a Russian acronym which means, "theory of solving inventive problems". It is an empirical process where innovation can be taught in a systemic way.
2 Altshuller, Genrich Altshuller (1926–1998), a Russian engineer of Jewish origin, developed a method that aimed to help researchers in the search for solutions to inventive problems, and designated this method, known as TRIZ.
3 Testimony of the Professor and researcher in an interview with author.
4 According to TRIZ method, a problem is "A gap between an initial (existing) situation and the desirable situation".
5 Presentation of the Communication Design course: https://sigarra.up.pt/fbaup/pt/cur_geral.cur_view?pv_ano_lectivo=2015&pv_origem=CUR&pv_tipo_cur_sigla=L&pv_curso_id=1314. Accessed: February 2021.

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6 Liquid Proximity

Engaging and Alternative Ways of Interacting with Design Students

Ricardo Lopez-Leon

Graphic Design Department, Autonomous University of Aguascalientes, Aguascalientes, Mexico

Gabriela Gomez

Industrial Design Department, Autonomous University of Aguascalientes, Aguascalientes, Mexico

Introduction: Understanding Liquid Proximity

Thinking about our teaching experiences during the past two years, we came to the conclusion that it has been as if proximity had liquified. The solid physical body that can occupy one space at a time had dissolved. The notion of liquid refers to a society in which established practices began a transformation process, challenging traditional ideas and manners (Bauman, 2000). We refer to liquid proximity as the practices that not only challenged the idea that physical presence is necessary when teaching design, but that also allowed new ways of proximity that could transform the way we teach design. It is worth mentioning that this liquefaction of proximity was only possible due to the incorporation of different information and communication technologies (ICTs), and not only those designed specifically for teaching. In fact, it was because of the availability of the internet and different ICTs that a liquid society became more visible. Since confinement and lockdown were mandatory for everybody during the COVID-19 pandemic, different social practices, including design teaching, found ways to keep going thanks to those technologies. The possibility of teaching design in a universe where proximity became liquid, enabled different practices that became engaging advantages for both students and teachers. Gathering our teaching experiences in graphic design and industrial design, we identified four ways in which proximity became liquid: proximity could be simultaneous, instant, elastic, and democratic (Figure 6.1). But before we explain these possibilities of proximity, it is important to describe the characteristics of solid proximity to understand how it has been dissolved.

When teaching design, physical proximity had been almost mandatory and unquestionable. Because of the practical approach of the design studio, design teaching traditionally enhanced face-to-face interactions. The teacher had to see the student's project, touch it, in order to give proper feedback. Traditionally, the design studio has had two main characteristics: first, a physical-solid space
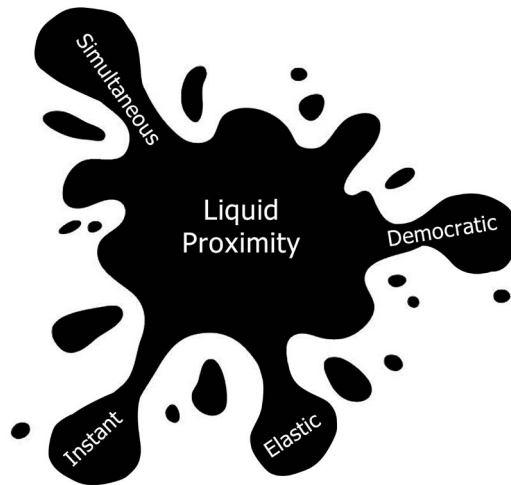
Figure 6.1 Possibilities of liquid proximity.

where the practical process of designing occurs and, second, a method of teaching centred on tasks and practical activities that students must complete (Broadfoot & Bennett, 2003), otherwise known as "learning by doing" (Schön, 1988). As we can see, physical proximity has been embedded within the core definition of the design studio as a learning space, which could be a reason why it has had so much trouble migrating towards the virtual universe. At the same time, attempts to "jumpstart" the virtual design studio (VDS), as it has been coined (Bradford, Cheng, Kvan, 1994), are not recent (Wojtowicz, 1994). Studies on the VDS mainly focus on technological and communicational issues highlighting the importance of interactions between students and teachers (Kvan, 2001). Since the design studio pedagogy is centred on constant dialogue, practice, and feedback, ICTs that are up to the task are fundamental in its virtualization, tools must enhance an ongoing conversation to really provide learning experiences within the studio realm. A less discussed issue is the teachers' perspective on engaging teaching in VDS (Shao et al., 2009), and how they do not only have to plan the activities for the studio, but most of the time play a role as tech-support to the students so that everyone is able to operate the necessary technologies for the virtual experiences. Teachers also tend to perceive that "their discipline [is] not suited to online teaching, an absence of time for online course preparation, and a lack of skills or confidence in teaching online" (Gratz & Looney, 2020, p.1). Therefore, it is no surprise that faculty members from different disciplines, not only design, are reluctant to introduce distance learning models into their teaching practices. As necessary teaching skills, computer literacy stands out (Dovbenko et al, 2020), also openness to "rethink the learning process and provide more responsibility to the learner" (Gratz & Looney, 2020, p.1) and shifting into new ways of teaching. The outcomes of the discussions on the VDS tend to point out the need to combine

virtual and physical experiences, as in a hybrid design studio to make the most of both scenarios and their possibilities.

When migrating to a virtual environment, new teaching practices must be designed that are adaptive to the new virtual space, since the experience and the proximity are different. It is futile to try and replicate what happens in a physical face-to-face environment, as some studies attempt (Walpole, 2012). A "third space" (Gutierrez et al., 1995; Gutierrez, 2008) is necessary to successfully activate the design studio in other realms, in a sense that "perspectives of the teacher and the students interact to co-construct new meanings that expand the boundaries of both" (Calvo & Sclater, 2021) regarding the boundary of proximity in this case. Boundary-crossing (Suchman 1994) pushed individuals to enter "unknown spaces of practice [having] to overcome the challenge of renegotiating social and relational positions vis-a-vis the other individuals who also cross the boundary" (Calvo & Sclater, 2021, p.236, referencing Akkerman & Bakker, 2011). The renegotiation was engaged between peers and teachers provoking the reconfiguration of the design studio as a learning and practical space, hence proximity becoming fluid.

Bauman's (2000) concept of a liquid society has led us to understand different practices in the information age and the digital era. Several studies tend to focus on a shift from authoritarian relationships between teachers and students, to a more social, collaborative, networked way of learning since today universities and teachers are not the only places to access knowledge (Das, 2012; Gratz & Looney, 2020; Lopez-Leon, 2020; McWilliam & Dawson, 2008; Savin-Baden, 2009; Schadewitz & Zamenopoulos, 2009; Schnabel & Ham, 2012). This community-centred knowledge has also been called "liquid learning" (McWilliam & Dawson, 2008) and seeks to identify and understand the benefits of horizontal pedagogies. In this chapter, we will not focus on liquid learning, since it only refers to one of the identified categories – democratic proximity – instead, we will discuss different ways in which proximity drifted from a physical face-to-face interaction and the engaging advantages that they produced.

Background: The Pandemic Scenario in Mexico

Facing the COVID-19 pandemic was different for every country. Since strategies and available resources were not the same, we will describe how Mexico tried to avoid this crisis and its relation to educational institutions. These facts intend only to provide context to the Autonomous University of Aguascalientes' (AUA's) scenario for the experiences described in this chapter.

Borders Open, Schools Closed

The first coronavirus case was identified in Mexico on February 27, 2020 (Suárez et al, 2020). Even though the first cases arrived via international flights, airports remained open. During the pandemic, Mexico never closed its borders. Airports remained open to international flights due to the fear of economic paralysis (Spinetto, 2020) since tourism is one of the most profitable economic activities. Moreover,

COVID-19 testing has not been one of the main priorities of the Mexican government. When the pandemic began, Mexico had only tested 89 people for each 100,000 by May 11, 2020 (Rivers, 2020). To this day, it is not required to present a negative test result to travel to Mexico. On the other hand, schools closed on March 23. However, distance learning highlighted inequality regarding accessibility, since not every family has access to a computer or an Internet connection. Studies report that by 2019, only 60% of Mexicans had Internet access (Statista, 2021). With the urge of returning to school, a year later, on April 20, 2021, a massive push for vaccination began for 3 million teachers (Forbes Staff, 2020). Quickly vaccinating educational personnel was possible with the CanSino Bio vaccine since it only requires one dose. Nevertheless, schools had to remain closed for 17 months (Morán, 2021).

Confinement and the Challenge of the Digital Migration

According to the Official Journal of the Mexican Government, schools suspended activities on March 23, 2020 (SEGOB, 2020). The forecast was that institutions of every educational level, meaning from kindergarten to university, could re-open on April 17 of the same year. The academic calendar in Mexico had the school break scheduled to begin on April 5, hence, it seemed a good strategy to quarantine this first period as if it were an extended holiday. However, as it happened in most countries, confinement remained mandatory past that date, indefinitely, meaning that educational institutions had to continue their activities facing the challenge of distance learning.

During the school break, the AUA strengthened its digital infrastructure, however, jumpstarting virtual meetings and online class sessions for 20,000 students was challenging. Before confinement, the university already had tools for online learning, with a Moodle-like platform and access to Microsoft Teams, but teachers were reluctant to use them. A small percentage of teachers had received any training in digital tools for distance learning, hence, when it became not only necessary but mandatory, many issues emerged. AUA began offering express training programs and support groups on Facebook for students and teachers (UAA, 2020). The transition was difficult for the whole community, in part due to the lack of knowledge on how to use the available digital tools, but mostly because a paradigm shift was necessary: physical proximity had to be dispensable, even in those courses that require a lot of practice hours, such as the design studio (Soriano, 2020). Nevertheless, new ways of interacting emerged, allowing different practices that otherwise could not be possible in a physical classroom, but were beneficial to the relations and engagement between teachers and design students. We have identified these new ways of interacting that propelled the design studio to a different level.

Engaging Advantages of Liquid Proximity Gathered from Experience

After a thorough analysis of experiences that we as teachers had since April 17, 2020, the date when the AUA migrated to distance learning, we identified four ways in which proximity liquified by becoming: simultaneous, since it was possible to be

close to one another in different platforms and virtual scenarios at the same time; instant, as meeting and sharing information could be done within seconds; elastic, dissolving time and space as class sessions could be attended from any place, and revisited at any time; and democratic, since hierarchies dissolved and horizontal relations emerged.

Experiences described in this chapter correspond to activities performed by graphic and industrial design students, ranging from the first to the last year of their professional studies. The activities were implemented in the AUA, a public-funded college in Mexico. A design class tends to have between 20 and 35 students per class, meaning that online sessions could include up to 35 students. The official platform for synchronic sessions at AUA was Microsoft Teams. Teachers and students can access the platform and make video calls using their institutional Microsoft 365 email account provided by the university. Every student and teacher has an account, which facilitates connectivity, sharing, and storing information, as well as collaboration between the members of the academic community. For the asynchronous sessions, a Moodle-like platform is available for planning activities, tests, and submitting works and projects.

The approach to the results in this chapter was mainly qualitative, meaning that participants were not considered for their statistical representation and the research did not include probabilistic or systematic samples. In this way, we did not consider it important to provide percentages for the results or to quantify the students and their behavioural differences. Instead, in this chapter, we highlight experiences that can bring a better understanding of the object of study (Kincheloe & McLaren, 2005) in this case, design teaching during the pandemic, and provide conclusions more holistically.

It is worth noting that the following experiences highlight two aspects: first, the fact that they were possible only because interactions became virtual, and second, that it could be almost impossible for them to emerge in a physical face-to-face scenario. We have selected those that represent an advantage, enhancing teacher-student interactions to the level that it was even better than the physical environment.

Simultaneous Proximity

Students and teachers could interact with each other through different platforms at the same time, combining the synchronous class session with other virtual platforms. We identified simultaneous proximity in three different platforms and media: chatrooms, collaboration tools, and WhatsApp.

Simultaneity between Chatrooms and Class Sessions

Each synchronous meeting in Microsoft Teams had two possibilities of interaction between participants; through the video call where one could raise their hand and

express an opinion, and through the chatroom, where the participant could type a comment or a question without disrupting the speaker on the videocall. In this context, participants could be listening to the speaker and at the same time interacting through the chat channel. This possibility represented an engaging advantage for everyone. A class session could have two simultaneous conversations on the same topic. Also, the chatroom has the possibility to react with emojis, meaning that participants could not only comment but react to others' remarks. When the chatroom became alive, students expressed their opinion, shared pictures, videos, documents, links, reacted, and maintained a parallel debate about the topic that was being discussed simultaneously on the video call. Some students were even more comfortable expressing their opinion in the chatroom and became more active than in the physical classroom.

Simultaneity between Collaboration Tools and Class Sessions

Collaborative work was possible thanks to different online platforms. Applications like Milanote, Canva, and MindMeister (Figure 6.2), liquified the idea that teamwork is not possible without physical proximity. Through online platforms, students could develop different projects within a common online canvas that allowed each member to simultaneously contribute, edit, make notes, without the need of being physically present. The teacher could also participate in these interactions, giving feedback through the platform, also correcting and editing. Moreover, feedback was given through two different channels at the same time: via the platform and the video call. Students and teachers virtually met via a video call, but also logged in to the virtual platform. Hence, everyone was present in both virtual scenarios, listening to the teachers' crits, and visualizing their notes and comments on the screen.
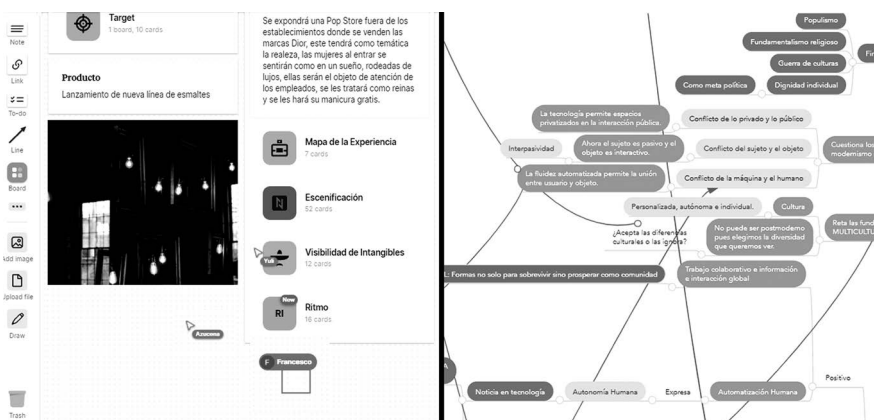
Figure 6.2 Left: Collaborative moodboard created using Milanote. Right: Collaborative mindmap created with Mindmaster.

Simultaneity between WhatsApp and Class Sessions

WhatsApp, an application mainly used for social communication, was transformed into a contact platform that allowed participants to organize different projects, teams, sharing questions and information in real-time, simultaneously being present in the class session while receiving instructions from teachers. These conversations, invisible to teachers, promoted a self-organizing attitude between students, which led to a more autonomous way of thinking. Students even self-organized the order of revisions and presentations when necessary.

Instant Proximity

Students and teachers could be present in the synchronous class session and share different information instantly. We identified instant proximity in three different scenarios: meeting and sharing online information, having access to everyday objects, and co-assessing practices.

Instantness in Meeting and Sharing Information

Since there were scheduled class sessions, a student could plan the day and login on time to class. When an unscheduled session was necessary to clarify some instructions or information, students and teachers could meet within minutes, instantly. Moreover, since everyone was in front of a device with Internet access, finding examples, images, and case studies to complement the day's lesson were particularly easy but exceptionally instant. If an unplanned topic emerged during the discussion, the teacher could rapidly search and show the students additional information to clarify the point. This activity extended to every participant. Anyone could look for additional information to expand comprehension, raise questions, and share insights.

Instant Access to Everyday Objects

A common activity in industrial design teaching is to ask students to bring an object from home. The main objective of the activity is to perform a usability analysis during class. Since many students get to school using public transportation, the type of objects that they bring tend to be simple or small, that is to say, objects they can carry. By being at home, suddenly, students found themselves surrounded by more complex and challenging objects that they could analyse, making this activity more compelling (Figure 6.3). The instant access allowed students to work with bigger, and more complex objects, hence performing a deeper analysis.

Instantly Co-Assessing Practices

Even though self- and co-assessing were more frequent practices when physical proximity was possible, it became a more engaging activity thanks to instant proximity. During a typical class session, students tend to present their projects to peers,
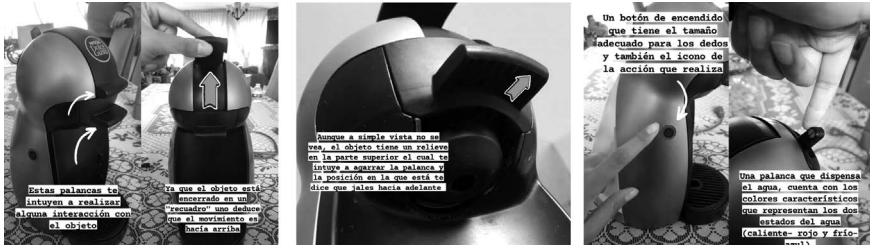
Figure 6.3 Analysis of an everyday object performed by a student at home.

which then give feedback. By using Microsoft Forms, interactive rubrics became available. When students presented their projects via the video call, everyone could instantly co-assess each presentation, encouraging more dynamic and objective feedback. By the end of the session, each project had received feedback and assessment.

Elastic Proximity

Students and teachers could attend the synchronous class sessions from any place and revisit each session at any time. We identified elastic proximity in three different areas: the physical space, social space, and time.

The Elasticity of the Physical Space

Space could be bent thanks to online meeting platforms. Students from different parts of the city, and even from different towns, could attend class without leaving home. Also, students could connect from work or a moving vehicle. In this sense, like a rubber band, the class could expand to 1,000 miles or contract to 10 feet. Likewise, elasticity allowed having special guests for different sessions. Without travel expenses and other bureaucratic processes that a teacher must endure to bring a specialist, suddenly inviting a speaker became more possible than ever. At the same time, without all the complications of traveling, scholars and professionals were more open and willing to accept invitations. Thus, we could have one or two speakers per course during the semester, even from another country. Moreover, elasticity meant that everyone could access the video call from different devices, these may be a laptop, desktop, tablet, or even a mobile phone. Hence, the class could shrink to fit into a small screen or enlarge to a widescreen.

The Elasticity of the Social Space

Even though confinement pushed students into isolation, it brought them closer to one another since they could interact more flexibly and organically. Without face-to-face physical interactions, students used platforms that allowed them to express themselves better to each other. Social media allowed them to take time and think

about how to answer better, improving their interactions with each other. Moreover, the transition from high school to the university was less abrupt to first-year students. Newcomers tend to feel alienated from the university since it represents a new context, new classmates, teachers, and new administration. Social elasticity allowed the adaption to the university process to run smoothly and become less stressful.

The Elasticity of Time

Microsoft Teams allows the participants to record the meeting or video call. Then the recorded session becomes available on the platform 24/7. This feature promoted a different attitude in students, which on occasions, they revisited the class session to clarify some aspects that were blurry during the synchronous one. Sometimes, the students were the ones asking to record the session or even pushing the recording button, meaning that they were interested in having a backup for later consultation. This recording was particularly beneficial for those that could not attend. If a student had to work late one day, he/she could access later the recorded file and review every aspect of that day's class session. This way, no student would miss out on anything. Recordings were identified by the students as one of the best engaging advantages of distance learning. In their own words, this is a feature they would miss when we go back to the physical classroom. The elasticity of time maintains every class session on the present day, without an expiration date.

Democratic Proximity

Hierarchies between students and teachers dissolved, and horizontal relations could emerge during synchronous and asynchronous class sessions. We identified democratic proximity in three different interactions: taking control of the session, diverse participation during sessions, and opening channels to subtle voices.

Democracy in the Control of the Session

Thanks to virtual meeting platforms, participants could not only intervene any moment during the synchronous session, but also take control of the session. This feature allowed students to share their screen and show images, videos, or any content that they felt was essential to exemplify, expand comprehension, or express their point of view during the discussion. The possibility of democratically showing and sharing information brought the class closer to students since the topics and interests could be selected and discussed by them. Hence, a co-learning environment became possible, maybe for the first time, due to the horizontal interactions between participants. Anyone could have access to controllers and lead the session, thus the hierarchy between students and teachers dissolved.

Democracy in Participation during the Session

In a group of students, there are different personalities with contrasting social skills. For some of them, it is easy to raise their hand and express their opinion, but for others, this could be a stressful activity, making them refrain from participating, even though they could have an interesting point of view. Synchronous sessions through the virtual platforms somehow encouraged participants to interact that otherwise tend to be silent. The fact that cameras were most often turned off during the synchronous sessions led to students feeling more comfortable in expressing their opinion, either via chat or by opening the mic. Thus, virtual sessions were more democratic by harnessing a plurality of opinions.

Democracy in Opening Channels to Subtle Voices

Tutoring is an activity in which full-time teachers follow-up with students that are at academic risk or are facing issues with other teachers or even at home. In a way, a tutor could be a guide and a mentor that helps students in overcoming any trouble and achieving their full potential. Before confinement, students hardly approached their assigned tutor to discuss any issues that they might be facing. When a tutor scheduled meetings with students at risk, they often did not show up for the meeting. Instead, virtual meeting platforms enhanced this activity. Suddenly students were showing up for the scheduled meetings. Other students were even making appointments to discuss different issues with the tutor. Somehow, it was less troubling for them to interact and express difficulties through the virtual channels, democratically leveraging the odds to speak and resolve issues for everyone.

Conclusions: Rethinking Design Education

In this chapter, we referred to liquid proximity as the practice that not only challenged the idea that physical presence is necessary when teaching design, but that allowed new ways of proximity that could transform the way we teach design. Proximity in a liquid state highlights several engaging advantages that were visible thanks to the migration to virtual scenarios. By being simultaneous, an ongoing dialogue was possible. Since dialogue and feedback are the core of the design studio, we should find new ways to enhance it, either virtual or face-to-face. By being instant, a broader scope of resources could be integrated into the design studio. We should develop strategies and find the tools to improve accessibility. By being elastic, the design studio stretched its space and time. We should make an effort to shape it into a more perennial form. By being democratic, different voices could be heard, and diverse individuals could engage. We should identify channels to keep the design studio as a safe space for loud voices and whispers.

   These aspects evidently point out a reconfiguration of the design studio as a learning-by-doing space. Moreover, these alternative ways of interacting highlight the transformation of students' engagement and performance. Liquid proximity

drove students to be more autonomous while searching information and performing tasks, become self-organized, and have a more responsible attitude towards their own learning process. For teachers, adapting to liquid proximity was also a challenge. Apart from having to become a tech-savvy teacher, everybody had to be more organized in planning every lesson, finding materials, and re-designing tasks for synchronous and asynchronous sessions. Also, teachers had to keep track of the progress of every student in a more individual way, since some of them could only log in and review the lesson at the end of the day. From our perspective, it is worth noting that only by driving the entire academic community to boundary-crossing into the digital environment could these practices emerge. Now, discussions should centre on whether to integrate them in design education regardless proximity becoming physical or virtual. Also, we would like to note that the concept of liquid proximity should remain liquid, giving it chance to transform and evolve. Consequently, maybe in the future, new ways of proximity emerge with new features and advantages, or the ones that we have described in this chapter evaporate.

In the end, we are glad to have witnessed the possibilities that design education has in the virtual realm. We feel lucky to have encountered liquid proximity and experience different ways of interacting with students noticing their transformation and response to the challenge, developing skills, and adapting to the new environment. May this chapter become an inspiration to students and teachers and aid in bringing down the barriers to embrace VDS as a compelling form of design education.

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7 Proximity of Conjecture to Design Pedagogy

Rupa Agarwal

National Institute of Fashion Technology, Mumbai, India

Introduction

The discipline of design with its logic of abduction and conjectured thinking has many distinguishing characteristics. When design was on its way to establish itself as a new discipline, it borrowed from the established disciplines of sciences and engineering. But it was soon apparent that design was different. The very logic on which it operated was different. Design operated on the logic of abduction as against deduction and induction.

'Abductive' reasoning is a concept from the philosopher C.S. Peirce (Peirce, 1957). He distinguished it from the other better-known modes of inductive and deductive reasoning. Pierce as in Cross (2006) suggested that 'Deduction proves that something must be; induction shows that something is operative; abduction merely suggests that something maybe.' It is therefore [also] the logic of conjecture. Design problem solving has the capacity and possibility to abduct solutions through the use of conjectures. Below is what various design theorists say about conjecture:

1 The role of the conjectured solution is a way of gaining understanding of design problem (Cross, 2006).
2 Conjecture keeps problems contained within manageable bounds (Hillier & Leaman, 1991) as in Cross (2006).
3 An early idea a designer 'holds on to' is a 'primary generator' (Darke, 1979). This plays a positive role of keeping the problem within manageable limits.
4 Conjecture is the 'extra ingredient' to knowledge, which helps solve design problems (Cross, 2006).
5 Conjecture is the 'ordering principle' in problem solving (Cross, 2006).
6 Variety reduction occurs early in the design process with conjecture or conceptualization of a possible solution (Cross, 2006).
7 Design is essentially a matter of pre-structuring problems (Hillier & Leaman, 1991).
8 As with science, it is not a matter of whether the problem is pre-structured but how it is pre-structured, and whether the designer is prepared to make this pre-structuring the object of his critical attention (Hillier, Musgrove & O'Sullivan, 1972).

9 There is a set of 'internal variety reducers' and these are an expression of the designer's cognitive map. This cognitive map acts as a kind of plan for finding a route through problem material that would otherwise appear undifferentiated and amorphous (Hillier & Leaman, 1991).

10 In the context of design, classifications and code formalizations would not be deterministic, but would constitute an extension of the designer's basic cognitive capability, and provide him with a position of strength from which to make his conjecture (Hillier & Leaman, 1991)

The Two Paradigms of Conjecture/Analysis (C/A) and Analysis/Synthesis (A/S)

Just as with other tenets of the positivist tradition, so with the analysis/synthesis (A/S) paradigm, it came under fire and conjecture/analysis (C/A) was pronounced as a more suitable method for design. Table 7.1 compiles the arguments, which underlie the two paradigms.

Table 7.1 Comparison between analysis/synthesis and conjecture/analysis design methods.

Comparison points	Analysis/synthesis	Conjecture/analysis
Core argument	Problem solving involves 'decomposing' problems and 'piecing together' solutions.	Essentially a matter of pre-structuring problems either by a knowledge of solution types or by a knowledge of the latencies of the instrumental set in relation to the solution types.
Dealing with the 'problem'	Problem will be understood by collecting 'observed' and 'recorded' facts, without selection or an *a priori* guess as to their relative importance.	To help structure an understanding of the problem, and to test its resistances, one must conjecture approximate solutions much earlier in the process.
The 'solution'	Synthesis is a process by which pieces of a puzzle gradually come together, and so a solution is typically visible only toward the end.	Without a solution-in-principle at some intermediate stage, a 'vast variety' of design decisions cannot be taken.
'Fit' with the ontology	In the four key stages – briefing, analysis, synthesis and evaluation – creative thinking is relegated to stage four in evaluation. This is a dis-analogy with design.	'Design development' is thus constructed by solution-in-principle.

Sources: Compiled by author in 2019 from Hillier, Musgrove and O'Sullivan (1972), Bamford (2002), and Thorndike (1931).

The A/S model is mostly prescriptive and can be placed in the realm of design methodology, while the C/A model is mostly descriptive and can be placed in the realm of design theory (Trebilcock, 2009)

Discussion of C/A Paradigm in the Context of Pedagogy

'Conjecturing approximate solutions' (Hillier, Musgrove & O'Sullivan, 1972) in order to understand the design problem has a marked resonance in pedagogy. Students need to pre-structure the problem and change it as they progress, because 'without a solution-in-principle at some intermediate stage, a vast variety of design decisions cannot be taken' (Hillier, Musgrove & O'Sullivan, 1972). Students are novices who need the anchor of conjecture to build their knowledge and skills. General principles cannot be applied to tackling design problems since every design problem is unique, a 'universe of one' (Schön, 1983). Experienced designers deal with every design problem through 'artistry' of reflective practice. But Schön (Schön, 1987) argues that this 'artistry' need not be relegated only to the expertise of experienced designers, but could be taught in professional schools. This thesis proposes that reflective practice can be inculcated in students through conjectured thinking.

Another convincing argument for C/A in pedagogy is that of Trebilcock, who says A/S concentrates on dismantling 'parts' toward reaching the 'whole' (Trebilcock, 2009). When applied to pedagogy, students very often become entangled in the 'parts', jeopardizing the overall coherence. C/A logic on the other hand assists design decisions that integrate several variables, so that the whole is more important than the parts.

Two empirical studies using C/A for pedagogy have influenced this research. The first is that of Kees Dorst, where he compares the different paradigms A/S and C/A, to demonstrate the 'closeness' of each method, to the way designers experience design activity. Though the rational problem solving process (A/S) has its merit where the problem is fairly clear-cut, reflection-in-action is 'closer' where the designer has no standard strategies to follow and is trying out problem/solution structures (Dorst & Dijkhuis, 1995).

The second empirical study where A/S is challenged is that of Chris Heape. In his Ph.D. thesis, he maps the 'actual experience of designing' into a 'Design Space' (Heape, 2007), which challenges the rational decision making of A/S, and argues for an organic way of dealing with design problems.

Addressing design problems by situating them in the context and using conjecture to make sense of the problem immediately creates a link between design and solution in the student's mind. Further, as one proceeds in the design process, testing resistance to conjecture helps students manage the complex and uncertain terrain of design.

A more detailed literature was studied of previous research done in the areas of 'Precedent-based knowledge', 'Case-Based Reasoning' and 'Episodic thinking', which are relevant to Conjecture-based pedagogy. All these concepts came to life during the observation of the studio of another instructor.

Precedent-Based Knowledge

Precedents may be previously employed solutions by famous designers. Another way of looking at it is that precedents transform 'internal memory' of designers to 'external memory'. This means that 'external memory' must be tangible information, which is more accessible and searchable. The precedents can be in the form of pictures, graphical representations, processes, text and verbal. The knowledge assimilated through the study and use of precedents is known as Precedent-based Knowledge.

Large databases of precedents exist in the areas of law, medicine and management pedagogy and practice. This formalizes this way of thinking in these fields. Design being different from law, medicine and management, the treatment of precedents in design should also be different. No two, design situations are ever identical, and Goldschmidt (1997) compared with Lawson (2004) points out that this is not necessary for precedent to be useful for a designer. In fact, unlike the lawyer, the designer is not trying to demonstrate a close parallel with the precedent, but rather is using something that is sufficiently similar in some respects to become a useful point of departure. Goldschmidt therefore argues persuasively that the term 'precedent' is less satisfactory than the term 'reference' as a generic description of this phenomenon in design. In fact, she prefers to see precedents as a sub-class of the more general idea of reference. The author furthers the idea of precedents being a sub-class of a bigger idea. The bigger idea is that of conjecture. The typologies of conjecture identified are listed at the end of this chapter where precedent is one kind of conjecture.

Case-Based Reasoning

Case-based Reasoning as a method in artificial intelligence (AI) is considered to be the brainchild of Janet Kolodner (Kolodner, 1984) compared with Akin (2002). Her work developed a computer-based system that could browse a repository of cases (recipes), find a match to the problem at hand (preparing a dinner) and adapt the recipe to the problem at hand (prepare a vegan dinner out of vegetarian recipes). The technique proved to be not only a powerful generative system but also one that would find broad applicability in other areas. Even more relevant to our topic here, Rivka Oxman (Oxman, 1994) developed a case base that assists designers in consulting design precedents. Schön (Schön, 1983; Schön, 1987) an early student of the method, aptly coined the term 'reflection in action' to describe the process that takes place in the design studio which is akin in many respects to the case method.

Key roles that the instructor plays in this method are facilitating the discussion around a given case, selecting and presenting the case and, in some instances, codifying and structuring the case, leading successful discussions through case examples collected in the classroom.

The other key ingredient of the method, obviously, is the case. Historically, cases used to consist of brief and, at times, cryptic, descriptions of situations that then had to be elaborated extensively on subsequent stages of the instruction process. The corpus of cases and their proper representation is obviously the prerequisite for any successful implementation of this method, regardless of the discipline of application.

Episodic Thinking

Episodic thinking is the use of knowledge from internal and external sources (Visser, 1995). Internal source is quarrying one's own experiences and external is the 'shared' experience with others. Both are very important, especially for students of design where they are not yet exposed to the rich repertoire of precedents from which to draw.

Schön (1983) indicates, 'in actual designing, designers often learn from earlier trials to reframe alternatives and even the problem itself. Moreover, each design project helps to prepare the designer for future projects'. This aspect of historical situatedness raises the question as to how design students are engaging with their design tasks, as their design experience is limited, particularly in the initial phases of their studies. What is the historical situatedness of their design situation and how are they doing this?

Clearly students need guidance in developing a repertoire of experience. An alternative view to developing 'situatedness' through experience, and possibly to help students and 'novices' with the design process is Goldschmit's description of 'importing information'. She talks about how 'In recent years computational technologies have permitted the creation of relevant databases and methods of indexing, accessing and searching them, so as to tap information and knowledge that can be useful in design problem solving. (…) Currently, models of design process build heavily on knowledge bases, including some procedural knowledge. Few of these models can be described as computational counterparts of procedures used by humans and if so, only in simple, moderately ill defined situations. They are counterparts in the sense that they solve problems, but they reach a solution using a different path than that used by a human mind" (Goldschmidt, 1997, p.442).

Here again one finds C/A more generative in nature rather than prescriptive, which makes it more suitable to the way designers solve problems.

Observation of Another Instructor's Design

The observation of the course PD2, Product Design 2, was conducted of students in semester 3 of the Masters of Design program at the Industrial Design Center of IIT Bombay, in India. The class consisted of 12 students and one anchor faculty. The faculty would bring the expertise of other faculty members as and when required.

Assignment brief: Develop an understanding of wiring accessories in the residential context. This will be done through field visits, talking to users, documenting existing situations through visual media and collecting samples of existing products in the market (Table 7.2). Prepare a product brief in order to arrive at a design solution.

Conjecture Found in Studio Observation

Conjecture is the unit of observation. Every utterance, object or reference to a previous experience has been flagged as conjecture. Next are some excerpts from the transcribed material.

Table 7.2 Final product categories chosen by students (observation of product design Studio IDC, IIT Bombay, India), 2019.

Student	Product chosen
1	Door bell
2	Main circuit breaker board
3	CFL holder
4	Immersion rod
5	Wire manager (extension boxes)
6	Plug points in kitchen
7	Ceiling fan regulator
8	Spike guard
9	Mobile charger
10	Night lamp
11	Switch
12	Switchboard

Students followed a synchronous mode of collecting samples available in the market currently. They went to shops, which stocked popular brands such as Anchor, Crabtree, and Havells etc. They collected various kinds of electrical and wiring accessories from the market and brought it back to the studio to be shared and discussed. Along with the samples, information about pricing and range was also found. Interviews of the various stakeholders such as architects, interior designers, electricians and end users were done by students to find brand/product preferences, influences of price of product and reliability, ease of use and safety, etc.

In the studio observation, two very strong case study inputs were given in the form of the instructor presenting his own previously finished project. He explained the nuances of the design and management of the project. Another example of a case study is that of an expert invited by the instructor for input in the user study. The expert explains the project done by students on how doorbells are used in Mumbai.

Table 7.3 Conjecture used in the studio class along with what it signifies. Analysis drawn from studio observation by the author in 2019.

Conjecture	Comments	Typology
Reference to personal experience of the instructor	The instructor brings in personal experiences that have occurred from his boyhood to the present to illustrate lifestyle changes, technology advancement, evolution and market dynamics.	Episodic
Reference to earlier student projects	The instructor presents projects done by previous students as examples of design process and challenges faced to produce the design solution. We find this tool to be effective for students as they can relate much better to it.	Precedent

(Continued)

Table 7.3 (Continued)

Conjecture	Comments	Typology
Reference to famous designer's work	The instructor uses this as a tool for making the students aware of well-known designers. Some of the designers' work may be directly applicable, but the rest adds as repertoire of knowledge about design.	Precedent
Reference to sections in books	Sharpens students' skills to use documented literature for their design projects.	Referent
Domain knowledge in other areas a User studies b Innovation c Design of ceiling fan	Three experts were called for domain-specific input. These are similar to exemplars proposed by Thomas Kuhn (Kuhn, 1996). These inputs are useful for students at later stages of design. These are explained through some previously finished projects.	Case study and precedent
Actual samples shown in class by instructor	This tool is very effective as the students get to 'see' and 'feel' the product.	Precedent
Project done by instructor	Gives an opportunity to instructors to explain the details of the design process, which is usually absent in any design case study.	Case study
Examples of electrical accessories (form, usage, innovation and function)	Some informative examples of electrical accessories, which were not been covered in any of the above.	Case study
Actual samples from market (students)	Students search the market for available samples of wiring accessories and bring them back to class. When all the students share with instructor, it helps inculcate peer learning.	Precedent/ primary generator
Personal experience of students	Instructor invites personal constructs to be discussed. These bring out the parallels between what the student knows and what they need to design.	Episodic/ primary generator

Typologies of Conjecture

The conjunction of literature and the studio observation yielded five types of conjecture as described below.

Primary Generator

Students latch on to a 'relatively simple idea very early in the design process' (Darke, 1979). Students should be encouraged to take it forward not 'as is' but by testing against constraints to get a better understanding of the problem. This is termed as a 'primary generator', which is the *prima facie* solution and is the 'window to the solution space' (Lawson, 2004). In the observation conducted, we found that the samples brought back from the market became the starting point to ideate for one's own design. This is because of several reasons. One student said, 'It is

tried and tested … [the] product is already selling in market'. Another said, 'When I went to the market, I didn't have anything in my mind. When I saw the new bulb holder, I was very interested in its mechanism. … I thought I should work on this'.

Examples from the students' own experiences are also a rich repository of primary generators. Transcript 1 shows how the instructor traces changes in products over the years by drawing on the student's own experience. The products discussed were a sev making machine, fan, fan regulator, switches, table lamps and irons. In this list, some saw many changes quickly and others not. In this example, the instructor invoked collective memory of an artifact, which a student articulates as a personal memory.

Instructor:	Remember, this traditional thing…grinder.
Student:	…in Kerala.
Instructor:	They are recently changed.
Student:	Even in our houses they buy those because they last for years.

Referent

It is important for the instructor to provide a list of referents to the students to bridge 'learning of declarative knowledge in theory class and the procedural knowledge needed to solve design problems in studio environments' (Khorshidfard, 2011)[1]. For our purposes, we will define referents as 'a design situation, which consists of design problems, design solutions and design process' (Dorst & Royakkers, 2006). Another support for the idea of a referent is that the knowledge that is valuable to students in their design problems is not instrumentally accessible when they work, …they do not know what they know (Tzonis, 2014).

In the observation conducted, the instructor brought books on 'how to conduct a user study' to class to show how prescriptive guidance in books can also be used as a referent in their design process.

Episodic

'Common-sense knowledge' is of utmost importance in students' understanding of design. It is observed that an already 'lived experience' either from an 'internal or external source' (Visser, 1995) helps students in interpreting a complex design situation. It will be worthwhile if instructors encash this behavior and consciously create design situations which give students a sense of déjà vu. It is proposed that this can be done through situating a design problem in day-to-day life. There is an academic interest in this area where designers 'reach a design solution by adopting interactions everyday design cases' (Kim & Lee, 2014).

The whole process of design pedagogy, in a sense, is a series of episodic events. In our particular case, the brief – 'managing wiring accessories' – also came from the instructor's personal (Kolb, 1984) experience, where he came across many challenges while building his own house. Consequently, the instructor embeds episodic elements in the discussion of the project and so do the students. Episodic

events are very likely to become the primary generators of the project. The example of the products used in households makes a connection with students. In the discussion of primary generators, this is also mentioned in point 1. Some conjecture typologies can overlap.

Precedent

Precedents are commonly used conjecture in design process. They are 'whole or partial solutions' or 'previously employed solution by a famous designer' (Lawson, 2004). Some designers have worked to create digital databases of design precedents. Precedents are used quite frequently in law and medicine. Lawyers and doctors have extensive databases to which to refer. We propose the same for design. Here, the precedents come from discussion of products and their features. Instructors use examples, like the earlier music players and how the iPod was developed, with different experiences for the user. Through this, ideas of innovation were imparted to students: you can change how you store music, by downloading music rather than recording it to a device.

Cases

The academic activity of developing case studies is missing in design. Instructors do present case studies to students. In fact, they are quite detailed, but many times cannot be used because they are not documented at the time the student wants to refer to it while designing.

Design cases are representation of knowledge that develop naturalistically as the designer or someone close to the design collects key artifacts and reflects on the reasoning behind decisions and the efficacy of those decisions (Boling, 2010).

Discussion

The chapter is part of a Ph.D. thesis that uses conjectures as epistemic units to build a Conjecture Analysis Model for Sustainability (CAMS). To do that, it was very important to expand the vocabulary of conjectures itself. The five typologies presented here have been gleaned from various sources of literature and corroborating it with observation of a product design studio. The typologies of conjecture are very effective pedagogic tools to generate new ideas and solve problems.

The proximity of C/A to design as demonstrated in this study will be useful to design educators as an important tool in pedagogy. It is not a wholly unknown tool. But to use it in a structured manner allows reflexivity, abduction and managing difficult problems, which are the inherent qualities of design. Design teachers can actually guide students in actively using appropriate conjectures for understanding concepts, furthering the design process and collaborative work. The use of precedents for furthering knowledge and practice is well known in medicine and law. The medical and legal cases are well-documented and classified so that they can be used to solve a fresh case. The discipline of design also needs the rigor of

developing design and design pedagogic cases that create a support ecosystem of conjecture knowledge.

Note

1 Khorshidfard's paper, which was based on Kolb's learning model (Kolb, 1984), has relevance to our enquiry. According to Kolb, learning is a process whereby knowledge is created through the transformation of experience. Knowledge results from grasping experience and transforming.

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Part II

Design Approaches in Academic Context

8   Food Design Education

Design for Food or Food for Design?
Different Approaches to Designing a
Change for Our Food Systems

Mariana Eidler

*CIAUD, Research Centre for Architecture, Urbanism and Design,
Lisbon School of Architecture, Universidade de Lisboa, Lisbon, Portugal*

Ricardo Bonacho

Universidade Europeia, Lisbon, Portugal

Food and Design: An Upcoming Concept for Research and Practice

With human imagination and creativity, we can collect food from nature and take it directly to our mouths. The way we eat will always be a matter of taste, and the social and cultural aspects that involve it have always been interconnected (Raymond, 2008). However, it was only in the last three decades that food, understood as the object we need to ingest to live, began to be explored from the perspective of expert design (Manzini, 2015) and to raise questions related to structural problems about how our food systems are currently designed. Parasecoli describes a system made up of open-ended, shifting, and unstable networks rather than well-defined chains (Parasecoli, 2019), where subjects such as sustainability, food waste, excess and lack of food, among others are current topics.

The human being's ability to change the environment is as old as its history. However, Heskett (2005) mentioned that methods have changed over time through technological, organizational and cultural transformations (Ricard, 2015).

Various authors have noted that the human need to shape the natural world for their well-being implies a design activity that is intricately linked to the economy and social life of different societies. Food and design were once considered separate fields, with little awareness of their close relationship (Margolin, 2013). However, food, like design, is a complex and diverse entity, and both embody the idea of transdisciplinary change and dynamics. The current media attention around food has elevated it to an object of respect and interest for academic research, particularly in the field of design, leading to the emergence of a new territory of action known as Food Design.

Defining Food Design is as complex as defining any of the fields of action in this study, as it depends on the approach and background (Biderman, 2017). The term Food Design was coined in the 1990s by Martí Guixé, who expresses an unconventional and irreverent attitude toward food. According to Guixé Food Design is the design of food, which is thought, perceived, contextualized, ritualized,

implemented and consumed as an object (Guixé apud Zampollo, 2015). For Antonelli (2008), some of the most basic foods are authentic design objects provided by Nature, and the essence of food innovation is to look at them and explore their potential. On the other hand, Hablesreiter and Stummerer (2009) state, "Food Design refers to all design of food based on reproducibility rules, and such fulfills a sensual, functional and cultural demand – much like the conventional design". Zampollo (2013) argues the definition of Hablesreiter and Stummerer (2009) when considering that it is reductive to restrict Food Design to the reproducibility of food as a factor of overcrowding since this refers only to food products of industrial and artisanal production when Food Design can be understood as something much broader.

Maffei and Parini (2010) and Zampollo (2013) categorize food and its mode of intervention, stating that it is crucial to pay attention to the context in which we are inserted, pointing out three dimensions (industry, senses and design) under which Food Design develops.

The third dimension (design) typically extends beyond the academy, often involving unconscious codesign processes, as Manzini (2015) characterizes as the last dimension of design for social innovation. This complex relationship is, in essence, what defines Food Design. "This means that our relationship with food is defined by the way we feel and think, the knowledge we have and the context in which we are immersed" (Reissig, 2017, p.9). The social impact of Food Design is significant, shaping our relationship with food and influencing our thoughts and feelings.

However, the relationship between design and food remains to be established. The contribution has been made essentially from concepts such as creativity and the creative process, suggesting that design and food production are identical concerning the creation process. Food is content and intermediary in a process in which the creative dimension of design can be particularly comprehensive and consequential to the existence of billions of people(Biderman, 2017). Its transdisciplinary character (Massari, 2021; Reissig, 2017) indicates that numerous agents contribute to its stabilization and definition. "This can be a challenge, as each field brings preconceived ideas about which epistemologies and pedagogies are most valuable and essential" (Biderman, 2017). Food must be seen as a system, and Food Design can serve as a creative and critical practice for the knowledge and understanding of food and people.

Food and Design: A Transdisciplinary Approach

In the Ph.D. Thesis of Mahan in 1970 and later in 1972, Piaget and Jantsch coined the term "transdisciplinary". At that time, there were presented hierarchically the concepts that described the forms of collaboration between different disciplines (Bremner and Rodgers, 2013; Dykes *et al.*, 2009) and pointed out that transdisciplinary is the most complex form of collaboration in which the project usually involves a problem. A single discipline cannot solve subjects of this nature and, therefore, requires the presence of others who share a theoretical understanding

and an interpretation of knowledge. Stein (2007) considers these approaches within a specific disciplinary group and points out that the insights sometimes differ in competencies. Within the scope of our study, we explore transdisciplinary theories under the proposal of Dykes *et al.* (2009) because it involves the knowledge and concepts of at least two disciplines, none of which is predominant (design and food). "This context brings together diverse disciplinary concepts to explore new issues" (Dykes *et al*., 2009, p.111). Changes require a design-specific, rather than an ambiguous, disciplinary framework to understand the emerging practice and how collaboration facilitates innovative work. These new structures can delineate the field of design and, in this case, food and design, allowing their activities and results to be better defined and understood.

Design Education in a Food Program; Food Education in a Design Program

According to Woodhouse and Mitchell (2018), throughout history, we find chefs who challenged the norms and dominance of gastronomy and food. Examples include Escoffier, who redesigned the kitchen and implemented a hierarchical system; and Ferran Adrià, who started a new revolution by using design method-ologies and combining science and cuisine in the movement known as modernist cuisine. "For these significant innovations in food to occur, it was necessary for chefs to adopt design methodologies and challenge the hegemonic practices and offerings of their time" (Woodhouse and Mitchell, 2018, p.23). The resistance to change the pedagogical model, mainly in gastronomy, is, according to Woodhouse and Mitchell (2018), a resistance in the structures that were instituted there:

1 The master–apprentice model.
2 The hierarchy of the kitchen.
3 The institutionalization of the culinary vocation.

The authors suggest that design as a pedagogy eliminates the technocratic focus of the French curriculum and the hierarchical support of the structures. Instead, adopting design as a pedagogy allows students to explore and discover their canons and truths (Woodhouse and Mitchell, 2018, p.25).

The issue of design is not just a matter of teaching; it is also present in the development of synergies and partnerships between professionals and disciplinary areas. Schifferstein (2016) states that the need for design in food production is far from being met and describes what design can do for the industry. From a futuristic approach, the author describes the role of designers in the food industry and the potential value they can bring to the development of food products. Expanding its application to innovation projects and shaping tools makes it possible to structure and facilitate cooperation between team members and integrating knowledge from different areas. Furthermore, by involving more designers, the company improves its performance and creates a commitment to the food system (Schifferstein, 2016). The author points that the challenges for food production are: (1) Developing

products for the future; (2) Cooperation between disciplines for cross-fertilization; (3) Integration of knowledge; and (4) Taking the right decisions for the market. Besides, he proposes that designers in the food industry should: (1) expand the scope of the projects; (2) Shape tools to engage others; (3) Facilitate cooperation between teams, and (4) Integrate experts (Schifferstein, 2016).

Despite not being well-defined, this design-food relationship neither in education nor in the industry is fruitful for both parties. Conversely, by working with food, designers will "enrich the design discipline by offering a rich array of prototyping materials, discovering a unique multisensory aesthetic and connecting designers with local cultures and with social contexts" (Schifferstein, 2016, p.129).

The Master's in Food Design at Estoril Higher Institute for Tourism and Hotel Studies, Portugal

The Master's in Food Design at ESHTE[1] in Portugal introduces Food Design, highlighting an education based on a holistic perspective, defined as a formation paradigm in which to look first at the totality of the system or subject, rather than its component parts, and proposes a multidisciplinary vision that seeks to develop versatile thoughts for the development of food products, services and experiences, focusing mainly on the problems of current food systems. Students are asked to find solutions through processes, tools and methodologies specialized in Food Design and innovation: design thinking applied to food, empathy maps and the journey experience. Using these methodologies, students coming from different disciplines with different backgrounds are allowed to learn from each other and create transdisciplinary projects. Exploring the boundaries between design and food by combining design with food science, innovation and technology in a transdisciplinary context helps promote student reflection and critical thinking on the food system's specific problems and adopt an approach to design as a project activity that promotes the responsibly and sustainably use and consumption of food.

Design for Food – ESHTE

How can we define the space of design in food education? It is relevant to question the place of design in the confluence with other disciplines, not only in the appropriation of its vocabulary and devices, but in its state as a creative agent of new models of knowledge and a transformer, interpreter, critic and unifier of our culture. In this way, we propose a set of moments of increasing complexity to explore and investigate the characteristics, principles and vocabulary of design in its relationship with food. Examples of this are the projects as follows:

1 "Neura – Mind your Food" (Figure 8.1), which offers a solution to motivate smokers to quit and help them fight against weight gain. The idea is to show the transdisciplinarity of the created project through proposing a service that brings

Figure 8.1 Neura, Conceição Barbosa.

psychology and gastronomy together with design. The idea is based on creating a session/workshop in which smokers have psychological support and learn which foods they should choose for their meals to help them stop smoking. The role of food designer is represented in this project, proposing a service design through food.

2 "Hungry for Change – Food Empathy and other types of scarcity" (Figure 8.2) aims to draw attention to the most significant food paradoxes we face today: waste, hunger and excess. A holistic gastronomic experience in which the food designer proposes a speculative component that assumes that we can lead people to have a critical perspective to change behavior through knowledge. "An edible book", which aims to stimulate discussion creatively, bringing together people at the table who taste different food supports configured as a page in a book.

3 The "Tasting Memories" food literacy project (Figure 8.3) is a tool designed by a chef for cooking classes whose main objective is to intervene in food literacy and education. The project approach is to educate the consumer through the choices they will have in the future. Essentially, better-prepared cooks will present better food, thus, design will help to teach consumers to eat appropriately, impacting society.

The three projects presented show the need of food designers to learn about design and apply it to gastronomy to create concrete and impactful Food Design projects.

Figure 8.2 Hungry for Change – Food Empathy and other Types of Scarcity, Maria João Leite.

Figure 8.3 Tasting Memories food literacy tool, Anna Lins.

Food Education in Design Programs: TFG Elisava – EspaiSucre

Elisava is the international Design and Engineering Faculty of the University of Vic. situated in Barcelona, Spain. The program proposes a bachelor's in Design and Innovation in which Food Design is one of the strategic contents. In 2018, Mariana Eidler started in Elisava's bachelor thesis in Food Design with interesting results to try to define what a food designer is. To start the research into the food for design approach, a collaboration was formed with EspaiSucre, a well-known chef school and restaurant created by Xano Saguer and Jordi Butron in 2000 in the context of the Elisava's Final Degree Project (TFG). Dykes *et al.* (2009) state that "working with other specialists should be encouraged within the practice of design; however, research in design does not have a specifically defined structure that describes work with other disciplines" (p.100). The idea of this project states into transdisciplinarity, since the students from two schools with different backgrounds jointly create gastronomic experiences. The team comprises 11 students from different design disciplines in their last bachelor year in Elisava, and four pastry students from the master's program at EspaiSucre. The project tutors are professional experts from the world of gastronomy and design, and they tutor the students as a team and individually, each one in their specialty. The main goal was to explore whether Food Design can be an essential link in the relationship between gastronomy and design to assess whether joint creation works academically to reach the final development of gastronomic experiences or projects where the different team members' participation is balanced to contribute to the definition of what a food designer is.

The process was divided into four sequential and evolutionary stages in which students explored different methodologies to end up with prototypes and the work report to communicate the results obtained. The stages and methodologies are the ones that follow:

First Stage: Exploratory

Students create groups to work together in transdisciplinary teams of designers and chefs. Cooking students are trained in theory of design and design students in theory of gastronomy. Students are trained in Food Design. Their participation in the workshop involved a literature review to facilitate an understanding of Manual Thinking, the co-creation method created by Luki Huber who was the designer working with Ferran Adrià at elBulli.

Second Stage: Generative

The teams use FAMM to consider the most important aspects to designing a meal experience (Gustafsson *et al.*, 2006). The first ideas for new gastronomic experiences, products and services emerge in this stage, and the first project proposals are created. The result is the generation of groups of ideas about the elements that each project will have according to the discipline led by each student.

Third Stage: Evolutionary

Students work all together and in small groups for each project. In this stage, they use "How might we" methodology to settle the ideas and understand how the projects might be completed and create impact. They also work with Service Design templates to clarify how the idea will help society. At this point, they are deepening in individual discipline work. In this stage, the expert assessment session is carried out to assess the proposals that the students have reached before moving on to the final formalization phase.

Fourth Stage: Communicative

The communication stage is held by all students and formalized by graphic designers to be ready for the presentation to the experts from the two schools and to the media. Mood boards will be used as methodologies to define this stage.

The projects have some elements that may be interesting to improve the daily actions of our society. They can help define gastronomic scenarios projected into the present and near future. The projects will be communicated individually to the evaluation experts of the corresponding universities. The students will have to explain the general project (made up of the four projects) and the specific project they have worked on individually.

We observed that after the training and research process, four ideas were presented with different approaches. All of them comply with the proposed brief. It is interesting to delve into this, explaining the resulting experiences, as they add value to the research because they are collaborations between chefs and designers throughout the creative process.

Food for Design – Elisava

As a result of the food approach to design, the projects are:

1 Agro (Figure 8.4), which proposes a different and educational way of entering the world of haute cuisine through an immersive process where the user acquires knowledge through a culinary experience in Barcelona markets. The project occurs within the field of social and sustainable design as it aims to encourage market dynamics and raise awareness and give relevance to the consumption of local and seasonal products. Also, the sustainable design uses the residues of the products left out of the sale to create materials to make useful objects.
2 Éclaire (Figure 8.5) is a new gastronomic experience based on the delivery of haute cuisine at home. This delivery is accessible to all people to democratize gastronomy and focus the service on the user, giving power and knowledge to all those who want it. Éclaire and the Light Kitchen are gastronomic and cultural platforms that promote gastronomy and design by bringing the chef to consumers. Many facilities are not prepared to provide face-to-face service along with delivery, and that is where this service adds value.

Figure 8.4 Agro, Berta Daina.

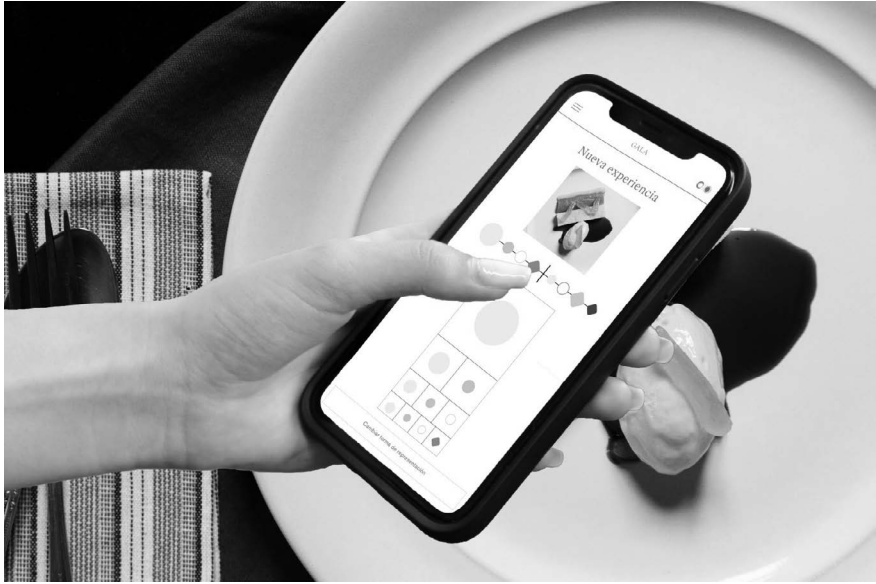*Figure 8.5* Éclaire, Judith Segura.

Figure 8.6 Gala, Marta Torras.

3 Gala (Figure 8.6) is a gastronomic visual code whose purpose is to educate and generate a database of the user's relationships with food. It is proposed as a graphic diagram capable of interacting with the individual in a systematic data-generation platform configured through digital support that has physical traceability. It gives a voice to the thought of "Food as a behavior of life", devised because it can understand a bodily process and translate it into graphic communication.

The students became food designers by having knowledge in design and in food while creating and working together with a chef. Again, the three projects previously presented show the need for food designers to learn about other fields of knowledge to create concrete and impactful food projects.

Designing Food for Change

"We are the first generation to be hunted by what we eat" (Wilson, 2019, p.5). We, as a society, are aware that our diets are altered and there is a need for a change, but we accept unhealthy food as the price we pay for living in modern society (Wilson, 2019 and Saladino, 2021).

Re(designing) our food systems is a shared responsibility and opportunity, and is essential to build new and innovative solutions for change. Although the current speculation and experimentation with food is a reality in the world of Food Design, the experiences that increasingly take place in this territory are the result of the absence of educational programs where the Food Design student has access to

balanced knowledge in food and design. Although it is relevant that these speculative projects exist and that designers think and act in the food system, it is relevant to emphasize that some projects are interesting experiments concerning current issues, such as sustainability, seasonality, proximity, food waste or respect for different rituals and cultural traditions, but almost never go out of the academic field.

This study shows two different perspectives that led us to the same conclusion: the present and future educational and professional profile of the food designer must be based on a program in which both areas of knowledge, design and food, are part of their training. We cannot design food without knowing it, and we cannot create a change in the food system without the designer understanding all the stages of the production, consumption and food waste processes. We need to emphasize transdisciplinary education in the new Food Design programs we create and also apply it to the existing ones.

In 2021, the non-profit organization the FORK organization – Food Design for Opportunities, Research and Knowledge – appears to fill some gaps in the Food Design field by creating a world community that reflects and acts under the current problems of our food systems. One of the pillars of The Fork Organization is to promote a transdisciplinary and collaborative approach to food that helps researchers and professionals – but also the industry – to create new knowledge and to design tools and strategies for the future generations.[2]

Examples of this transdisciplinarity are the celebration of the first World Food Design Day 2021, celebrated on October 16, which brought together more than 70 participants from 30 different countries. The presented projects showed how putting together food and design, we can empower people, activate changes, create concrete solutions and support impactful actions toward more sustainable food systems. Another example of transdisciplinarity is the Third International Conference on Food Design and Food Studies, Experiencing and Envisioning Food: Designing for Change, which took place in April 2022 and presented a broad panel of different experts in the four pillars of the organization: (1) research and education (translate data and values into concrete actions); (2) Food supply chain and food industry (involve stakeholders, co-create and innovate); (3) Gastronomy (rethink, co-create and share); and (4) Food Design.

The examples presented allowed us to deeply reflect about how to define the future profile of the food designer and help demarcate a territory that so far continues to lack academic attention and collaboration between disciplines. As Bee Wilson puts it in *The Way We Eat Now – Strategies for Eating in a World of Change*, we as designers and consumers must start thinking about eating consciously and objectively.

The Education Profile for a Food Designer

The examples shown in the different contexts show that it is necessary to involve academia, industry, gastronomy and designers so that the educational profile of the future food designer will be created consciously, objectively and with an acute sense of the real needs of our food systems. As a part of this ongoing research, the main objective of the training of Food Design students in design and gastronomy lies in discovering the competencies of a food designer, as it is still a socially unknown and yet undefined profession.

At a round table about academia at the Food Design Festival 2021[3], we had the opportunity to launch a questionnaire to experts[4] about who the food designer is, what they do and what background they need.

Experts suggested that the food designer can be a creative, active and empathetic creative person who is aware of the food system's problems. They could work in industry, private and public organizations or restaurants or works related to any food situation. However, despite the awareness of an educational profile of food designers, most specialists said that society does not know what Food Design is and its aims.

Concerning the parameters that the industry needs (Schifferstein, 2016), the food designer should be a professional expert in design and food, able to generate a change of value in the food chain, improve the food systems and generate a sustainable system of the circular economy when creating new products, services and experiences.

To this end, the training that we propose Food Design students to receive is focused on assimilating the following competencies whether they are in a design school or a gastronomy school:

1 Know the technologies needed to develop new food products.
2 Know the industry, its strategy and market environments as well as distribution channels.
3 Know the consumer of the present and future.
4 Know the present and future trends of the food system, culture and art markets.
5 Be able to innovate, finding new systemic solutions.
6 Understand the transdisciplinary nature of the area of knowledge in which they are trained to integrate experts in their teams according to the disciplines required by the project.
7 Know Food Design in-depth and be able to use it as an agent of change.
8 Teamwork.
9 Flexible thinking.
10 History, design/gastronomy/art.
11 Know design fields: design of new materials, space, communication design, interaction design, product design engineering, innovation, creative methodologies and storytelling.
12 Know gastronomy fields: nutrition, culinary arts (cooking, pastry), food technology, food science, gastrophysics, food safety, enogastronomy, hospitality and catering.
13 Be aware of the sustainability needs (food waste, food loose, waste management, etc.).

It is not yet clear how to define a concrete educational profile for a food designer, but we need to keep in mind that to change our food systems, one of the objectives of the food designer must be to influence the consumer to be in tune with the actual food problems we face. We live surrounded by design forms, and it is design in its most extensive, multidisciplinary and experiential sense that can lead to the experimentation capable of using new creative procedures in food practices and processes. From the perspective of Zampollo and Peacock (2016),

Food Design thinking can be conceptualized as the process by which food design-ers transform knowledge and ideas derived from food science, food psychology, and food culture into creative solutions. It is one of the many ideas being con-sidered in design education. Design can introduce and diffuse these processes through products, services and experiences, democratizing their experimental and innovative elements. It is relevant to question the role and place of a food designer as an agent that creates new models of knowledge and a transformer, interpreter, critic and cultural unifier. Design, with a rich creative tradition, can serve as a tool and a stimulus for food. Just reflect on Elisabeth David's omelette and a glass of wine, as these can be as delicious and enjoyable as a gourmet dish; the same applies to design – it is not necessary to be exclusive and expensive to be pleasant and comfortable.

Acknowledgments

Notes

1 Estoril Higher Institute for Tourism and Hotel Studies.
2 By activating networks and partnerships, FORK aims to bring academia to the market and vice versa. FORK feeds scientific research and finds the most interesting trends in the design and food sector. In addition, FORK supports and provides learning opportu-nities, sharing moments such as conferences and seminars, and educational pathways such as training sessions to share and discuss with the best specialists, both challenges and opportunities, of future and current food scenarios.
3 The Food Design Festival was founded in 2019 to promote the value of design and its relationship with food. It is an independent, plural and international festival and has the objective of becoming an essential meeting point within the agri-food sector and addressing future challenges for the industry hand in hand with design. The festival brought together more than 100 participants with presentations and reached a worldwide audience with more than 5000 views.
4 Charles Michel, Chazz Titus, Elsa Yranzo, Emilie Ballantyne, Emilie Baltz, Fabio Parasecoli, Francesca Zampollo, Honey and Bunny, Julia Kunkel, Sonia Massari, Luki Huber, Luiz Mileck, Nataly Restrepo, Pedro Álvarez, Sara Roversi, Victoria Molina, Xano Saguer. www.fooddesignfest.com

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9 Design Activism

A Humanitarian Approach in
an Academic Context

Carla Cadete

Lusófona University, Porto, Portugal

Introduction

Today's society faces complex challenges in which Social Design is responsible for mediating, such as migration, climate change, population aging, chronic diseases, poverty, loss of biodiversity, and reduction of natural resources, that require new solutions where Design should assume an important role. According to Resnick, we are living in transitional times and design has a key role to play, "Social Design is a recent field of study where the primary motivation is to promote positive social change within the society. Initially inspired by the writings of William Morris, Buckminster Fuller, Victor Papanek, and others (…)" (Resnick, 2019, p.3).

Moria is the largest refugee camp in Europe, on the island of Lesbos, Greece. The living conditions in the camp have become inhumane as a consequence of its overpopulation. Prepared to accommodate 3000 people, it currently houses more than 20,000. In September 2020, a fire destroyed the camp, and about 7000 people were relocated to a new camp, known as Moria 2, where the conditions are even worse. Journalists and photographers are not permitted to enter the new camp (Moria 2) to take pictures.

This chapter describes a pedagogical practice carried out in an academic context at Lusófona University of Porto (ULP), a co-creation activity to raise awareness about humanitarian crises in Europe. Now You See Me Moria (NYSM) is a poster movement intending to educate people about the crisis at Moria Camp, on the Greek island of Lesbos. The project has collected 449 posters from graphic designers and students all over the world, through a website and an Instagram profile, that can be downloaded, printed, and shared globally to shed light on this issue. Love for Moria is a call for human rights started by Noemí Pascual a Spanish photograph editor, also the project coordinator, working collaboratively with Qutaeba from Syria, and Ali and Amir from Afghanistan (Amir is a refugee living in Moria Camp). Raoul, a German designer living in New York, also joined the movement and created the website.

Since August 2020, the group has been collecting stories and photographs to document life in the camp. NYSM has produced a book (action book) where all the posters can be seen, offering an opportunity for students not only to see their

work shared around the world but also to contribute to a humanitarian cause. The publisher and designer involved in the action book did not receive financial compensation for their work and a potential financial positive result for the action book will revert to the Moria community.

After being in contact with Noemí, where she understood how interested the Portuguese students were in being part of the project, she proposed that they use a set of photographs of the children at Moria camp and their respective dreams to design a series of posters to bring awareness to the movement. This way, students in Communication Design at ULP were able to contribute to the cause and be part of this manifesto with a new approach to the theme – dreams of refugee children from Moria Camp. This collaboration integrated Design students into real projects of social nature and, thus, were taught to work not only for commercial purposes but also for human and social needs. However, "(…) there is strong undergraduate and postgraduate design student demand for engaging with public and collective issues, which is not being met by current academic resources. Design research has historically focused more on its technological or commercial applications emphasizing the production of traditional design objects" (Armstrong, Bailey, Julier, & Kimbell, 2014, p.20). ULP, being aware of this imperative demand, has throughout the years increasingly involved their students in collaborative projects that play a social role in society.

Now You See Me Moria

The Brief

A student from the Communication Design bachelor program, was informed of the NYSM project online and proposed that the class to support the cause on a co-creation activity with the aim of bringing awareness. After establishing contact with the coordinator Noemí Pascual, a touching collaborative project came to life. Photographs of children at the camp and their future dreams were sent for Portuguese students to design a series of posters and make an impact. The nature of the posters emphasized that, currently, the children lack very basic needs, such as access to education, which compromises their aspirations. The posters acted as the voices of these children. Here, Design plays a very important role in sharing the message and shocking audiences in an effective way. This initiative offers a "(…) concrete opportunity for immersion in a specific context, understanding sociocultural aspects and figuring out the role (and responsibility) of design in promoting change. By interacting and reflecting on the praxis, this experience promotes a 'learning by doing together' approach" (Krucken & Mouchrek, 2008, p.135).

Work Methodology

On the first semester of 2021, the first year of Communication Design bachelor's program in the module of Introduction Design participated in the challenge by

creating posters for NYSM. The results obtained might not be the most skilled, however the students with very little experience still showed tremendous motivation and interest in the work, proving to be a great academic opportunity, and a Social Design challenge.

Students had two weeks to work in this project (four sessions on a total of 12 hours). The creative process was done through *Design Thinking* methodology. The creative process began with the following order: *problem definition, ideation, prototype, and implementation (problem solution)*.

1. First Term – Problem Definition

The process began with the brief, after the photographs and sentences (dreams) were sent. The objectives were taken into account: target (society), available time (two weeks), proposal (design posters to raise awareness about the humanitarian crisis at Moria Camp, specifically children's dreams), and a schedule with dates for first term, mid-term, and final term assessment. "Almost like a scientific hypothesis, the brief is a set of mental constraints that gives the project team a framework from which to begin, benchmarks by which they can measure progress, and a set of objectives to be realized (…)" (Brown, 2009, p.22).

2. Mid-term – Ideation and Prototype

Ideation: Ideas were generated with tools such as words, images, colors, and shapes, through brainstorming, key words, action verbs, a mind map, and a mood board. Students presented the creative process and a set of ideas, an exercise that starts with a divergent process to create a large range of options. "If the convergent phase of problem solving is what drives us toward solutions, the objective of divergent thinking is to multiply options to create choices" (Brown, 2009, p.67).

Prototype: Testing posters ideas through an exploratory process. On this term after testing their ideas, students presented the advantages and disadvantages of each possible solution in a convergent process. The strengths and weaknesses of each proposal were analyzed to find the most effective way of fulfilling the initial goal. Design tools, such as color, typography, legibility, composition, contrast, and balance were considered, taking into account that posters will contain a message that needs to be easily and successfully comprehended. In some cases, the typography used by students was handwritten to establish a better fit for the message – children's dreams (Figures 9.1–9.3). This phase was vital to orient student work and to advise accordingly, as practice-oriented initiatives are crucial in Design teaching. This phase required special guidance from the teacher, as the teacher's experience allows them to draw attention to certain aspects that often go unnoticed by younger students. This is why, at this stage, an interim presentation and evaluation was carried out, where these factors are highlighted and usually surpassed.

Most students showed difficulties in creating visual impact and achieving legibility on posters. Sometimes they didn't use strong enough typography, enough
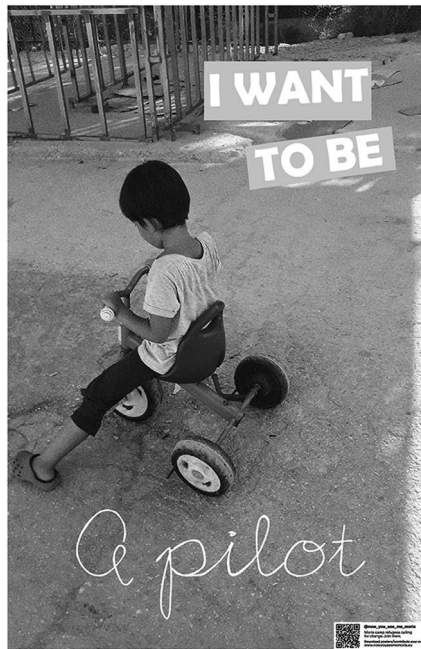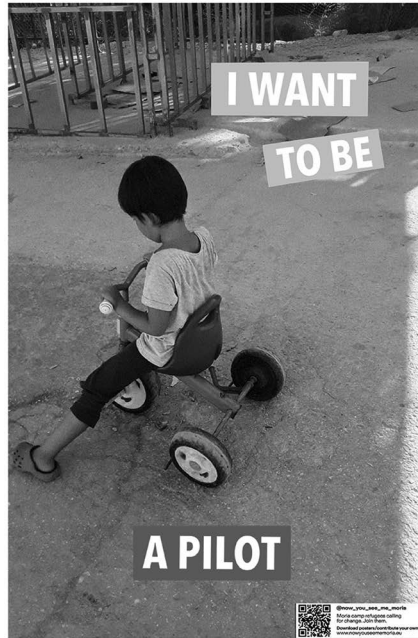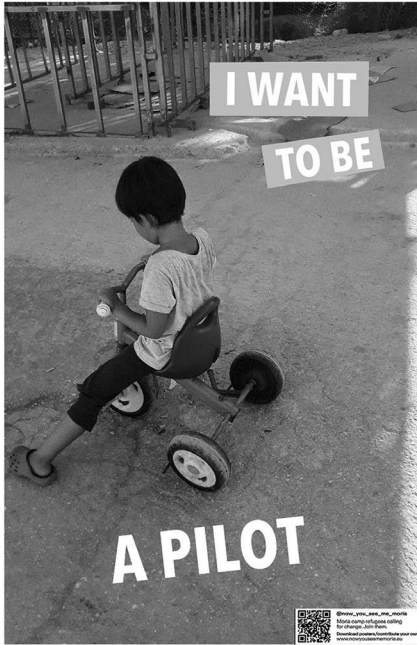
Figures 9.1, 9.2, and 9.3 Work process, testing typography. Work by Danielly Correa, a student in the first year bachelor's program in communication design, 2020.

color contrast between the background and the text, or they placed text in areas where the background (the photograph) had too much visual information, interfering with legibility and visual impact. As a solution, some students created a color square or rectangle to support typography and ensure the message could be easily read.

3. Final Term – Implementation (Problem Solution)

The final solution was developed, finished and presented together with the creative process and with all the steps justified accordingly. The final assessment took into account: creativity, relevance, impact and legibility (Figures 9.4–9.6).

Despite the students having very basic skills, due to the fact that they were at the start of their course, it was an exercise that allowed them test their abilities and apply them at an early stage.
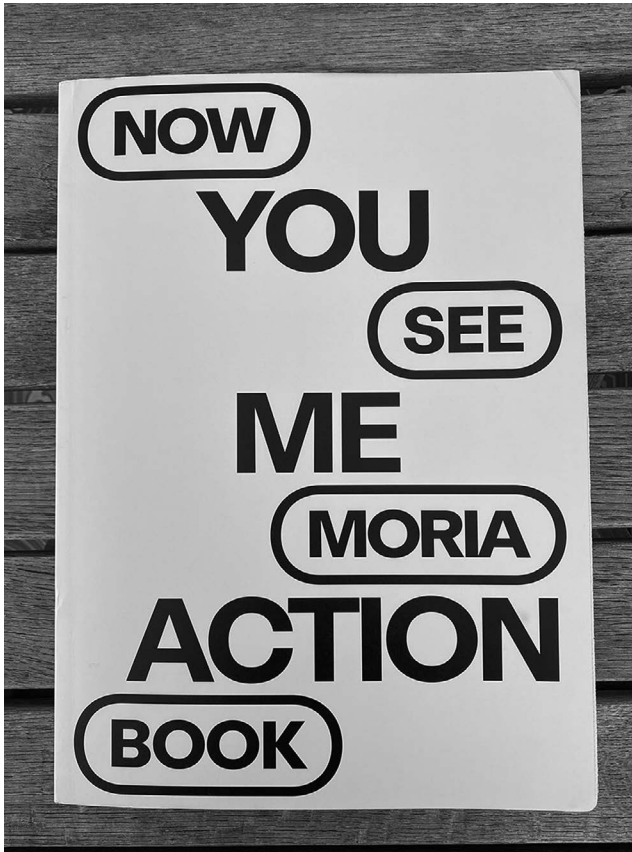
Figure 9.4 Now You See Me Moria Action Book (cover).

Source: Photo by the author Carla Cadete.

Figure 9.5 Luis Paulo Góis (poster on the left), and João Pedro Martins (poster on the right). Students in the first year of a bachelor's program in Communication Design, 2020.

Source: By the author Carla Cadete.

Figure 9.6 Gonçalo Iury, a student in the first year of a bachelor's program in Communication Design, 2020.

Source: By the author Carla Cadete.

Final Considerations

This pedagogical practice proved to be valuable in integrating students into a project of a social nature, influencing the new generation of designers to have an empathetic mentality and work toward humanitarian causes in their future career through a project that engaged students and generated enthusiasm and motivation. Simultaneously, this project allowed children's dreams, whose freedom is restricted in a refugee camp, to be heard. A Design initiative that was developed *locally* (the academy), and shared *globally* (the world).

The manifesto *Now You See Me Moria* has been growing ever since it was created, essential in compelling Europe as a whole to acknowledge the reality of the camp. To continue helping with the expansion of the organization, the same group of students and the same professor will organize an exhibition in the university with a selection of posters submitted by using the *Action Kit* (book with all the posters ready to be displayed). Also, an online conference at ULP – *Ramificações* – was held in 2022, with Noemí Pascual, Raoul (the Germain graphic designer), teachers, and students from the Communication Design bachelor program.

Margolin highlights the importance of implementing social projects in pedagogical objectives so that students will eventually believe in their ability to carry out such work in their professional lives (Margolin, 2014, p.68). This practice of involving students in humanitarian and social causes has been common at ULP. However, there's still a lot to be done at Design schools, where the curriculum needs to be reviewed and adapted.

The presentation of the work done by students in the book and on social media is extremely important in obtaining international recognition and for students to feel their work is valuable. The greatest significance, however, is to make Design students aware of having an active role in society. Students must learn Design theory, but most importantly, hands-on activities, such as this exercise, are necessary to develop a stronger understanding of the fundamentals.

This collaborative project proved to emphasize the importance of Design as an agent of change and as a catalyst in creating approaches for social transformation. Also, Design educators have the responsibility of stimulating their students – using their creativity as an alternative way of intervening in social issues.

Acknowledgment

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10 Textile Design

A Transdisciplinary Approach in Higher Education in Portugal

Sónia Seixas, Gianni Montagna, and Maria João Félix

CIAUD, Research Centre for Architecture, Urbanism and Design, Lisbon School of Architecture, Universidade de Lisboa, Lisbon, Portugal

Introduction

Textiles have a close relationship with humans. Since we were born, one of our first contacts with the world is a textile product that establishes a very close relationship with us, often close to our body, it is part of our DNA. From clothing to everyday products, textiles are present in many different objects that are close to us, setting up an emotional relationship with the user. The textile designer should consider this proximity to give objects an emotional connection beyond their functionality and usefulness, perhaps minimizing the overconsumption of textile products. Textiles can be considered as a visual, tactile, sensory and acoustic language, and the textile designer is the translator of this language.

The textile and clothing industry is an important part of the industrial landscape worldwide, but it is also considered one of the most polluting industries (Boström & Micheletti, 2016). It is responsible for more than 1.7 million tons of CO_2 and 90 million tons of waste per year, and only 13% of clothing is recycled after use, while only 1% is recycled in a closed-loop to create new clothing (UNECE, 2018). It is urgent to improve the industrial production processes in favor of the sustainability of the planet and, consequently, of the human beings by introducing more sustainable practices for this industry. Textile product development can play a key role in building a new strategic positioning by incorporating circular economy concerns into the creative process and promoting a new mindset and attitude throughout the value chain, and the role of the textile designer is important to this change. The use of renewable energy and recycled or environmentally friendly raw materials can mean the intelligent use of resources to ensure the socio-environmental well-being of humans and the planet (ATP, 2021). Design can drive indispensable changes throughout the value chain by considering sustainability and a circular economy as a premise and developing textile products for zero waste. The choice of raw materials and the processes required to process them determine the environmental and economic impact of textile products on the product life cycle from durability, reparability, adaptability for reuse, biodegradability and recycling (ATP, 2021; Fletcher, 2009; Gwilt, 2020 [2014]; Seixas, 2021;

Seixas et al., 2021). Seek more sustainable ways to meet consumer needs by creating a change in behavior and mindset among all actors – designers, manufacturers, and consumers – to improve the relationship between production and consumption that is focused on a circular economy. Promote a sustainable circular system for textiles that regenerates and repairs natural systems by minimizing waste and pollution, benefiting society, the environment and the economy (ATP, 2021; Ellen MacArthur Foundation, 2017, 2020).

Given the urgency of today's environmental, economic, cultural, ethical and social challenges, it is time to reflect on the mission of design practice. In today's global and interconnected world, systemic problems have not only one, but several viable solutions by extending the scope of design from a "traditional" and circumscribed intervention to a more "strategic" and pervasive intervention. On the academic side, it is important to rethink pedagogy to meet these challenges by training designers with skills in the fields of sustainability, circular economy and society, as well as vision and systemic thinking to become active members of a circular economy embedded in a textile economy of the future (ATP, 2021; D'Itria & Vacca, 2021; Fletcher & Williams, 2013; Murzyn-Kupisz & Hołuj, 2021; Sterling, 2004). Interdisciplinarity and transdisciplinarity between design and the various adjacent fields of knowledge, such as engineering, materials, chemistry and others, should be part of the strategies not only of university textile design programs during their academic training, but also throughout their professional education in a dynamic of lifelong learning, since the world is constantly changing. The main concern of these restructurings will be to consider the quality of life in all its forms, defined as the result of the combination of social, scientific, technological and environmental control conditions. The concern for the future is imposed by the reality of the planet (Félix et al., 2018), which can see in design a contribution to "salvation" with the creation of products that appeal to equity in the distribution of resources (Chiaradia & Pazmino, 2015).

The main objective of this study was to understand the new challenges facing the textile industry and to determine how the academia can intervene in the training of future textile designers, thus weaving a future for this industry. It is believed that the main contribution to design with this study has been the possibility to list a set of key competencies for the textile design profession. Through non-interventionist research and the use of literature review and surveys interconnecting and crossing the different research topics, it was possible to observe that the use of transdisciplinary approaches combined with multi- and interdisciplinary strategies in the training of textile designers can meet the needs of the textile industry in finding solutions in a collaborative way between design and the different adjacent fields of knowledge, sharing ideas, opinions and thoughts.

It is intended to continue this study to understand how a transdisciplinary mindset can be instilled in the textile designer and how it can be pedagogically addressed in higher education for textile design to help the industry face new challenges and train students with skills in the fields of sustainability, circular economy and society for a textile economy of the future that weaves together the socio-environmental well-being of human beings and the planet.

**The Significance of a Transdisciplinary Mindset
in the 21st Century**

The term transdisciplinarity was formally introduced in 1970. The concept was mentioned by Jean Piaget, Erich Jantsch and André Lichnerowicz at the international workshop *L'Interdisciplinarité – Problèmes d'Enseignement et de Recherche dans les Universités*, organized by the Organisation for Economic Co-operation and Development (OECD) (Popescu, 2014). Transdisciplinarity refers to the transgression of boundaries between disciplines to integrate different forms of knowledge (Antunes & Almendra, 2020; Gibbons & Nowotny, 2001) and in 2013, the concept was extended to the field of design, revealing an opportunity to better understand and incorporate the practice and body of knowledge of design between and beyond its disciplines (Vieira, 2021).

According to the OECD report (2018), 21st-century skills such as creativity, critical thinking, the field of information and communication technologies, collaboration, communication and cross-cultural understanding should be included in current education (Chu et al., 2017; OECD, 2018). Considering the design activity as the search for solutions to complex problems, which are often considered undefined (Simon, 1973) where the space of the solution and the problem co-evolve (Dorst & Cross, 2001), that is, a cognitive activity (Jones, 1991; Simon, 1996), the search for different solutions that adapt to different contexts requires multiple and collaborative approaches of transdisciplinary thinking with a critical analysis that prepares for the required skills for the 21st century.

The design activity is not simply connected to the physical product, the user relationship with objects can also be influenced by design intervention. In a world where environmental, economic, social, and cultural concerns are critical to the survival of the planet, design can intervene in changing social behaviors by directing its practices not only toward appearance, but also toward the interaction of objects with the user and with society (Norman, 2011). In the early 1970s, these warnings began with the work of Victor Papanek (1972) in his book *Design for the Real World,* in which he reflected on the role of the designer in society (Papanek, 2006 [1972]). More discussions followed that showed the importance of thinking about design activity, considering social practices and socially responsible design in a relational approach with society. The designer should adopt a participatory approach in the design process and must not neglect the role of the user in the search for solutions, considering himself as a partner and also as a user in a nonlinear and transdisciplinary dynamic (Lawson, 2005 [1980]). Designers with different backgrounds observe the problem in different ways, with their basic education, upbringing, acquired and trained skills, responsibilities and interests (Bucciarelli, 2003), and they should act in close collaboration with their different valences in a common creative approach. Transdisciplinarity goes beyond disciplines, it is holistic work that seeks solutions to real-world issues. It is complementary to interdisciplinarity which combines the generation of knowledge with established disciplines, transdisciplinarity seeks to connect with the real world (Choi & Pak, 2008; Drake & Reid, 2020; Guimarães et al., 2019).

Future designers need to be educated for the real world, to also fulfill their social role beyond their professional role and to actively and critically participate in the dynamics of the world (Norman, 2011). The development of a transdisciplinary mindset should be encouraged to contribute to the solution of current complex problems, such as the pressing issues of survival of the planet and of the human being, taking into account current environmental, economic, social, ethical and cultural impacts in a future vision. Transdisciplinary thinking allows us to expect and respect differentiated perspectives, which enables constructive critique and analysis of complex real-world problems and complements the skills needed to meet 21st-century challenges. Connections between disciplines are actively sought, where knowledge is transformed, rethought, and recombined. They systematically create new knowledge, not just keep it, and share it to build new knowledge.

The Significance of a Transdisciplinary Approach in Higher Education

We are at a turning point where a new post-industrial context has emerged focused on services and less on production, creating new objects and new demands from users that confront design activity (Manzini, 2011). The role of the designer in finding solutions to complex problems such as sustainability and circular economy is not a simple process. The designer must consider environmental, economic, cultural and societal impacts in his decision-making process. He must work collaboratively and adopt a multi-, inter- and transdisciplinary mindset (Choi & Pak, 2008). New challenges are coming and design education must adapt to this new paradigm by continuously adapting to contribute to this changing context.

Higher education in design is still based on a traditional academic structure. It begins with contact with basic sciences, then with applied sciences and, finally, with applied teaching, which guides students to solve everyday problems using the knowledge acquired in the first two moments. The inclusion of practical teaching at the end of the academic structure leads to gaps in the skills acquired by designers, as they are not confronted with real-world problems until the end of their academic training (Schön, 1987). The design process is a bridge between the identification of a problem and the proposal of a possible solution, but it must take into account the context in which the problem is embedded. This includes the social and symbolic aspects that must coexist in a set of values, and not just in a single objective that deals with the context, in harmony with the environment and society, in which the human dimension must be included to contribute to the global balance between humanity and the natural world. The designer must always be aware that he in some way he is recreating the world when he gets involved in a design project (Findeli, 2001). He must consider and incorporate social and cultural values without compromising the ecosystem and the environment (Manzini, 2009).

The automation economy, resulting from technologies, is changing the way we live and work, the information transfer is no longer the sole purview of institutions of higher education (Gleason, 2018). These impacts will require a restructuring of the curricula (Dias et al., 2017) in higher education to enable students to understand

the technologies in detail and to analyze and anticipate the evolution of networked technology systems. More proactive response from the educational sector will be needed compared to what has been done in earlier industrial revolutions. Our universities should be prepared to develop more interactive forms of pedagogy and adopt a curriculum that emphasizes multiple cultural and disciplinary perspectives in different areas (Félix & da Silva, 2021).

Education in the 21st century, in turn, is in a process of transition and it is essential to incorporate pedagogical practices that address different areas of knowledge, integrate transversal themes and present transdisciplinarity as a possible path that can connect the different areas of knowledge. These should be incorporated into design teaching and practice and serve as facilitators of the creative process to solve complex problems. According to Bernard Choi and Anita Pak (2008), a multidisciplinary approach refers to multiple disciplines working side by side with little or no interaction (basic involvement); interdisciplinary refers to two (sometimes more) disciplines interacting at a level where disciplinary boundaries are crossed and new knowledge is generated in the form of new perspectives, methods or disciplines; and transdisciplinary involves deeper involvement where members from the different disciplines sometimes expand or exchange roles and seek for the dynamics of a whole system (holistic approach) (Choi & Pak, 2008). Teaching that incorporates an understanding of life, the planet, the human being, culture, their relationships and interrelations (Nicolescu, 2006) proves to be important, and design is a humanistic activity, it designs for the human being.

> Transdisciplinary approach can provide a systematic, comprehensive theoretical framework for the definition and analysis of the social, economic, political, environmental, and institutional factors influencing human health and well-being.
>
> (Rosenfield, 1992, p.1343)

In this new paradigm, in the urgent search for solutions to complex real-world problems such as sustainability and the circular economy, transdisciplinarity may be an appropriate strategy. Problems of this nature cannot be solved with the knowledge of only one field but require knowledge from multiple disciplines and a sharing and interpretation of concepts (Gibbons et al., 1994). A transdisciplinary approach complements the disciplinary approach, it provides new data that are articulated and offer a new vision of reality, a cross-section of knowledge that does not try to dominate but to open new paths. It involves knowledge from at least two disciplines, none of them being predominant (Choi & Pak, 2008; Stein, 2007) and the disciplines work together by focusing on finding solutions to a given context, thus representing the generation of new knowledge, the disciplines no longer work in isolation but, on the contrary, they collaborate and share ideas, opinions and thoughts. The transdisciplinary mindset and attitude aim to understand the complexity of the universe, the relationships between subjects, subjects with themselves and with the objects that surround them and to recover the sense of the human being's relationship with the world. To do this, it is necessary to emphasize

the generation of knowledge from the scientific field with other branches of knowledge such as philosophy, human sciences, art, literature, traditions and experiences that, in this context, the knowledge generated is characterized by complexity, non-linearity and transdisciplinarity, these characteristics being competencies that are inert to the profession of design.

The education of the human being in his relation to others, to the world, to himself and to formal and non-formal knowledge, should be promoted and articulated while maintaining knowledge as an open system. But to reform a thought, first, the educational institutions must be reformed, which is a paradoxical problem (Morin, 2000).

Data Collection and Analysis

The literature review allowed us to understand the new challenges facing the textile industry and how academia can intervene in the preparation of textile designers in the search for solutions to complex problems such as sustainability and circular economy. Data collection began by analyzing undergraduate offers in textile and fashion design in Portugal, particularly the project and/or studio curricular unit, to understand whether they integrate strategies of transdisciplinary thinking. In parallel, surveys were conducted among students to understand the level of satisfaction with the disciplines included in the curricula and to obtain suggestions for improvement. These surveys did not focus on the issue of transdisciplinary, but rather on looking for gaps identified by students in their academic path and, thus, understand whether the adoption of transdisciplinary pedagogical practices that address different areas of knowledge can help overcome the difficulties identified.

Analysis of the Curricular Unit Project and/or Studio in Undergraduate Courses of Textile and Fashion Design in Portugal

Higher education in textile and fashion design is recent in Portugal and there are currently six proposals for undergraduate degree level, four of which are public and two are private. This research refers to the universe of fashion design, since only one educational institution specifically offers textile design (Table 10.1). The analysis focused on the curricular units of practical learning, project and/or studio, where their objectives, teaching methods, program and learning outcomes were analyzed. We found that all institutions include practical learning curricular units in their curricula, using different strategies for the development of the creative process that promote autonomy, experimentation, teamwork and interdisciplinarity. However, transdisciplinary thinking is not addressed in any institution, which does not mean that it is not addressed, but is an optional view of the professors who teach these curricular units (DGES, 2021; ESART, 2020; ESAD, 2020; FAUL, 2020; UBI, 2021; UMINHO, 2020; ULHT, 2021).

It was noted that none of the offers focused on textile design, which led us to reflect on the importance of establishing an undergraduate course in textile design in Portugal that would allow the preparation of professionals in the field in

Table 10.1 Undergraduate courses in textile and fashion design in Portugal.

Institution	Undergraduate course	Year of implementation	Project and/or studio unit
Lisbon School of Architecture, Universidade de Lisboa	Fashion Design	1992	Fashion Design
Higher School of Applied Arts, the Polytechnic Institute, Castelo Branco	Fashion and Textile Design	1999	Textile Design Fashion Design Fashion Design Studio
University of Beira Interior	Fashion Design	2000	Laboratories
School of Art and Design	Design with a specialization in Fashion	2004	Project
University of Minho	Fashion Design and Marketing	2005	Interdisciplinary Project in Design
School of Communication, Architecture, Arts and Information Technologies, University Lusófona	Fashion Design and Production	2021	Fashion Design Production Design

Source: (Seixas, 2021).

collaboration with the other stakeholders associated with the productive and creative process, including fashion designers, for the development of textile objects that address the challenges of sustainability, circular economy and society. It is a necessary to update the curricula in undergraduate textile and fashion design programs in Portugal to integrate transdisciplinary thinking in the training of these professionals to address the new challenges faced by the industry, finding solutions to complex problems that are an emerging concern of the 21st century and to which the textile and clothing industry has contributed as one of the most polluting industries (Boström & Micheletti, 2016; UNECE, 2018).

Analysis of the Results of the Questionnaire Surveys Conducted among the Students of Undergraduate Courses in Textile and Fashion Design in Portugal

The online questionnaire survey, conducted between October and December 2020, received 104 responses. It can be concluded that students are less satisfied with the knowledge they have acquired in the more theoretical disciplines such as philosophy, history and sociology, as well as marketing and management as they filed that they are not acquiring enough knowledge for their professional careers (Figure 10.1). Regarding the acquisition of improvement contributions, which was conducted in an open question, the responses refer to the need to deepen knowledge in the fields of manual and digital pattern making/styling/photography/communication design/marketing/management/entrepreneurship/ergonomics. In light of this data, a structural problem was identified. Students feel gaps in their academic preparation and

DISCIPLINES

	totally unsatisfied	very unsatisfied	unsatisfied	neither satisfied nor unsatisfied	satisfied	very satisfied	totally satisfied
DESIGN	3,85%	0,96% / 11,54%	18,27%	22,12%	25,00%	18,27%	
TEXTILE MATERIAL AND PROCESSES	6,73%	7,69%	10,58%	16,35%	19,23%	24,04%	15,38%
MARKETING AND MANAGEMENT	19,23%	11,54%	7,69%	25,96%	16,35%	14,42%	4,81%
NEW TECHNOLOGIES	13,46%	9,62%	11,54%	22,12%	22,12%	14,42%	6,73%
PHILOSOPHY	32,69%	8,65%	12,50%	24,04%	15,38%	3,85% / 2,88%	
HISTORY	6,73% 5,77%	13,46%	23,08%	17,31%	24,04%	9,62%	
SOCIOLOGY	19,23%	10,58%	12,50%	26,92%	16,35%	5,77%	8,65%

Figure 10.1 Degree of satisfaction with the disciplines of textile and fashion and design students.

Source: By the author Seixas in 2021.

refer to the need to deepen knowledge in technical areas and the design universe as a business field.

We believe that incorporating a transdisciplinary approach in higher education in textile design, with projects worked on in teams with different backgrounds such as fashion design, textile design, product design, materials engineering, marketing, among others, would help to solve the identified problem so that students feel better prepared for the professional world and can respond to the challenges of the sector. In addition, collaborating with industry to find solutions to real problems is another strategy that will enable students to respond to industry challenges, in a close relationship between industry and academia.

Conclusion and Further Research

The purpose of this chapter was to investigate and reflect on the importance of a transdisciplinary approach to textile products development. From the triangulation of the literature review, the analysis of the undergraduate curricula in textile and fashion design in Portugal and the questionnaire surveys conducted with the students, it was found that the design activity is changing and assuming new social, environmental, cultural and ethical responsibilities, designing objects in search of a global balance between humanity and the natural world.

The textile industry faces major challenges in restructuring its production processes to minimize energy and water consumption and to look for solutions for use and reintegration into the production cycle to minimize potential waste. The reduction of textile waste is also a concern, looking for synergies with complementary industries for the use of waste in products from other sectors such as paper or cardboard. Last but not least, it is important to work on the recovery of textiles via the disassembly of components with materials that are complex to separate to reintroduce them to the cycle. Here, it is important to think about the creative process in introducing more sustainable fibers that are easy to separate after their life cycle, to think about the product before and after its use throughout the life cycle

and to minimize disposal and landfill. Textile designers play a key role in the creative process and need to look for more sustainable solutions, from the selection of the fiber and its respective processing to the use of the product until its end of life, considering its disassembly or a second life.

For their part, academia needs to teach these skills to textile design students. A systemic shift at the technical level and in the way of thinking is critical in developing a transdisciplinary mindset where knowledge is transformed, rethought and recombined, and new knowledge is built in close collaboration and feedback loops with industry. Collaborative projects are key to finding solutions to real problems with other areas of knowledge inside and outside of academia, so that textile design students are prepared to weave their entry into the professional world. The construction of a new strategic positioning that incorporates circular economy concerns into the creative process and promotes a new mentality and attitude throughout the value chain, and the role of the textile designer, is important to this change. He must work in multi-, inter- and transdisciplinary teams throughout the production chain to find circular solutions to these complex problems.

We believe that the study may also contribute to understanding the gap between industry and academia in the textile sector, which leads us to the question: how can there be proximity between these two actors when there is no specific higher education for textile design in Portugal? It can even be argued that there is textile engineering and fashion design, but is not that the same as saying that there is civil engineering and architecture when what I want is interior design? This study has also shown us that higher education in textile design needs to find ways to respond to the challenges of the textile industry. Transdisciplinary approaches combined with multi- and interdisciplinary strategies are one way to meet the needs of the manufacturing industry, and in particular the textile industry, by seeking solutions in collaboration between design and the various adjacent fields of knowledge, sharing ideas, opinions and thoughts to connect to the real world. A textile design curriculum designed from scratch in view of the fact that there is no planet B, that is based on a transdisciplinary collaboration with existing training offers and industry and offers a new lease of life to academia and the textile sector, and probably to future designers is the goal.

As a future study, we intend to continue this analysis to understand how to foster a transdisciplinary mindset in textile designers and how to approach it pedagogically in higher education for textile design. We want to help the industry face emerging challenges by training students with skills in the fields of sustainability, circular economy and society, with a vision and systemic thinking to become active members of a circular economy embedded in a textile economy of the future that weaves the socio-environmental well-being of the human being and the planet.

Acknowledgments

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11 Urban Design Project-Based Teaching

The UQAM Praxis III Lab Approach

François Racine

Université du Québec à Montréal (UQAM),
Montréal, Québec, Canada

Introduction

The urban planning program at Université du Québec à Montréal (UQAM) was founded in 1976. In 1993, the program was reformed and a series of modifications were implemented, leading to the development of the "Praxis" laboratory approach as we know it today. Learning in urban planning is organized on the basis of a gradual introduction of the complexity of the city, its social, economic, and urban fabric. The Praxis laboratories are a place where the shift is made from urban planning theory to practice through the adoption of a global approach to analysis and intervention on the built environment. As part of a reflection initiated by other researchers (Devillers, 1994, Tsiomis, 2008) on the practice of project-based teaching, we would like to re-examine this educational strategy and its place in the undergraduate urban planning program offered by the Department of Urban Studies and Tourism at UQAM.

The Praxis studio courses start in the first year of study with the development of the skills required to analyse and understand the complexity of urban phenomena. The physical and spatial characteristics of the city and the forces impacting the development of this complex organism are studied during the Praxis I studio. The Praxis II courses, during the second year of the program, focus on the regulatory and planning tools that the up-and-coming urban planners will use to intervene on urban form. Students learn how to use the legal and operational tools of urban planning in Québec. The series of three workshops that make up Praxis III, to be taken in the third year of study, are aimed at developing an urban design approach among students through the hands-on transformation of a specific built environment. In this context, urban design is defined as the design and implementation of physical and spatial arrangements to manage the growth of the city through permanence and change (Choay and Merlin, 2015).

It is important to mention that the development of the Praxis studio program and courses is based on a definition of urban planning that is more than a meeting ground for the humanities and social sciences. In the Praxis program, urban planning is a discipline in its own right with methods of its own (Hillier, 1987), offering a practice-oriented research field (Nijhuis, Stolk, and Hoekstra, 2016). This vision corresponds to the dictionary definition of urban planning and development where urban planning is defined as the science, art, and technique of spatial organization of human settlements (Choay and Merlin, 2015). In the following sections, we will

look at the content of the Praxis I, II, and III studio courses in more detail before focusing on how project-based teaching is approached in urban planning. It should be noted that each lab course is supported by theory and instrumentation courses that are taken as prerequisites or concurrently with the Praxis studio courses.

Praxis I

Research methods on the social and economic, and physical and spatial dimensions of the city are taught in the four Praxis I studio courses. The sequence begins with learning investigative methods associated with the characteristics of urban populations, aiming to introduce students to the various quantitative (statistics) and qualitative (field observation) analysis tools. It aims to make the students aware of the socio-economic characteristics of a given urban neighbourhood and to identify the challenges that arise therefrom. The topics studied next are urban morphology and the built environment. The second studio course on the methods of environmental and morphological analysis of the urban environment provides tools and techniques for the inventory and analysis of environmental and physical characteristics at the scale of a specific urban neighbourhood. This involves, in particular, the interpretation of cartographic documents and aerial photographs representing the urban fabric and land-use patterns. The third studio course allow the students to develop analysis criteria for the definition of architectural typologies and 3D representation of buildings and structures that make up the built environment. Finally in the last studio, students are asked to produce an urban analysis portfolio covering the social and economic, environmental and morphological aspects of their studied neighbourhood throughout the first year of the program. Emphasis is placed on the ability to diagnose issues through observation and create cartographical documents. They also learn how to articulate urban issues and to identify related intervention objectives.

Praxis II

The five Praxis II studio courses continue the development of skills for analysis and representation of the city and the territory that go hand-in-hand with acquiring urban planning legal and operational tools from the regional to the municipal level. One studio course focuses specifically on the various stages of regional planning and development. Students are introduced to the process of developing planning tools by critically evaluating the strategies used in existing regional development plans. The second delves into the various stages of municipal planning and development. In this studio, students are asked to evaluate the intervention strategies of an existing municipality with a view to developing an alternative urban plan accompanied by a regulatory framework review strategy.

Praxis III

Learning rounds off in the third year with a sequence of three Praxis III studio courses where students are invited to develop their approach to design through the creation of an urban design project. This project-based educational strategy stretches over an

entire academic year, and it is organized in three phases. The first step is to create a working plan, a timeline, and a service offer identifying the main tasks, resources, and stages for the project. This phase is devoted to performing the analyses, profile definition, and inventories required to set the background and the problem, the challenges, and objectives statement for the development project. What the students learned in the first year in the context of presenting an urban analysis portfolio is applied here during the analytical phase of a sector of intervention chosen by a team of students. The second studio course aims to establish the necessary base for the elaboration of two concepts leading to the schematic and graphic representation of two distinct development scenarios. The teams thereby begin a process involving an evaluation of these two scenarios according to their appropriateness to the objectives and criteria established, which results in the development of the final scenario. This is where the notion of "project" emerges for the first time as an intent to organize the territory, using normative and regulatory, but also prospective and urban design tools. In the third phase, student teams must demonstrate the economic, environmental, and social feasibility of their development project and build an implementation strategy for their final scenario. The operational concepts learned in the second year of the program are applied here in a project of their own.

The Praxis approach presented here differs from architecture programs where design skills are usually launched at the outset of training. In the context of the Praxis studios, urban design abilities are developed intensively in the third year, i.e., at the end of the program. The pedagogical approach developed at UQAM makes learning urban design the completion point of a process that begins with learning analytical skills. This implies a gradual transition from an analytical approach to an urban design and creative approach. This duality between the analytical dimension and that related to the development of an art of spatial organization marked the emergence of the practice of urban composition (Sitte, 1889) and that of urban planning (Cerda, 1867). This duality is still present in the contemporary teaching of urban planning. It still oscillates between the analytical focus required to understand complex urban phenomena and the implementation of an approach to urban design and composition that makes it possible to shape the city as a spatial and material entity (Devillers, 1994). Urban planning is a practical academic field that also involves research through design, a dimension that we tend to forget. Hence the importance of acquiring analytical skills to understand and develop specific knowledge and, above all, to learn how to best shape urban form and space. Therefore, the basic element to be acquired in urban planning studio courses is a research and intervention methodology in the service of an informed practice that is aware of its impacts on urban form (Nijhuis, Stolk, and Hoekstra, 2016).

This poses the problem of shifting from urban analysis to the definition of the urban design project. Multidimensional and multiscale analyses should lead to a diagnosis and the formulation of a problem that should provide the benchmarks and objectives for the development of an urban design project. The question then arises of the necessary transition from analysis to design in the teaching of urban design practice at UQAM. From this perspective, it is of interest to describe the context of project-based learning of urban design in the three Praxis III studio courses, the proposed design approach, and the expected results of projects at the urban fabric scale.

To answer these questions, we will use the criteria formulated by Strickland in a special edition of the journal *Urban Design and Planning* dedicated to university training in urban design (Strickland, 2017). Although the nature of these recommendations is international in scope and characteristic of the perspective of the English-speaking world, they are aimed at improving urban design teaching and learning in university urban planning curricula. Strickland puts forward ten recommendations based on the contemporary reality of urban design practice. These relate specifically to the learning context of the project, the proposed conceptual approaches, and the expected outcomes of the design process on an urban scale.

Project Context

Stickland goes back to the foundations of the concept of urban design (Krieger and Saunders, 2009) to revisit and discuss the importance of encouraging multidisciplinary project development (architecture, urban planning, landscape, engineering, etc.). Moreover, in the context of globalization and the circulation of urban models, urban planning programs should, in his view, prepare students for the context of practice with an international perspective. According to Strickland, it is also fundamental for students to acquire the ability to work in teams and apply the various degrees of structuring of the built environment when developing a project. Skills can also be developed in the context of project development through role-playing, which allows students to get a glimpse of the perspective and the varied interests of the stakeholders involved and the population concerned in the implementation of an urban design project.

Project Approach

This author also argues that in the transition from analysis to project design, it is important to build research analysis skills and cultural and historical awareness that will enable students to create meaningful projects rooted in the reality of the intervention context. He also questions the linear aspect of the traditional project approach, moving from analysis to the formulation of a design and a development plan, to communication and implementation of this plan. Retrospection and questioning along the way should be encouraged to reflect the reality and usual course and outcomes of urban design projects in actual practice. He mentions that educational strategies should help students develop their own personal approach to urban design.

Project Outcomes

Strickland mentions the need to develop a broadly comprehensible language in the communication of the urban design project to engage the general public and a vast array of stakeholders. He proposes to make the statement of urban design guidelines and principles the main impact of the urban design project instead of focusing strictly on the proposed spatial configuration, which is often frozen in time. Since the urban design project concerns collective space and must fuel public debate, it should, in his opinion, encourage the presentation of projects outside of academic walls to those concerned.

Here are the ten criteria used in this research approach to analyse and evaluate the educational relevance of the three Praxis III studio courses.

Context of the project:

1 Multidisciplinary project development.
2 Preparing students for an international practice of urban design.
3 Favour teamwork and working on multiple scales.
4 Role-playing to make students aware of the variety of stakeholders involved.

Project approach:

5 Developing research skills and cultural and historical consciousness.
6 Questioning the linear approach to the project by integrating retrospection.
7 Developing each student's own approach to urban design.

Project outcome:

8 Using easily understandable language.
9 Statement of urban design guidelines and principles as project impacts.
10 Presenting projects concerning the collective space outside institutional walls.

The following section evaluates project-based teaching in the Praxis III studio process in terms of its context, development, and results. For this research, we use educational material (course outlines, plans/research design, etc.), and a review of the projects carried out during the 2015–2016, 2016–2017, 2017–2018, 2018–2019, 2019–2020, 2021–2022, and 2023–2024 academic years to study the context in which the projects were developed, the educational approach used, and the results of the projects. A summary table (Table 11.1) identifies, according to a rating scale, the dimensions covered in the teaching of the project to determine the specific knowledge acquired by the students of the Praxis III program. This is in terms of know-how and interpersonal skills in the context of working on the development of an urban design project over an entire academic year.

Table 11.1 Evaluation of the Praxis III approach according to Strickland's criteria.

Criteria	Fully covered (1pt)	Partially (0.5 pts)	Not covered (0 pts)	
1. Multidisciplinary project development		0.5		
2. International perspective		0.5		
3. Teams/scales	1			
4. Role-play	1			
5. Research/culture/ critique	1			
6. Questioning linearity		0.5		
7. Personal approach		0.5		
8. Easily understandable language	1			
9. Guidelines/principles	1			
10. Dissemination outside academic walls	1			
TOTAL	**6**	**2**	**0**	**8/10**

Context of the Project

Multidisciplinary Project Development

The Bachelor of Urban Planning program is an undergraduate program recognized by the Ordre des urbanistes du Québec (OUQ) and the Canadian Institute of Planners (CIP). Most of the students who enrols in this program have a CEGEP-level education (college of general and vocational education), which, in Québec, is a two-year general pre-university program; hence, their background could be in any field of the humanities and social sciences. Some students have attended a technical education program in architecture, engineering, or land-use planning. The program also welcomes a few candidates who have begun university studies in other programs and choose to branch out into the field of urban planning. As a result, students have similar backgrounds and preparation for undertaking urban planning studies, and when it comes to project development, there is not, strictly speaking, groups of students from a variety of planning disciplines. However, the program does cover disciplines such as architecture, geography, sociology, economics, and ecology.

Preparing Students for an International Approach to Urban Design

The Bachelor of Urban Planning program offers two concentrations, one international and one regular, that students can choose from in the second year of study. The international concentration involves a choice of courses that address urbanization models around the world and how they influence the practice of urban planning. Students having chosen this concentration are offered a one-term exchange where they are introduced to the perspective of urban planning practice in France, Belgium, the United States, or Central America. In the context of the studio project, there are usually 36 students following the regular track and 36 students following the international track. This ensures that half of the cohort acquires an international perspective on the practice of urban design. It should be noted, however, that teaching methods being common to both groups, the teams from both concentrations are brought together at key phases of the project for the purpose of feedback and jury empanelment. The students in the regular concentration thus get an opportunity to become familiar with European, American, or Central American planning issues. Conversely, students working in an international environment are also aware of regional and local planning issues, particularly in the cities of Montréal and Québec, as well as in other Canadian provinces (Maritime provinces, Ontario, British-Columbia, etc.).

Working in Teams and on Multiple Scales

With 36 students following the regular track and 36 students taking the international concentration, the Praxis III studio work is usually done in teams of five to six students and there are usually six teams per group. Close supervision is provided by the teachers during weekly individual team meetings, generally lasting about 30 minutes. For this purpose, each team of students sit around worktables equipped with a screen to display their deliverables and facilitate discussion

between team members, the teacher and the teaching assistant. Although not in a closed-off space, this organization replicates the typical meeting room of a municipal urban planning department or a private firm.

The key element ensuring the cohesion of the work team is the definition of a service offer, i.e., the definition of the mandate which is developed as a team and presented to the whole group. This service offer includes the presentation of the firm, its mission, its vision, and its interest in the development project. The team members' résumés are appended to the service offer. To organize and work effectively, each team must develop a chart illustrating the various tasks to be accomplished throughout the academic year. They are included in the schedule of assignments and presentations that students must complete for the three courses that make up Praxis III (Figure 11.1). Team members must also assign the tasks and distribute the resources that they intend to include in their "mandate." The process begins with a clear definition of the work to be done, the steps to be completed, and the deliverables for the three phases of their development project. This is necessary to optimize collaboration between team members and to develop in each member a sense of responsibility for the complex task of developing an urban design project as a team.

With regard to the multiscale design work involved in developing an urban project, the two-fold task of analysis and design must be done on three different scales: the neighbourhood scale (zone of influence, 500 m to 1 km of intervention zone); the scale of the contextual zone (impact zone, 100 m to 250 m of intervention zone); and the scale of the intervention site chosen by the team members and validated by the team of teachers (project zone, 5 to 10 ha or 6 to 8 urban blocks). The cartographic base of the plans elaborated for the urban analysis and design development correspond to these three scales. In addition, the question of interlocking and the effects of each scale on the others must inform an understanding of the intervention site and its role in urban dynamics at higher levels.

Role-Playing to Teach Students the Variety of Stakeholders Involved

At key points in the Praxis III studio process, when submitting and presenting deliverables (D) number 1 (D1) of the Project Analysis and Programming course, D2 of the Urban Design and Design Composition course, and D2 of the Project Development and Implementation course, members in each team take turns to form a six-person jury (Figure 11.1). During the presentations of their site analysis, designs, final scenario, and implementation strategy, they act as representatives of the stakeholders in the municipality concerned. A specific evaluation grid guides them in their evaluation and commentary on the work presented. Role-playing leads students to focus on the way each team interprets the specification requirements for each deliverable in their work (Figure 11.2). Moreover, in the context of role-play they can adopt the perspective of various municipality stakeholders, i.e., members of the planning committee, groups involved in their project, and citizens. In addition, it provides a context for emulation because students of both teams draw inspiration from the innovative and attractive ideas shared by others and use them in their own work.
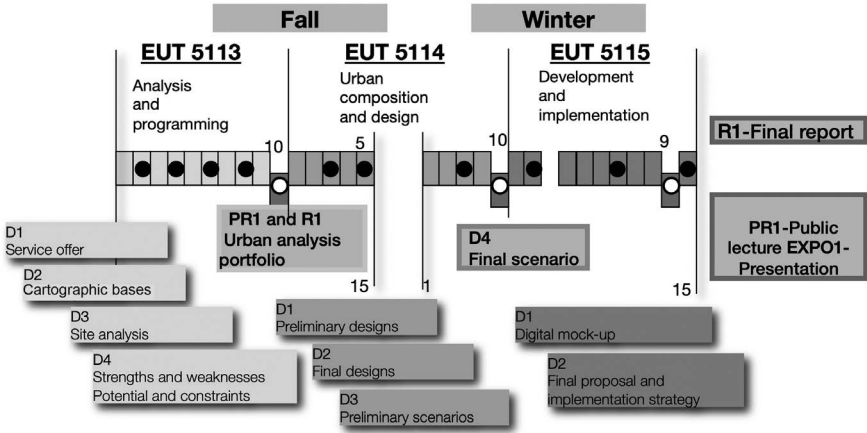
Figure 11.1 As part of the Praxis III studios, courses EUT 5113, EUT 5114, and EUT 5115 cut across the three stages of the urban design project (analysis, design, and implementation).

Figure 11.2 Example of presentations in a role-play context.

Project Approach

Developing Research Skills and Cultural and Historical Consciousness

As already mentioned, in the urban planning program at UQAM, research skills development begins with Praxis I. The objective is to teach students methods of analysis and research to be applied both at the level of the socio-economic dimension of the city (quantitative and statistical tools) and at the level of its physical-spatial dimension (qualitative and morphological tools, field studies). These concepts and tools are applied during Praxis III, mainly at the project analysis and programming stage (Figure 11.1). The formulation of a diagnosis on an intervention site chosen by a team will be the opportunity to define the development potentials and constraints (physical-spatial dimension) and the strengths and weaknesses of development (socio-economic dimension, local stakeholders, and dynamics).

The development of cultural and historical knowledge is fostered through the required readings and lab course discussions on the evolution of urban design practices, as well as during exchange abroad, but mostly through the Urban Planning Theory course as regards cultural awareness. The History of Urban Planning course is also intended to awaken the historical awareness of future urban planners. For the purpose of this course, the teams are asked to situate their design approach among the main schools of thought in urban planning (neoclassical urban composition, modernism, postmodernism, contemporary approach, sustainable development, etc.). The diachronic morphological analysis of their sector is also an opportunity to incorporate the urban know-how and the building culture specific to the place of intervention. Finally, readings of select literature spark class discussion on major debates currently shaking the practice of urban planning and design in Québec and Europe.

Questioning the Linear Approach to the Project by Integrating Retrospection

The Praxis III studio is the point in the program where the shift is made from urban planning theory to practice, through the definition of an urban design and intervention approach to the built environment. The projects engage the teams in an approach to design and implementation of physical arrangements enabling them to control the formal organization of urban transformation in the urban sector they have chosen, and this, through permanence and change (Choay and Merlin, 2015). Despite the linear process organized by three studio courses organized according to a three-stage urban design approach, the elements produced at each stage are connected to previous work. In addition, each modification and question arising along the way allows teams to make the required clarifications and adjustments. This is to ensure the overall rigour of their urban design process over the course of an academic year. In this way, students engaged in the pedagogical process are constantly led to question the linear approach of the project by integrating retrospection. They are also called upon to anticipate the effects of their development concepts according to the stages to come, particularly during the phase of establishing the tools for project implementation.

The design process begins with the development in freehand drawings (sketch paper, overlays) of a plan of potential and constraints of the site of intervention aimed at spatializing the elements identified from the urban analysis (see plans of potential and constraints, Figures 11.3–11.5). A series of drawings superimposed on the plan of potentials and constraints allows the considering of these physical elements in the elaboration of distinct responses translated in the form of two development concepts (see the plans of the two design concepts, Figures 11.3–11.5). These two concepts or spatial structures must embody two different possible responses to the problem

New public square with an existing village house

Development of spatial structure

Detailed development scénario

Potentials/constraints   Two design concepts
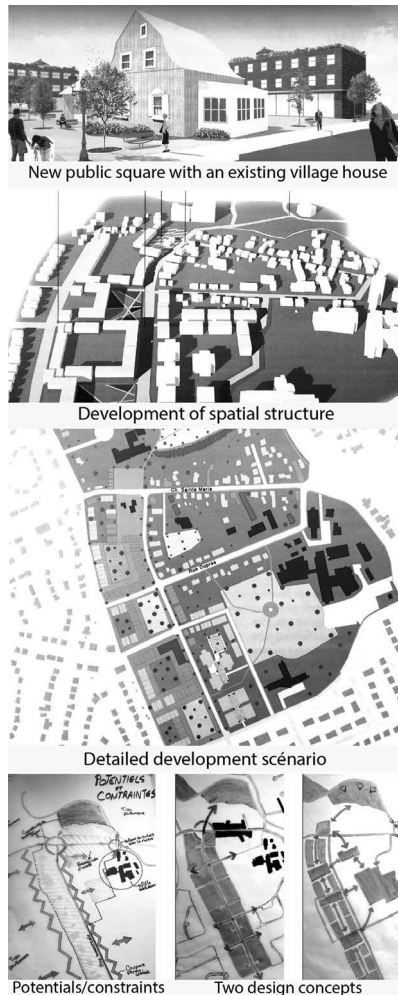
Figure 11.3 The approach to the project located in Mascouche in the Montréal region. Design team: Sophia Racine, Camille Pelletier, Francis Lévesque, Yuri Camiré, Natasha Dassylva, Ratana Sarry, and Stewart Martins-Sabourin (Praxis III, 2018–2019).
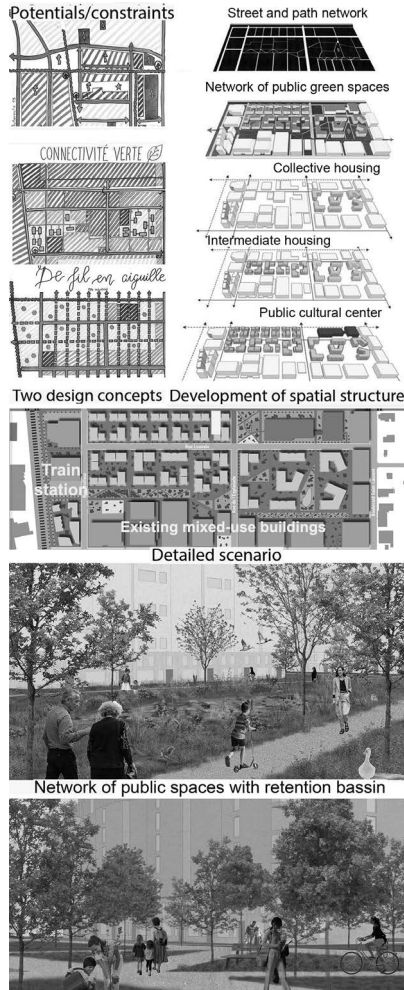
Figure 11.4 The approach to the project located in a borough of Montréal. Design team: Yomi Theo Paquet, Laurent Deschenes, Jean-Pierre Florian, Mélanie Martial, Gabriella Vaccaro, and Thomas Dupont (Praxis III, 2023–2024).

raised or highlighted during the urban analysis stage. If a new element concerning the development problem emerges during the development of the concept, the teams must provide feedback to revise their plan of potentials and constraints and their urban analysis. Thus, the elaboration of drawings allows students revisit in a sensitive way the site of intervention to apprehend the scale and the characteristics of the bordering context.

Subsequently, development work, still carried out by freehand drawing, engages the teams in the transition from the two concepts to the development of two corresponding scenarios specifying the organization of the road network, parcel
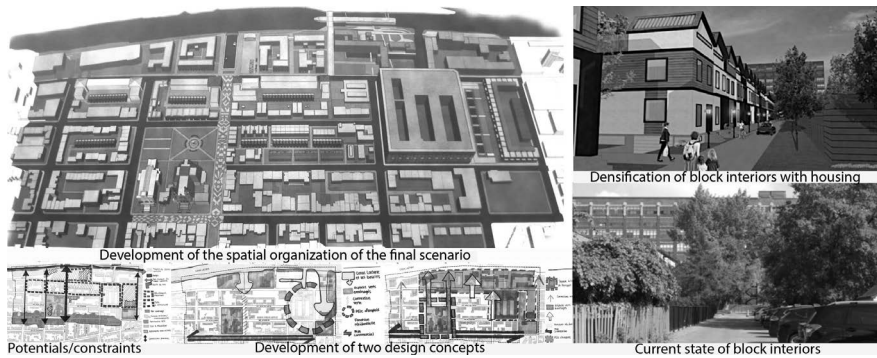
Figure 11.5 The approach to the project located in the Pointe-Saint-Charles neighbour-
hood in Montréal. Team: Virginie Turgeon, Arthur Fortier-Mercier, Jordan
Larabie, Frédérique Hogg, Marie-Ève Gervais, and Olivier Lambert (Praxis III,
2017–2018).

divisions, the built environment, and public spaces without forgetting the distribu-
tion of uses. The evaluation of the two scenarios in relation to the development
objectives set and responding to the problem is the moment for each team to un-
derstand the essence of their intervention and to make the necessary summaries.
This step leads to the design of the final and detailed development scenario (see
development of spatial structure, Figures 11.3–11.5). This process is important to
become aware of the repercussions of their actions on the existing urban fabric.

   This is followed by the stage of materialization, fixing of the detailed development
scenario (see detailed scenario, Figures 11.3–11.5). This results in the development of
a planned fabric anchored to the existing urban structure, with the precise indication
of the interventions on the site (topography, hydrography, vegetation cover), the road
network (hierarchy, public right-of-way), the division blocks and plots, the definition
of built typologies, and the configuration of public spaces. The final scenario plan is
the key element from which it is possible to develop the urban design project in three
dimensions using numerous tools (SketchUp software or real models), illustrating
and validating the degree of response of the spatial organization to the planning issue
raised by urban analysis. Ambient views taken from selected viewpoints serve to spa-
tially manifest the essence of the selected development concept or the broader urban
planning party that should guide the proposed transformation. Finally, by comparing
the proposed organization with the framework of the intervention site, the teams can
go back (retrospection) to the development objectives and programming elements set
out in their urban analysis file and thus complete their urban design approach.

Developing Each Student's Own Approach to Design

The studio course approach is modelled on the standard steps of an urban design pro-
ject process: context analysis (urban analysis), creation of the urban structure (design
plan), and detailed planning (3D, cross-section), and implementation strategy (phasing,
costs/benefits, regulatory framework) (Llewelyn-Davies, 2007). It should be noted that

the design approach involves studying pedestrian and cyclist movements that are specific to each development design defined by the teams. This is an opportunity to verify the "walkability" and serviceability qualities of their proposal (walking, biking, public transit) and to integrate the fundamental notions of sustainable development and active mobility, as soon as the two concepts to be developed by the teams have been defined.

As such, the Praxis III studio does not allow for the acquisition of a design approach specific to each student but rather to each team. This approach is therefore developed in a collegial manner with the support of the teacher and his or her teaching assistant. Although the teachers insist that each group of students complete all three steps, it is up to each team to tweak the approach according to the specific development problems of the site and the city it has selected. It is important to remember that the teams' mandate is developed together with local stakeholders, which also ensures that the design approach is adapted to the type of environment (wasteland to be re-urbanized, existing urban environment to be consolidated, etc.) and according to the dynamics and degree of involvement of local urban planning stakeholders in their project.

Project Outcome

Using Easily Understandable Language

Whether during the urban analysis phase (Project Analysis and Programming), the design phase (Urban Design and Composition), or the implementation phase (Project Development and Implementation), the documents submitted are in large format (A4) and the layout favours an equal division between text and graphics, composed of diagrams, plans, photos (etc.), enabling an easy and synthetic understanding of the content of the deliverables. The transition from urban analysis to composition and urban design is another important element, requiring students to work solely in freehand drawing by superimposing layers on the background plans to map out the potentials and constraints of their site and to define their two preliminary design concepts. This helps to develop their ability to draw with a view to conveying their design intentions because drawing must become a communication tool in the context of their professional practice. Finally, the development of digital models using the SketchUp software, among others, also allows them to validate and share their strategy for the development of the public and built spaces of their project. The development of ambient views also enables them to illustrate the key elements and spaces of their project and the sequence of certain pathways, streets, and public spaces.

Statement of Urban Design Guidelines and Principles as Project Impacts

The transition from the Project Analysis and Programming course to the Urban Design and Composition course involves defining four to five major development issues that emerge from the urban analysis of the intervention site. These issues will serve as a basis for the formulation of a planning problem and objectives that respond specifically to these issues. The search for architectural and urban precedents or relevant archetypes will allow each team to put together a bank of physical and

spatial responses that can illustrate their development objectives. This documentation of urban know-how should enable them to undertake the formulation of two detailed designs and scenarios, and it is through the comparison and evaluation of their organization that the final development plan is defined. The three-dimensional development of the project, using SketchUp software, and the definition of ambient views are at the basis of the statement of principles and planning guidelines that steer the transformation of their sector of intervention, and which are the real spin-offs of the project.

Presenting Projects Concerning the Collective Space Outside Institutional Walls

At the end of each academic year, after eight months of intensive work, each team is called to contribute to the organization of the R-urbane exhibition by setting up a booth and making a public presentation of their "project design" approach. This event is an opportunity to showcase the work of the students outside the walls of the Urban Studies and Tourism Department (Figure 11.6). Speakers from each city and members of the jury from the professional community are invited to attend the presentations and booths prepared by the usual 12 teams that have completed the final stage of the urban planning curriculum. The student association also organizes a graduation cocktail party on the exhibition grounds. This is a special moment where students take full measure of the quality of their work and mark their transition from the academic sphere to the professional world.
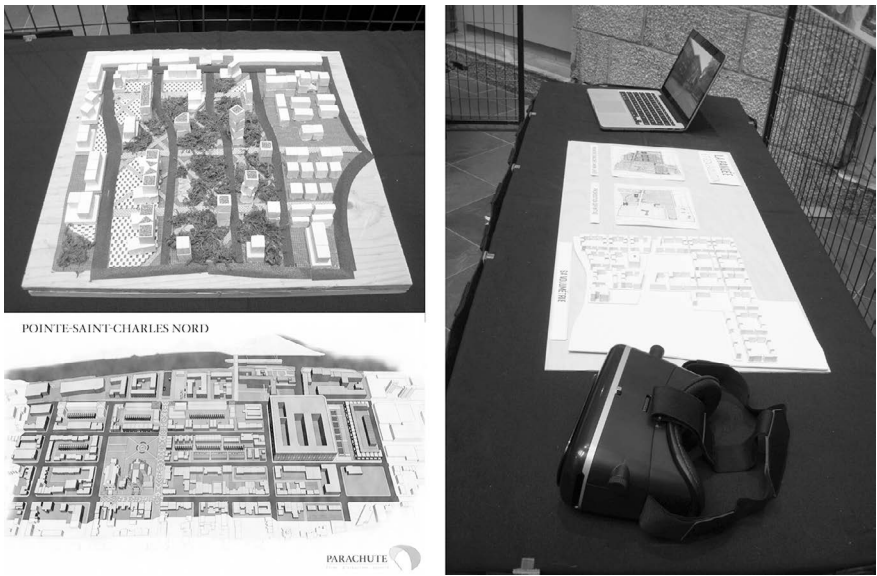
Figure 11.6 Example of the R-urbaine exhibition.

Conclusion

This research paper focused specifically on project-based teaching through the example of an original Québec practice, i.e., UQAM's Praxis program. It is based on precise criteria covering three dimensions that are inherent to an educational approach to city-wide design: the context in which the project is taught, the proposed approach, and the expected outcomes of urban design projects.

We have addressed the specific context of urban planning education in the province of Québec (Canada) and demonstrated the difficulties of establishing multi-disciplinary teaching (architecture, landscape, engineering, etc.) in undergraduate training. With the creation of an international program that is specific to urban planning training at UQAM, students can become familiar with Canadian (Montréal, Toronto, Ottawa, Moncton, Halifax, etc.), North American (Boston, Detroit, etc.), Central American and Caribbean (Costa Rica, Cuba, etc.), European (Brussels, Porto, Geneva, Copenhagen, etc.), and even African (Cotonou, etc.) perspectives of practice. However, we note students' difficulty to address the urban planning issues of Asian cities due to the complexity of the social, political, and economic issues encountered.

Given the number of third-year students following the Praxis III curriculum (72, divided in two groups), their ability to interact and to come together in the context of a collective project is at the core of their urban project-based learning. Although their focus is the urban fabric of specific cities, their reflection considers, both analytically and in terms of design, the factors that impact the process of transformation of the urban sector in which they intervene on different scales. We have seen the importance of using role-playing to allow students to get a glimpse of the perspective and the varied interests of the stakeholders involved in the implementation of an urban design project.

The Praxis III educational approach calls upon the analytical and research skills as well as the cultural and historical awareness of students as they move from urban analysis to the development of planning designs and scenarios. The concept of historical and spatial continuity introduced by the faculty is intended to foster the development of meaningful projects that are firmly rooted in the reality of the context of intervention without, of course, being mimetic. Although the teachers consider the presentation of an ideal, linear, and more classical approach to the project to be of prime importance, the critical interaction between teachers and teams during the project development process favours retrospection and questioning along the way. This questioning in relation to the "ideal" approach presented by the faculty should help students to hone their critical thinking. This critical distance is reflected in the definition of their own approach to design, once they have acquired a comprehensive view of the process (analysis, design, implementation).

Teachers' maintaining and keeping to common objectives that guide the design teams over the long term (eight months) results in the creation of high-quality urban projects. This is due to the fact that the completion time of the "mandates" exceeds the deadlines often imposed by the public order in professional practice. In addition, the use of simple freehand or digital drawing tools, the representations of

the various development scenarios in plan, cross-section, axonometry, and perspective ensure an easy dissemination of the proposals to reach the public and an array of stakeholders. The urban design guides and principles that emerge from these development visions are the main outcomes of the Praxis III urban design projects, disseminated outside the academic walls. They are tools that stimulate public debate on the future of the city in a context of climate change.

We have grouped our analysis data in a table summarizing the qualitative study of the educational strategy used in UQAM's Praxis III program (Table 11.1). Overall, we note that all aspects of Strickland's criteria are covered in the Praxis III educational approach. However, the scoring for some criteria, which were deemed to be partially covered, was only half a point. We obtained an indicational score of 8, or 80%, regarding achievement of the educational objectives in accordance with our analysis grid.

What emerges from the overall assessment is that the international perspective needs to be strengthened through greater "cross-fertilization" between the two groups during the year and by comparing local and international approaches in the discussions. The organization of urban design exchanges involving other departments and institutions should allow our students to be in contact with other disciplines related to the practice of urban design. Furthermore, it is important to question the linearity of the approach by setting up blitz exercises that prefigure the questions to come in the development of projects. More exploration and differentiation between teams will also need to be encouraged and innovation in the urban design approach (risk-taking) will need to be stimulated to individualize projects.

By way of conclusion, we can say that the systematic and rigorous research on urban project-based teaching approaches should make it possible to compare programs and to initiate a more comprehensive reflection on the issues of project-based urban-planning pedagogy in French-speaking schools of urban planning and architecture. Currently, we note that this issue is discussed, most notably, in the English-language literature by urban design faculty teaching at the University of Delft in the Netherlands, at Harvard University, the University of Cincinnati, University of Michigan, University of Pennsylvania in the United States, and at Tsinghua University in the city of Beijing in China. This analytical tool can be used to study, in greater depth and on common ground, the urban planning programs in the French-speaking world. We have in mind the network of the *Association pour la Promotion de l'Enseignement et de la Recherche en Aménagement et Urbanisme* (APERAU), which brings together programs in France, Belgium, Switzerland, Canada, and North Africa. In this sense, we must underscore the efforts of the PédagAU network (urban planning and development education) which aims to promote the development of research on teaching practices in urban planning and development, which is scarce in the French-speaking world. This will bring to light the implementation of practical workshops within urban planning programs as part of an evolving and perfectible teaching practice whose objective is to enable students to acquire the skills to read, analyse, and (re-)design urban form, on the scale of landscape, urban fabric, and territory. Continuous evaluation helps to define the basis for learning urban planning as a research and design discipline in its own right, with material and requirements (research through design) of its own.

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12 Investigating the Means Utilized by the Supporting Staff in Design Studio Courses

An Interview Study

Pelin Efilti and Koray Gelmez

Department of Industrial Design,
Istanbul Technical University, Istanbul, Türkiye

Enver Tatlısu

Department of Industrial Design,
Mimar Sinan Fine Arts University, Istanbul, Türkiye

Tuğçe Ecem Tüfek and Onur Yılmaz

Department of Industrial Design,
Istanbul Technical University, Istanbul, Türkiye

Introduction

Learning is conditioned as 'a social and interactive process' in which learners take part as active participants rather than passive recipients (Bowles, Radford, & Bakopoulou, 2017, 3). Social constructivism draws attention to the impact of social interaction, language, and culture on the learning processes of students (Vygotsky, 1978). Through an established dialogue and an interaction, learning 'could be realized under the guidance of teachers and in a social environment' (Eyyam, Doğruer & Menviş, 2016, 47). Vygotsky (1978) also described that 'learning first takes place on a social level before it takes place on an individual level' (van de Pol, Volman & Beishuizen, 2010, 272).

Social constructivism emphasizes this interaction and guidance that strengthens the mental activities and cognitive developments of learners in the 'zone of proximal development' (Baysan & Silman, 2016). This conception visualizes the distance between 'the independent problem solving and the level of potential development … under a guidance or in a collaboration' (Vygotsky, 1978, 86). Under social constructivist perspective, the stakeholders of the studio setting shapes specific learning and teaching dynamics of design education, also determines the achievement of the learner.

Scaffolding Metaphor and Means

The socio-cultural theory of Vygotsky (1978) and studies of Wood, Bruner, and Ross (1976) fostered the conceptualization of the scaffolding metaphor. The scaffolding (van de Pol et al., 2015) is generally used to describe the support of

a teacher 'to move the student toward his/her potential understanding' (van de Pol et al., 2015). In this conceptualization, the zone of proximal development as a prominent concept represents the temporal assistance of a teacher mediated by verbal interaction to support a student to complete a task alone. Scaffolding as a fluid process in which both teachers and students are active participants in these interactions (van de Pol, Volman & Beishuizen, 2010; Zackariasson, 2020).

The conceptual model of scaffolding was discussed and a framework for analysis of scaffolding strategies was developed by van de Pol, Volman, and Beishuizen (2010). Scaffolding strategies are composed of two interrelated aspects; intentions and means. The goal of scaffolding represents an *intention*, which aims to support meta-cognitive, cognitive activities, and affective learning process of students. The *means* also represent the ways of occurrence of support, such as feeding back, hints, instructing, explaining, modelling, and questioning. Any combination of means and intentions fulfils a scaffolding *strategy* and directly affects the learning process of students (van de Pol, Volman & Beishuizen, 2010).

Within the scope of this study, we focus on investigating and understanding the scaffolding means used by supporting staff, the research assistants, in design studio courses.

Supporting Staff in Design Academia

The learning activity of students arises from the student's relationship with the design teachers and peers (Oh et al., 2013); therefore, these interactions of the design studio impact the learning processes and the critical skills of the learner (Dutton, 1987). The interaction between the design teachers and students can occur in different ways and at different levels, the roles and teaching styles of design teachers including 'a variety of modes of acting and performing' (Grasha, 1996) reserve the strongest impact on the learning process and activity of students.

Elshof (2009) stated that teachers are more influential than the curriculum. Therefore, it can be said that the pedagogical roles, means, and strategies preferred by design teachers and supporting staff in design studio courses have a crucial impact on students' learning processes. The pedagogical roles of teachers contain specific teaching and communication styles, means, and strategies that are developed intentionally or unintentionally. However, these roles and teaching styles are varied, differed, and privatized in regard to the content of the lecture, particular classroom techniques, personal characteristics, psychological factors, and interpersonal communication (Grasha, 1996).

Within the context of design studio education, several researchers note that the studio teachers and students interact in different ways. Thus, the learning experiences of students may differ with regard to the means and strategies used by design teachers, which is highly related to design teacher's roles (Efilti & Gelmez, 2021).

Apart from the design teachers, the supporting staff in design education, called research assistants, teaching assistants, graduate assistants, etc., play a significant but ignored role in design education (Gelmez et al., 2021). The particular conditions and experiences of supporting staff were studied in various academic fields and articles. The wide range of studies focus on the training of assistants and their impacts in higher education (Broeckelman-Post & Ruiz-Mesa, 2018; Young & Bippus, 2008), the employment status of assistantship (Flora, 2007; Muzaka, 2009; Vaughn, 1998), the dynamics of student-assistant interactions (Rubie-Davies et al., 2010), the assistants' behaviours and the organizational conditions (Aydın et al., 2016), and also the non-pedagogical roles of assistantship 'having an indirect effect on pupil learning by helping with classroom organization, limiting negative and off-task behaviour, and ensuring lessons run' (Webster et al., 2011, 15). Some predicate their academic experiences by examining their perceptions about their academic advisers (Gülmez & Kozan, 2017) and their methodologies related to academic studies (Toptaş, Şahin-Kürşad & Çokluk-Bökeoğlu, 2018). Besides, some investigated this topic from the viewpoint of students and asked the perceptions of undergraduate students about the assigned supporting staff (Kendall & Schussler, 2012).

While there is a lack of studies about the pedagogical roles, means, and strategies of supporting staff in design education, there is an interest to understand their effectiveness on students' learning processes. Radford et al. (2015) examined the perceptions of teaching assistants about their use of inclusive pedagogical strategies and defined the scaffolding as their key role including major dimensions. While the supporting role keeps students 'motivated and engaged with a particular task' through the aspects of 'emotional, curricular and relational' support that are providing the self-belief, increasing the accessibility of curricula, and facilitating the participation respectively; the 'repair function helps them when they encounter difficulty; and the heuristic role encourages them to use their own learning strategies' (Bowles, Radford & Bakopoulou, 2017, 3). These aspects were compared with the strategies of teachers for a broader understanding of their pedagogical roles and responsibilities (Radford et al., 2015). In higher education, the supporting staff are placed in an 'ambiguous niche' (Park, 2004) between learning activities in the role of post-graduate students and teaching activities in the role of teachers. The studies show that supporting staff may have different roles and responsibilities in design studio courses than design teachers that could distort the hierarchical relationship by treating themselves as peers of students due to the closeness in age, offering emotional and counselling support for students, or their positioning by students as a closer friend with which to communicate and receive advice about their design projects (Efilti & Gelmez, 2023). Webster et al. (2011) also mention the direct impact of the supporting staff in terms of instructional, supportive, and interactive characteristics on the learning processes of students.

It can be said that exploring the means and strategies of the supporting staff in design studio courses will be helpful to comprehend their teaching approaches, and thus their impact on learning processes. This study aims to understand the means utilized by research assistants in design studio courses.

International Correspondents of Supporting Staff

In this part of the study, we will share the international correspondents of the academic and educational position, which is defined as 'research assistant' in the context of this chapter. The institutions given in Table 12.1 are selected from among 20 universities in the QS World University Rankings by Subject 2019: Art & Design list. The current staff positions were examined in the faculty and members section of the web pages of the institutions. As can be seen from Table 12.1, it is seen that the 'research assistant' position has correspondents such as Post-Doc, Researcher, Ph.D. candidate, Ph.D. student, Research fellow, Academy research fellow, Research assistant, and Graduate assistant. The position of Research fellow is available in six universities and is the most commonly observed university position among others. It is followed by Post-Doc positions, which are observed in a total of four universities. Other positions such as Researcher, Ph.D. candidate, Ph.D. student, and Research assistant are distributed evenly among all universities given in Table 12.1.

We think including international correspondents of supporting staff can explain our research framework better. Seeing international examples can lead to comparative studies.

Research assistants under investigation in this study have academic, pedagogical, and administrative roles in universities. Although their primary duties were defined as research, research assistants defined by the Turkish Higher Education Council, depending on the purposes and principles specified in Articles 4 and 5 of the Higher Education Law, simultaneously fulfil research and educational duties and responsibilities. From this point of view, it can be said that they experience a hybrid process in which tasks and responsibilities related to research and education are carried out together. Some of the international and institutional examples given in the table may not cover both academic and educational work at the same time, but the founding factors of these positions relate to supporting research or education. Considering that some of the international and institutional examples given in the table are related only to research or only to education, we can say that the research assistants mentioned in the context of this study constitute a combination of them.

The Interview Study

This study aimed to understand the means and strategies used by research assistants in design studio courses within the context of higher education in Turkey. To address this issue, phenomenography was adopted as a research approach, which considers a 'second-order' perspective (Richardson, 1999) to 'bring into the light' the different ways of understanding about a particular phenomenon (Larsson & Holmström, 2007). To understand the variety of experiences and perceptions of people, the phenomenographic approach examines their narratives and actions, which makes it empirical, content-specific, and qualitative. As a phenomenographic method of data collection, open-ended interviews encourage people to talk

Table 12.1 Research assistants: international and institutional correspondents

Country	University	Post-Doc	Researcher	Ph.D. candidate	Ph.D. student	Research fellow	Academy research fellow	Research assistant	Graduate assistant
The Netherlands	TU Delft	X	X	X					
Italy	Politecnico di Milano				X	X			
Finland	University of Aalto	X	X	X		X	X		
Sweden	Umeå Institute of Design				X				
The UK	Royal College of Art					X			
The UK	Glasgow School of Design					X		X	
The UK	University of the Arts London					X			
Denmark	Royal Danish Academy	X						X	
USA	Rhode Island School of Design								X
USA	Massachusetts Institute of Technology	X				X			

and have rich descriptions of lived experiences, attitudes, values, thoughts, and opinions (Larsson & Holmström, 2007).

Adopting a phenomenographic approach for collecting and analysing data, this chapter includes a follow-up of a study including semi-structured and in-depth interviews with research assistants (Efilti & Gelmez, 2023). In our study, we discuss the pedagogical roles of research assistants (Efilti & Gelmez, 2023). This current interview study was conducted with 26 volunteer research assistants, who were permanent staff in the Industrial Design Departments in Turkey. Considering the authentic phases of the design process, the interview questions prepared to explore teaching experiences, performances, pedagogical roles, strategies, and means of research assistants. Within the context of this study, the pedagogical means used by research assistants will be discussed. Interview sessions were recorded upon the permission of the participants and transcripted verbatim. The interview transcripts were qualitatively analysed on the Atlas.ti software. Using a phenomenographic approach, the analysis process respectively followed particular steps: systematic coding, grouping the codes based on similarities and differences under categories, comparative analysis, and association of categories (Larsson & Holmström, 2007).

Findings

Based on the analysis of interview data, this section reveals 22 different pedagogical means that a research assistant can utilize in design studio courses (Table 12.2).

Asking Questions

According to the results of the study, research assistants widely adopt the means of asking questions. By asking questions, they mostly aim to understand the students' ideas, processes, or design decisions. A participant stated that she cannot analyse the student's project in the first moment; consequently, by asking questions she is obtaining more information to analyse (P1). Another motivation for asking questions is fostering students to question their design decisions. With this approach, participants advocate that they encourage students to generate more and new questions (P6). A participant focused on the importance of generation questions:

> […] actually, design education is about learning to ask questions in a way, and if he asks the right questions, he can create the right answer himself (P10).

Also, some participants said that they ask questions for not directing students' projects in a restrictive manner (P7, P19). A participant stated that it is safer to adopt asking questions as a means:

> […] because it's a bit dangerous to comment, I don't know exactly where to stop, so I was trying to continue with more questions […] (P19).

Table 12.2 The summary of pedagogical means and their brief description

Pedagogical means	Description of means
Asking questions	Asking related questions to understand the students' ideas, processes, or design decisions
Giving critiques by drawing, writing, and modelling	Explaining and demonstrating their thoughts and ideas by writing, drawing, or modelling
Encouraging students to create more alternatives	Prompting students to create different alternatives related to their design ideas
Suggesting alternative design approaches and ideas	Sharing their own ideas to induce student thinking
Direct demonstration/guidance	Directly demonstrating or telling the student what he or she needs to do
Using a familiar language/ embodying	Adopting a language more familiar to the students to explain design related issues
Not giving critiques	Standing back and observing due to lack of experience, time limits, etc.
Empathizing with users	Interacting with mock-ups and models by imitating the user's movements
Thinking/making together with students	Adopting co-producing techniques to think or make collaboratively with the students
Listening and understanding the student	Encouraging the student to explain his/her project in his/ her own language
Promoting students' self-discovery	Adopting an appropriate stimulus to trigger students' self-discovery and understanding about their own design process
Questioning students' design decisions	Making students think about their design decisions/ preferences
Revealing the positive aspects of the design process	Motivating students and showing the good and strong aspects of their projects
Directing students to proper information sources	Guiding students to proper information sources when necessary in the context of the design project
Exemplifying processes, ideas, and approaches	Giving examples and providing links between students' processes, ideas, and approaches with their own and others'
Showing a classmate's project as examples	Demonstrating examples from classmates' projects while giving critiques to the students
Oral communication	Preferring talking instead of drawing
Sharing experiences with familiar examples	Sharing experiences or memories with the students to create links between their projects and existing examples
Encouraging collective discussion	Prompting collective and non-hierarchical discussions
Showing errors and conflicts	Pointing errors and conflicts through the students' repertoire
Showing by doing through mock-ups	Communicating with the students through making mock-ups and models
Giving hints and suggestions	Giving emotional support, clues about teachers' expectations, and suggestions about their own studentship experiences

Giving Critiques by Drawing, Writing, and Modelling

As another frequently used means, research assistants resort to explaining and demonstrating by writing, drawing, or modelling. According to the answers, writing down and sketching may be utilized for a variety of purposes such as recording the process (P4), reminding students' what to do next, developing students' ideas (P12), or simply driving students' attention (P22). The participants generally mention their utilization of writing and sketching in relation to ideation and development phases (P8, P9, P12).

Some participants specified that while sketching, they consciously limit themselves in order not to 'draw the project [on behalf of the student]' (P12). There are also some reservations on specific practices like drawing over students' work since it could connote negatively. For example, one participant states that drawing over the student's drawing 'implies me dismissing what the student has done [by that time]' (P22).

Encouraging Students to Create More Alternatives

Another means that research assistants follow in the design studio is to encourage students to generate more alternatives. In their responses, participants repeatedly emphasized the importance of encouraging students to yield different alternatives through their process. For example, one research assistant explained his encounter with a student regarding his early fixation in the design process:

> For example, one student comes with a finished product. You respond that 'You cannot do it like this. Actually, you have to explain your ideas first. Maybe your other idea is better'. While managing that [critique] process, I need to exemplify and explain it (P9).

While guiding students to come up with more possibilities, research assistants may also employ different means, such as brainstorming with the student (P9) or vocalizing rather absurd ideas to prompt the student's idea generation process (P7).

Suggesting Alternative Design Approaches and Ideas

Suggesting alternatives is another technique that research assistants utilize through their interaction with the students. The answers show that generally indirect methods are preferred since students may have difficulties in understanding the examples (P7) or do not take the suggestions they offer (P15).

As an emergent approach, most of the participants indicated asking prompting questions like: why did you do this in this way? Why did you choose this? (P3). This motivates students to consider and generate potential ideas further. One participant explained this inquiry process as '[it is like] to take the work that the student brought as a starting point but to offer alternatives that compel her to think about what ways to go beyond it' (P16).

Research assistants may also share their own ideas to induce students' thinking. For example, one participant stated:

> Sometimes, if there are design ideas that just come to my mind, I would suggest students 'one of you can do this' or 'we have not seen something like this, I wonder how it would turn out' in the interim jury (P8).

Direct Demonstration/Guidance

Some participants stated they may feel a need to guide some students more directly in some cases. This may occur when the student misses 'a point that would make his/her project better' (P3) or the research assistant feels like the design process will not lead to any results (P4). One participant said that he sketches himself in the studio to show students how one can search and reproduce product forms in the ideation phase (P9). On the other hand, direct guidance and demonstration as a means was also regarded as an 'unprofessional' (P26) or even 'risky' (P19) intervention by some.

Using a Familiar Language/Embodying

The interview revealed that research assistants may adopt a language more familiar to the students to explain design-related issues. Some participants expressed that – especially in first years – students lack the knowledge on field-related terms and notions (P7, P9). Likewise, students may yet realize that 'they can be very versatile [with their ideas] and feed from other fields' (P9). In these cases, research assistants rely on students' pre-existing knowledge by giving examples from everyday life and 'using metaphors' to enable them to make sense of given critiques and conceptual issues (P8, P9).

Not Giving Critiques

Another means that research assistants employed in design studio courses is 'not giving crits' (critiques) deliberately. According to the statements of the participants, there may be various reasons for this. For example, according to P4, the reason might be the attitude of the teacher or the relationship between the teacher and research assistant. According to P14, research assistants may prefer not to give critiques due to concerns about time management. On the other hand, the reason for P23's choice of not giving critiques is related to the student. He stated that he prefers not to give critiques in times that the student attends to the studio without any preparation. According to P25's statement, another situation that pushes the research assistants not to give critiques may be the lack of experience. In these cases, it can be said that the research assistant prefers to stand back and observe until he/she has sufficient experience.

Empathizing with Users

Research assistants, while critiquing students' design projects in a design studio, often try to empathize with users. To achieve this, they mostly rely on students'

demonstrations such as sketches, mock-ups, and physical models. For example, one of the participants (P3) stated that if he thinks there is something wrong with the design project and that it will cause a problem during use, he/she uses and interacts with the mock-up to reveal the possible errors of the designed concept by pretending to be the user. Another participant (P22) stated that critique sessions revealing the possible deficiencies of the design project by seeing, feeling, and touching is more satisfying both for the student and the assistant. While doing this, he stated that he tries to convey his critiques not through the product but through the action with a theatrical expression, for example, by imitating the user's movements, e.g., the user throws his arm like this or walks around in this way.

Thinking/Making Together with Students

The findings show that, while giving critiques to students, research assistants often adopt a means of thinking/making together. They try to exploit techniques such as brainstorming (P3, P9, P23), exchanging ideas (P6, P11), and co-producing (P11, P12). They generally use students' ideations as a base on which to build discussions and co-develop ideas by using various techniques. According to P11, for this reason, students mostly feel more comfortable to openly discuss their ideas with the research assistants, rather than the teachers of the design studio.

Listening and Understanding the Student

Most of the participants stated that research assistants' priority is listening and understanding the student in the design studio courses. While listening, they support students with proper questions (P1, P8, P10, P18) to reveal (P18) their design process, helping students to understand the strengths and weaknesses of their own design project. According to P13, research assistants in the design encourage the student to explain his/her project in his/her own language while listening, guiding, and giving feedback.

Promoting Students' Self-Discovery

Another means that research assistants employ in design studios is to enable students to discover and understand their own design process. According to P3, research assistants are in a mutual learning process with the student rather than positioning themselves as a design authority. A participant (P6) said one tactic is to direct questions to the student about their design or question its functionality by experiencing design representations such as mock-ups prepared by students. Another participant (P8) emphasized the importance of the 'aha moment' as an indicator of the student's learning process in the design studio and states that she uses appropriate stimuli such as asking questions, provoking, and inviting different viewpoints to achieve this.

Questioning Students' Design Decisions

According to the results of the field research, one of the means adopted by the research assistants in the design studio is to question the students' design decisions/preferences. They often said that instead of giving direct guidance to students about the design process, they tried to create an alternative thinking space by asking questions on the materials they selected, especially 'why' questions (P3, P7, P13, P14, P23, P26). According to P16, one of the main contributions of research assistants in design studio is to make students think and question their work.

Revealing the Positive Aspects of the Design Process

Research assistants in the design studio courses often try to position themselves in the middle between the teacher and student. This positioning enables the research assistant and teacher to take on 'good cop/bad cop' roles when necessary (P14). To do this, they often motivated the student who receive negative criticism from the teacher by showing the good and strong aspects of his/her project. According to P9, in terms of the learning process, expressing the good aspects of the project is as important as grading and expressing the shortcomings of the project, so that the student can know what he/she did right and what he/she did wrong.

Directing Students to Proper Information Sources

A majority of the participants stated that they often direct students to proper information sources when necessary in the context of the design project. These information sources may be related to design methods (P9), research tools and techniques (P3, P8, P11, P23), academic readings (P9), expert institutions and groups (P6, P7, P11, P12, P20), materials and production techniques (P6, P8, P9, P22), etc.

Exemplifying Processes, Ideas, and Approaches

One of the common means that research assistants utilize is exemplifying. According to the responses of the participants, research assistants frequently gave examples from their past professional careers (P18) as well as related design processes and ideas (P5, P9, P19, P20) to provide links between students' processes, ideas, and approaches with others. Also, one of the participants states that exemplifying offers a better base for communication:

> Sometimes what we talk about with the student is not the same thing. So, you're saying some design-related terms. Since the child [student] does not know this, he cannot perceive it. When he cannot perceive this, he cannot perceive the critique in his project, and he/she cannot perceive that he should receive feedback from the given to his project. For example, you are trying to develop methods such as exemplifying them (P9).

Showing a Classmate's Project as Examples

One of the prevalent means that research assistants often adopt was demonstrating examples while giving critiques to the students regarding their projects. One participant (P5) indicated that she usually tries to exemplify her points in the critique sessions, sometimes she also shows a peer's work to the students even though she dislikes it.

Oral Communication

The study shows that research assistants adopt oral communication as a means, too. A participant stated that she prefers talking instead of drawing while she is critiquing a student's project, since drawing would be over directive (P23). Also, another participant adopted oral communication as a means and thought that drawing over a student's sketch is disrespectful to the student's labour (P22).

Sharing Experiences with Familiar Examples

Another means that research assistants employ is sharing experiences or memories with the students to create links between students' projects and existing examples. While some of the participants adopted this means by using the materials that exist around them at that time (P2, P17), some stated that they found and sent visual material to the students after the class (P20). Also, a participant implied that she encourages students to notice surroundings to benefit for their project processes (P22).

Encouraging Collective Discussion

Encouraging collective discussions is another means that research assistants adopt. In the scope of the study, we define collective discussions as non-hierarchical discussions between teachers, research assistants and students about the students' design processes. According to a participant, in design studio classes, while teachers are mostly 'transmitters (of information)', research assistants tend to be a side of a dialogue (P11). Another participant defined her way of critiquing as discussing the mistakes together, rather than teaching something directly (P6).

Showing Errors and Conflicts

One of the major techniques research assistants adopt is showing errors and conflicts in students' projects. Participants stated that they point out errors and conflicts mostly from the users' perspective (P3, P6, P18, P20, P22) through the students' repertoire such as models, mock-ups, sketches, etc. (P3, P6, P12, P20). Also, some participants implied that they employ this means to help students create more alternatives (P20, P25) and encourage students to discover their own ways of designing (P15, P18, P22, P25).

Showing by Doing through Mock-Ups

The findings show that research assistants adopt a means of showing by doing through mock-ups and models. While one participant stated that she makes mock-ups to communicate with the students (P17), another participant implied that she employs both model-making and drawing activities to communicate (P8). Also, one participant said that she had once done the model with the student collectively (P12).

Giving Hints and Suggestions

Giving hints and suggestions is also one of the common means among research assistants. Some participants advocate that these dialogues may function as emotional support (P4), motivation sources (P21), or guides (P26). A participant implied that these hints are also instrumental for translating the teacher's expectations to the students (P5). Some participants stated that their hints and suggestions are shaped by their own studentship experiences (P3, P4).

Conclusion

This study attempts to reveal the means utilized by the supporting staff, called research assistants, in design studio courses through an interview study. As the neglected participants in the design studio, research assistants have significant responsibilities regarding pedagogical practice together with academic activities and administrative duties (Gelmez et al., 2021). In this respect, this study addresses their operational activities within a pedagogical framework from a second-order level.

The findings show us that research assistants undertook various activities that can be regarded as pedagogical practice. This study highlights 22 different means that a research assistant can tend to utilize. While some of them can be counted as passive activities, such as 'not giving design critique', some include quite impactful activities pedagogically such as questioning students' design decisions, encouraging students, and giving critiques by drawing, writing, and modelling, etc. This variety urges us to think about modelling those means in terms of scaffolding theory in further studies. The intentions of these means and their combinations that create new strategies intrinsic to design education should be discussed and framed. This study is limited, with the interview data depicting the current situation of research assistants from industrial design departments in Turkey. This data needs to be supported and extended with studies from different domains in creative practice education and different countries and institutions.

Acknowledgements

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13 Assessments in the Design Studio

Self-Reflecting on MDD (AUAS) Methods

Irene Maldini

Oslo Metropolitan University, Oslo, Norway

Pamela Nelson and Paul Geurts

Amsterdam University of Applied Sciences, Amsterdam, Netherlands

Gabriele Ferri

Eindhoven University of Technology, Amsterdam, Netherlands

Introduction

As a format for design education, the 'studio model' is rooted in the practice of the architectural studio. When taking part in studio-model education, design students are typically proposed a project in the form of a brief, often involving external organisations that play the role of the client. These briefs can be highly prescriptive, or they can be open-ended, leaving more space for student's initiatives and interests (Giloi & Belluigi, 2017). The complexity of projects tends to increase as students advance in their studies and form the basis of the tacit knowledge needed for professional practice.

In the most traditional end of the design studio, the performance of students is assessed by tutors who guide the creative process and help students navigate the brief and their relation to the client in a mix of formative and summative assessments. However, with the increasing integration of design schools to universities and the development of educational policies and standards applying to all fields, this model of assessment is increasingly challenged. The challenges of traditional studio assessment do not only result from the organisational changes mentioned previously, but also from internal debates in the field.

Some design educators defend the value of this model given the particularities of creative education and professional practice (Orr & Bloxham, 2013). Moreover, they argue for their authenticity in connecting students with 'real world' issues and positioning them in the role of a professional practitioner from their first design experience, following a learning-by-doing approach (Axelsson, Eriksson, & Wideström, 2006; Taylor & McCormack, 2004). Others argue that it promotes an outdated designer profile, with a "superficial understanding of the problems they are presented with (…), treating the symptoms rather than the underlying root causes" (Meyer & Norman, 2020). Another downside mentioned in literature is the

obscurity of traditional studio-based assessment practices, where the principles of reliability, validity, and transparency are difficult to put in practice (Karahanoğlu, Alink, & Bakırlıoğlu, 2019). Yet another shortcoming mentioned by design scholars is the resulting isolation and marginalisation of creative disciplines from the other fields (Wang, 2010), hindering interdisciplinary collaboration, academic mobility, and the consolidation of design as an academic discipline.

Research has found that that too much importance is given to the product in assessment practices of creative disciplines (de la Harpe et al., 2009) and that a stronger focus on process and person is needed. Although products or portfolios are often used to evaluate the design process too, how this happens is not necessarily made explicit to students. An explicit focus on how the student works during assessment has been assigned the "potential to redirect the learner toward reflection and understanding" (Ehmann, 2004).

Assessments are not only moments of evaluation but are also functional to learning because students consider how they will be assessed during curricular activities. Moreover, assessments foster retrospective reflection from students on what they achieved. A good alignment between assessments and learning objectives, focusing on reflection, evaluation, and improvement can upgrade design education to ensure long term learning and transparency in the objectives it pursues, while acknowledging the importance of tacit knowledge. However, there is no single or validated way to do this, as developing the tools and procedures to do it remains a challenge (Whelan, Maher, & Deevy, 2017).

This chapter discusses how we at the master of science (M.Sc.) in Digital Design (MDD), a one-year programme at the Amsterdam University of Applied Sciences (AUAS), have dealt with these issues from the vantage point of a newly established curriculum, set up in 2017. Based on a survey distributed among graduates and former assessors of the programme, we reflect on how the methods used respond to the intentions for their development. These intentions include addressing some of the challenges of design studio assessments mentioned in literature. By asking assessment participants for a comparative perspective between these and other assessment methods they have experienced in an international design education context, we engage in a self-reflective process with the purpose of improving the programme's evaluation tools. In this chapter, we share this self-reflective study with others that are also committed to find better assessment tools for design education.

In comparison to other subjects such as STEM, design education has been a somewhat neglected area of education research. Hounsell et al. (2007) for example identified 272 published articles that were categorised as appropriate to the topic of Innovative Assessment Across the Disciplines, of which only six fell under the category "art, design and media". Ehmann (2005) assigns this gap to the non-standard procedures and methods in the design education, highlighting assessment as a significantly neglected area. In this study, we contribute to a more active academic discussion about design education that has emerged in the last decade, as visible in the papers referenced previously. Although the chapter focuses on our own practices as a programme, it is not intended to promote the choices we have made or the vision that drives them. On the contrary, it is based on input from the students and

assessors that experienced it, following a bottom-up approach to discuss design assessment methods.

Context

The MDD is a one-year programme that enables students to develop their design competences, especially the ability to work in interdisciplinary/multicultural teams on complex projects. In the Netherlands, design courses are offered by different institutions, including technical universities, art academies, and universities of applied sciences. Until recently, Dutch universities of applied sciences (UAS) could only offer practice-based education comparable to a bachelor level. This is an early example of a master's programme at a UAS, and the first one in this faculty, existing since 2017.

As an M.Sc. programme, the MDD is aligned with level 7 of the European Qualification Framework (EQF 7) and its Dutch counterpart (NLQF 7). The level's descriptors are articulated in a matrix of design-specific competences (Framing & Strategizing; Reflection & Awareness; Concepting & Ideation; Creating & Crafting; Self-Directed Learning), each divided in three indicators (see rubric in Appendix 1).

To achieve the competence profile required for graduating with a M.Sc., MDD students work in teams on three client projects that grow in length as the academic year advances (5, 8, and 14 weeks). They share project progress with peers in critique sessions chaired by the staff. Moreover, they are encouraged to pick up other self-directed projects if they wish. Four different tracks support the studio practice, namely Creation, Literacy, Research, and Strategy. These tracks include readings, lectures, workshops, and non-summative assignments and run in parallel to the client projects.

Summative assessments are the formal moments of evaluation in the MDD, and they take place twice per academic year: midterm (at the end of the first semester) and finals (at the end of the second semester), they award 30 European Credits (EC) each. Students hand in two deliverables in advance: (a) a process book including selected design work and (b) a reflection document explaining how this work matches the competence rubric. The selected work may include client projects, personal projects, and the assignments proposed in the different tracks. After considering these documents, a panel including three assessors – at least two of which are lecturers of the programme – interview each student individually for one hour. Building on the documents submitted, students can refer to any activity conducted while enrolled in the MDD programme to show how they meet the indicators in the rubric. After the interview, the student receives a grade calculated on the basis of the competences in the rubric, and qualitative feedback including impressions of the panel on the student's work and advice on future steps.

While developing the programme, this format was preferred over other ways of assessing studio-based education, seeking alignment with the programme's philosophy. In connection with the M.Sc. diploma offered, the MDD prioritises a focus on process rather than outcomes. Moreover, it aims at fostering critical reflection

emerging from practice rather than separating theory from design activity. In line with the previous points, the aesthetic quality or visual refinement of design solutions receives less attention than the understanding of the social, environmental, or ethical implications of their work. Lastly, it promotes independence and the crafting of an individual professional profile through self-directed learning. For example, having smaller exams at the end of each course could make the MDD less practical, as students would be tested on theory. Alternatively, grading the three projects that students do for external stakeholders would disincentivise students from working on self-initiated projects, thus reducing the emphasis on self-directed learning.

Practicalities and regulations aside, in this chapter, we would like to reflect on the extent to which this format responds to the purposes with which it was designed. We are aware that this is not a common format for design assessments, and believe that our own reflection (graduates', assessors', and the authors') will be of value for others intending to tackle challenges in design studio assessments.

Method

We designed two separate online surveys for former students and assessors, these were distributed across all relevant respondents. The aim of the survey was to understand how they regard MDD assessment methods when compared to other methods they have experienced within design education. Respondents not reacting to the questions addressing this issue specifically in the form are not considered in the qualitative analysis that appears later in the chapter. This includes assessors that did not have experience in this role in other programmes. We received 27 relevant responses from former students (the total number alumni is 117) and eight from former assessors. The responses were analysed by identifying differences and similarities with assessment methods practiced in other programmes, and advantages and disadvantages in relation to MDD methods according to respondents.

Results

The 27 former students completing the questionnaire are between 23 and 35 years old. They come from a variety of countries within and outside Europe. Most of them are currently living and working in the Netherlands. They work as designers in companies ranging from small design agencies and studios to big multinational consultancies. Five respondents are self-employed, another two are working in education, and yet another two are not working at the moment. Half of these respondents were students of the latest cohort (2020–2021), while the other half studied during the three previous academic years. Most of them followed design programmes for their bachelor degrees, in a variety of universities and countries.

The eight assessors were all active at MDD during the previous academic year (2020–2021), and some of them had been in that role for a longer time. They previously assessed design students in several programmes and institutions within and outside Europe.

The data provided by respondents confirms that the assessment format at MDD is different to other design education programmes in several aspects, with specific advantages and disadvantages over other methods. The main differences highlighted in the surveys are mentioned next.

Unification of Assessments

All graduates (except two respondents who do not describe or recall their bachelors' assessments) mention unification of assessments as a main difference with their bachelors. While in their bachelors, they were assessed separately in each course or project (for instance, for a certain number of credits) and at MDD, the assessments are fairly independent from the different courses. Students receive feedback from lecturers and coaches, and they use the work produced during these courses for assessments. However, they are not assessed by lecturers on their process or result within each course. This means that the design work produced in projects is only considered for assessment in relation to the programme's rubric (discussed in the next section).

As an example of this difference, one respondent explains that during their Graphic Design bachelor in Latin America, they were "usually assessed with grades via projects or exams. For more practical courses we would deliver a project. While in more theoretical courses we would take an exam or submit reports". Another respondent that graduated from a European B.A. in Communication Design had "three kinds of courses/classes with different kinds of assessments" including tests or written assignments for theoretical courses and practical design courses assessed by lectures based on design outcomes.

The unification of assessments seems to be particular in relation to other master level programmes, too. Five respondents of the assessors' survey had previously taken a similar role in other masters (in the Netherlands and abroad), and they all mention this difference.

Respondents list a variety of advantages and disadvantages for the unification of assessments, summarised here:

Advantages of the Unification of Assessments

- Time saving, and an opportunity to align expectations for staff.
- Holistic and based on individual personal/professional profile of students.
- Focused on earned skills rather than the output of students' work.
- Gives students an opportunity to look back to their past work, consider their present position, and plan their next steps accordingly.

Disadvantages of the Unification of Assessments

- It is a hard and stressful experience, especially for students used to being assessed based on the "quality" of specific design output, they feel unsure of what is expected.

- It can be frustrating for students to describe what they did in a past project for assessments when they no longer have the opportunity to change it.
- Failing an assessment can be painful when there are only two assessment moments in the whole master's programme. More frequent assessment helps to steer actions along the way in order to pass.

Use of (Integrated) Rubrics and Indicators for Expected Competencies

Some of the programmes previously experienced by respondents used rubrics and explicit competences in their assessment process. Others not. For instance, a graduate that completed a bachelor of arts in the Netherlands felt that "it was a relief to finally know what the parameters were and what was expected of students. This I had never experienced during my B.A." In line with the previous section on the unification of assessments, the programmes using rubrics tend to use separate rubrics for their courses or final assignment/thesis. Another respondent recalls from their bachelor of science in the Netherlands that "for each subject we had competences which we needed to fulfil. These were communicated to us in advance".

What is particular in MDD assessments is that there is a single rubric for the whole programme, which integrates all relevant competences across subjects. Respondents react differently to this method. Some appreciate the transfer of tacit knowledge from 'master to apprentice' and deal well with the implicit rules that guide 'good design'. These tend to regard the rubric as an unnecessary bureaucratic tool. Others (like in the quote opening this section) appreciate the explicit nature of rubrics. Overall, respondents point to the following advantages and disadvantages of an integrated rubric:

Advantages of an Integrated Rubric

- The rubric guides the learning process, students work considering what will be expected from them during assessments.
- Clarity in what is considered good work by the programme, for example, that projects are expected to include ethical considerations.
- The rubric separates grading from teacher-student relations, avoiding favouritism.

Disadvantages of an Integrated Rubric

- Difficult to understand what is expected from students, especially those that had not been evaluated with the use of rubrics before.
- The rubrics give the impression of impartiality, but the grades assigned to each competence depend on the interpretation of assessors.

Importance, Format, and Content of the Reflection Document

The survey results confirm that the reflection document is quite particular of this programme. This is one of the two deliverables requested to students for their assessments, next to a selection of their design work organised in a process book. The

outline of the reflection document matches the rubric. Students refer to their design work in the process book to explain how it matches, one by one, the required indicators. These reflections are later discussed in an individual interview, the grading and qualitative feedback are a result of this process.

One assessor referred to MDD assessments as one where students "demonstrate their capability" rather than "displaying their ability", the latter describing other creative programmes where this respondent has a similar role. A European graduate with a background in arts highlights that "for the first time during my studies, I was more focused on the skills I earned, rather than the quality of my work. At first, it completely did not make sense to me, but then I thought it was really interesting to encourage my personal evolution as a designer".

The MDD staff's choice to translate design 'quality' into competences regarding the breadth of the creative process, or the acknowledgement of the social context of projects in a written document is controversial, and some graduates felt strongly about it. "In my bachelor's, I was assessed on the actual (design) work I did and the quality of it, while the process was also important. At the MDD, the quality of the work was not of interest to anyone. As someone who has seen the quality of work delivered, I find this less fair and quite far away from the professional design world". Strong opinions emerged also on the other end, with some graduates acknowledging the influence of the reflection document in their learning experience and professional path: "A lot of my 'a-ha' moments for the year came in the 2nd semester assessment. Tying my projects together under one measure made me make deeper connections". Another graduate stated that putting together the reflection document "was insightful and gave me the professional self-awareness I had been lacking before. I learned a lot about how I work; my default role in a team and my strengths/weaknesses as a teammate and as an individual designer".

Overall, respondents point to the following advantages and disadvantages of the reflection document:

Advantages of the Reflection Document

- It promotes critical and reflective practitioners.
- It opens a path to become a better professional over time. Students are assessed on their ability to grow, they are not 'tied' to the work.
- It trains designers to clearly explain the rationale behind their decisions.

Disadvantages of the Reflection Document

- More useful for those pursuing a research focused career.
- It does not address the visual aspect of design quality.
- Disadvantage for students with reading and writing disabilities and non-English speakers.
- Can be frustrating to prepare and/or difficult to experience, as they are placed in a vulnerable position to reflect honestly on their own work (including its flaws) in front of others.

Freedom in Formats and Deliverables to Show Design Work, and in the Methods to Approach a Design Challenge

This aspect is less frequently mentioned by respondents in the survey, as the questionnaire did not address it specifically. However, a few respondents referred to this as a difference with other design programmes. There are no disadvantages mentioned, although freedom in the format of deliverables could be linked to lack of attention to visual aspects mentioned in previous sections. Positive statements about the freedom of formats include that of a graduate came from a European creative bachelor of arts student: "the MDD provides more freedom in approaching an assignment, making yourself more critical about what to include than on a bachelors. This positively affects my professional profile as tasks are not always as straightforward as in the academic system". Another graduate with a Dutch bachelor of science in Communication and Media Design stated that this freedom made them "realize where my true passions were and helped me be able to present what kind of designer I am (or aspired to be)".

Discussion

Building on the four characteristics of MDD assessments as described by respondents, and the advantages and disadvantages mentioned by them, in this section, we reflect on how the methods used to respond to the intentions for their development.

In our view, these methods help balancing studio-based education with university culture in a M.Sc. context. They are a way to navigate the challenges mentioned in literature and discussed in the introduction of this chapter. They also respond to the specific characteristics of our education system and university policy, and our choice to be open to candidates from all disciplinary backgrounds. Coming back to the literature, some of the challenges of studio-based education in a university context mentioned by scholars are addressed by this method in the following ways:

Obscurity in Studio-Based Assessments, with Problems in Terms of Reliability, Validity, and Transparency (Karahanoğlu et al., 2019)

The use of rubrics communicated to students at the beginning of the academic year, a practice that is becoming more common in design education, addresses this point. Integrating all staff input into a single rubric, and, therefore, two overall assessment moments along the year, helps to align the expectations of lectures and management and enables a holistic assessment of students considering their individual profiles. A point of attention here is the language used in rubrics, which many students find unclear, adding insecurity to the already stressful experience of being assessed. Although every year we run an iteration of the indicators together with all lecturers for continuous improvement, we do not ask input from students in this process. We see a clear opportunity for improvement here.

Isolation and Marginalisation of Creative Disciplines
from the Other Fields (Wang, 2010)

The focus on reflection rather than on design artifacts for assessments, and the possibility of using group work as evidence, allows students with diverse disciplinary backgrounds to join the programme and potentially succeed during assessments. Although most of respondents to the graduates' survey had followed a design bachelor, that is not the case in the whole MDD alumni community, which is more varied.

Being assessed on the basis of text rather than visual elements is controversial and unexpected by some students. A point for improvement here is clearer communication to applicants. We promise students that they will upgrade their design skills to the next level during the programme, but we could be more explicit in what is meant. Better communicating what is good design in this programme is vital. Moreover, clarifying that we rely on self-directed learning for technical and visual skills, while focusing on more analytical aspects of design practice in the assessments should be made clearer to students. This is our way to promote professional development over time, following the principles of sustainable assessments (Boud & Soler, 2016).

Superficiality in the Understanding of Problems, Treating Its Symptoms
Rather than Its Causes (Meyer & Norman, 2020)

Assessments drive learning, therefore, competences addressing ethical aspects of design, the acknowledgement of complexity in the context of projects, and the extent to which design decisions are based on reliable evidence in the rubric (and the self-reflective nature of assessments as a whole) promote a specific mindset when approaching client projects' briefs. We praise the learning-by-doing process that develops in studio practice, and the briefs bring a sense on real-world challenges that is much appreciated (Axelsson et al., 2006; Taylor & McCormack, 2004). However, these briefs do not always contemplate the aspects listed in this chapter, and we see the rubric as a balancing tool to ensure that they are addressed.

Some survey respondents saw a gap between the content of the rubric and the professional field, where, according to them, analytical skills are given a second place to technical knowledge and visual literacy. Still, we like to think of education as a practice that does not only provide businesses with the human resources they need, but also actively shapes practice in the professional field in a meaningful direction.

Support Material

Appendix 1 of this chapter can be found in the online Support Materials for this book: www.routledge.com/9781032835549

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14 Teaching Design in the Google Age

Redesigning the Assignment

Pedro Cortesão Monteiro

CIAUD, Research Centre for Architecture, Urbanism and Design,
Lisbon School of Architecture, Universidade de Lisboa, Lisbon, Portugal

João Batalheiro Ferreira

IADE–Faculdade de Design, Tecnologia e Comunicação da
Universidade Europeia, Lisbon, Portugal

Context

The scene is recurrent: within minutes of receiving the brief for a new design assignment, students will roam Internet sites looking for answers – images, to put it simply – to a problem they have not even started trying to figure out. The students who resist that first urge will follow the same path as soon as they feel slightly overwhelmed – as they should – by the problem presented to them. Normally, it does not take students very long to come upon some solutions. They do it, not necessarily to use such solutions as templates for theirs, but it is as if they need to feel somehow reassured by the notion that somewhere out there, in the World Wide Web, within reach of a few keyboard strokes, there is a path they may follow if they become stuck for more than a couple of minutes.

For us, their teachers, especially if dealing with first- or second-year undergraduate students, this may become a problem. If one's teaching the process of getting from a problem to a solution, it surely does not help anyone if students start their quest already with a goal (a formal solution) in mind. The challenge is huge because most design problems have been addressed countless times and, differently from what happened until recently, the solutions to each and every one of them may be easily found in a few Pinterest boards, a YouTube video, or the right Google search string.

Our concern is not strictly about students incurring in plagiarism (although there may be such risks involved) or even the quest for some kind of originality: it is about the crucial importance of thoroughly understanding and defining the problem and learning to learn through trial and error. It is about the joy of coming to a result that is one's own, with all its shortcomings and pains it took to get to them. Also, in design education, the famous aphorism [often, but wrongly, attributed to Ralph Waldo Emerson] – *"It's not the destination, it's the journey"* – resonates as an important credo, especially when the journey is just beginning.

For anyone who started teaching before everything became so accessible, it is not always easy to adapt to such (an illusion of) immediacy. From the

short-comings of one's own college library – that certainly lacked many works that might have been decisive had they come across our personal development in the right moment – we moved to a scenario where "everything" humanity has ever produced seems to be easily available (or so they seem to think). The challenge has moved from extracting the most of whatever was in fact within reach (especially if the resources were scarce), to being able to find something worth extracting in a situation when everything seems to be at the same distance and hold the same value.

Of course, this does not happen only within classroom walls or related to education contexts. The same radical shift in (the notion of) availability happened in many other domains related to work, leisure, or consumption. So, as things apparently became easier to anyone doing research, the truth is that getting to know where to begin became an apparently insurmountable task for everyone not acquainted with the methods and limitations of the previous analogue era.

Problem

How to Begin

The foundational tool of design education is the exercise, assignment, project brief, prompt, or any device that sets off the work carried out in a design studio. A project brief establishes how far a student may go, what topics are explored and how, whom the design will serve, what problems are addressed, and so on.

No matter how well structured a course plan is, students still spend an overwhelming majority of their time in the design studio doing project work under the supervision of a teacher (Ibrahim & Utaberta, 2012). As Lawson (2004) noted in a global review of design schools: "All those schools of design understand this too and use methods of learning by doing in the 'studio' format as their primary educational tool;" (p.7) and in a study supported by numerous real-context observations, Green (2005) summarised the studio's overall configuration as: "[U]sually a large room equipped with drawing tables and chairs to enable students to work independently on projects" (p.10).

In a studio setting, project work unfolds in a series of 'design conversations' (Adams & Siddiqui, 2016; Ferreira, 2018); these conversations (sometimes referred to as 'crits') are the centre of the student's experience in the design studio educational format. The term 'design crit' originated in architecture education (Dinham, 1989) to describe the individual meetings between teacher and student in the design studio and, as Mewburn (2012) argues, the 'desk crit' is generally recognised as the core feature of the design studio.

In this educational setting, teacher–student interaction while working on a design project are fundamental for a successful teaching-learning situation. The studio's inherently iterative dynamic (Goldschmidt, Hochman, and Dafni, 2010) offers the student a rich educational experience, which leads Ellmers (2014) to state that design conversations "foster [knowledge] transfer by supporting students to connect their thinking from the project with thinking

about approaches to projects in the future" (p.32), and Marda (1996) and Ulu-olu (2000) argue that in these close tutorials the interactions grow in learning potential.

Studio experience is then generally acknowledged as central to a student's educational success since design schools adopt a learning-by-doing pedagogy where learning how to design gradually unfolds as students tackle design projects of increasing difficulty. Each project, then, is a steppingstone towards design mastery. In an analysis of undergraduate design education, Lee (2009) concluded that "projects are assumed as the structure through which practice-based design education occurs" (p.541).

When we put it this way, the importance of the project brief is clear. The tools that define the design problems explored in the classroom are crucial not only to the immediate outcomes, but to the education process; however, research studies on project assignments are scarce, especially if we compare with other aspects of the design studio experience that have attracted consistent attention. In some recent publications, authors such as Paim et al. (2016) and Heller and Talarico (2009) gathered design assignments and presented them in concise bits. While these books are a welcome addition to the sparse bibliography on this issue, they nevertheless often lack essential details such as duration, evaluation criteria, intended aims and outcomes, course-year, or nature of the degree. There is also the temptation to focus on the outcomes, that is, to illustrate the assignments with the students' final results. While this is a useful documentation of a brief's application, it tells us only the happy ending of a story, like skipping to the final act of a film.

However, as we observed in the introduction, the conventional approach to design assignments may no longer be enough for a successful educational experience. The (recent) problem design teachers must face is that there are infinite solutions to any 'realistic' design brief readily available (and thoroughly detailed) online. This means that a first-year undergraduate can immediately, without hesitation or effort, discover a stampede of possible solutions to their design assignment. In this chapter, we present a pedagogical case study in short-circuiting the students' tendency to use powerful online search engines to either find ready-made solutions for their assignments or gather visual references to mash into a design solution of their own.

Designing the Design Assignment (One Peculiar List)

In an often quoted Q&A[1] on the occasion of the *Qu'est ce que le design?* exhibition (held at the Musée des Arts Décoratifs, Paris, in 1972), to the question *"Does the creation of Design admit constraints?"*, Charles Eames famously replied:

> Design depends largely on constraints. (…) The sum of all constraints. Here is one of the few effective keys to the Design problem: the ability of the Designer to recognize as many of the constraints as possible; his willingness and enthusiasm for working within these constraints. Constraints of price, of size, of strength, of balance, of surface, of time, and so forth. Each problem has its own peculiar list.

It is the set of constraints that define the problem. Normally, in studio-based pedagogy, such constraints try to simulate those of real-life problems and, consequently, result in objects/solutions that are, themselves, similar or close to existing ones. Therefore, it is very probable that, in this world of Google searches and Pinterest boards, students may easily come across existing solutions to whatever problem they have to solve.

If students can easily find a solution to their design problems, they will fall short of the expectations for higher-education learning objectives; learning objectives usually follow the taxonomy defined by Bloom et al. (1956), where the author argues that student knowledge should move from lower-level cognitive dimension (dealing with the recall of factual knowledge) to higher-level ones (that cover creativity and integration of facts into personal knowledge frameworks). A design assignment should, therefore, guide students towards the upper end of their cognitive abilities (Anderson & Krathwohl, 2001), and this is the challenge design educators face, to offer a rich educational learning experience that encourages students to operate at their highest cognitive capacities.

As such, to make things more thought-provoking and the design process learning more meaningful, we felt the need to create a new kind of challenge, consisting of problems *without prior existence*. So, we took it upon ourselves to design a new kind of design assignment; one that contains in itself a process to generate a new kind of problem, different for each student, each with its *own peculiar list* of constraints.

In a first iteration, some years prior, a similar type of assignment had been tested in another context (with first-year design students from Lusíada University of Lisbon) and with different purposes: it was originally used to generate objects devoid of practical functions, focusing solely on their material, sensorial, and symbolical aspects. It was described as a "'reverse assignment' – [where] each student [started] with a verbal definition drawn up at random, to try to find (build) an object that matches it […] instead of looking for the exact words to better define an object, each [student] should create the object that best [fitted] the words, the definition". Borrowing the title from a book by Portuguese surrealist poet Alexandre O'Neill (1924–1986), *"Uma coisa em forma de assim"* (which, tentatively, could be poorly translated as "A thing shaped like so"), the assignment proposed the construction of a surrealistic object from a set of characteristics defined from the last six digits of the student's national identity card number, according to a formula/sentence (see Table 14.1), that should read as *something [A] that [B] full of [C] made of [D] and*

Table 14.1 The algorithm table used in the assignment "*Uma coisa em forma de assim*"

	0	1	2	3	4	5	6	7	8	9
A	aggressive	fake	flashy	deceptive	ironic	mechanical	shy	exact	romantic	calm
B	opens	swings	hides	bends	bursts	sings	extends	reads	grows	moves
C	scents	sounds	buttons	flowers	shadows	clouds	letters	strings	holes	wings
D	wood	fabric	plastic	metal	glass	sand	paper	foam	mirror	rubber
E	heavy	dirty	elastic	light	warm	smooth	cold	rigid	rough	slimy
F	white	transparent	mate	green	yellow	sparkling	red	translucent	dark	blue

that is both [E] and [F]. So that a student with an ID card ending in 012345 would have to come up with *something **aggressive, that swings, full of buttons, made of metal, both warm and sparkling***.

Based on a descriptive formula concerning material aspects and appearance – *physical traits* – the assignment resulted in objects that, even if potentially very funny and surprising, lacked any functional requirements and, as such, were partly missing the type of thinking design students need to practice and exercise. It was done within a longer pre-Bologna process undergraduate course, where there were opportunities for more experimental work. The main idea, though – that of generating objects from a set of randomly combined features resulting in individual assignments – proved to work well and seemed to make even more sense in this new context.

The new iteration, called "Geringonça"[2], a Portuguese word for something somehow clumsy that solves a practical problem – a contraption – was designed so that the resulting individual assignments would involve solving a practical (even if not realistic) function.

In a way, the assignment is, in itself, a contraption – its purpose to randomly generate an object defining formula that would translate into a design problem. Doing it in such a way that:

1 Students would be forced to solve a design problem without having to deal with a very open set of conditions. On the contrary: all aspects are narrowed, so that they have to choose between fewer options.
2 Students would not be able to find solutions to similar problems online (for the simple reason that there were no similar problems: they would be dealing with problems with *no past*).
3 Students would not be conditioned by the preconceived ideas (and/or shapes) about the *right form for a known function*.
4 Each student would have a different set of constraints – and thus their own particular problem – and for that reason would have one more reason to deal with it on its own.

To do this, we created a way to generate different problems, defined by (a) the function the object should (help to) carry out, (b) the conditions in which such function should be fulfilled, and (c) a few material characteristics the object should satisfy.

These aspects were organised in an algorithm-generating table as shown in Table 14.2. In the end, the algorithm should result in a function/object described by a sentence that should read something like: **a contraption to carry** (something) **on** (a specific site/situation) **made of** (a pre-existing object) **that has** (some specific material component) **and is** (a subjective quality defined by an adjective).

Again, to define each individual problem, the number of each student's ID card was used, specifically the last five (out of eight) digits, which are less prone to repetitions. The employment of this formula guarantees the individuality of

Table 14.2 The algorithm table for generating each contraption's requirements/constraints

	Tens of thousands	Thousands	Hundreds	Tens	Units
A contraption	to carry...	(where)	made of...	that has...	and is...
0	2 dozen eggs	on sand	a wooden box	a handle (to push)	silent
1	6 empty wine bottles	up a ramp	a plastic box	a cable (to pull)	noisy
2	3 kilos of sand	on a polished floor	a cardboard box	a lid (that closes/opens)	discreet
3	3 liters of water	on top of a wall	a bucket	a big wheel	exuberant
4	3 kilos of oranges	on water	a flexible pipe	one or more small wheels	bright
5	2 sets of table cutlery	on cobblestones pavement	a rigid pipe	a handle (to pull)	dark
6	9 empty beer bottles	on grass	a wicker basket	skis/blades	soft
7	1 pumpkin	up some steps	a plastic bowl	one or more brushes	rigid
8	12 paperback books	down some steps	an old chair	a mirror	smooth
9	3 pairs of shoes	on a dirt road	an old pot	one or more suction cups	elegant

each problem that – symbolically – is the *translation of each student identity* (alternatively, one could use the last five digits of each student's mobile phone number – one that might be even more identity-defining…) Thus, an ID card with a number ###09727 would result in a design problem defined by the following sentence (Table 14.3): *a contraption to carry two dozen eggs on a dirt road made of a plastic bowl that has a lid (that closes/opens) and is rigid.* After considering the resulting sentence, each student had the possibility of making one change to their formula/problem.

The development of the design process is not very different from any other that might be based on some more realistic premises. Each student has to solve all the problems presented: how to carry a specific load on real conditions (surpassing the difficulties that arise from locomotion on sand, grass or water, for instance) considering ergonomic or safety aspects; how to solve the technical and construction problems that arise from the assembly of a plastic or wooden box with a big wheel, some brushes or an handle of some kind; and, finally, to consider every design decision envisioning some sensorial or subjective qualities of the resulting object.

At the same time, the exercise's theme summons a design stance that incorporates existing materials/objects into problem solving. The aim is to awaken first-year students to responsible practices (both as consumers and as designers) through the awareness of the potential for re-using objects and materials, for repairing objects, and the importance of a close, manual relationship with materials.

Table 14.3 The result of the algorithm after using the ID card number key 09727

	Tens of thousands	Thousands	Hundreds	Tens	Units
A contraption	to carry…	(where)	made of…	that has…	and is…
0	2 dozen eggs	on sand	a wooden box	a handle (to push)	silent
1	6 empty wine bottles	up a ramp	a plastic box	a cable (to pull)	noisy
2	3 kilos of sand	on a polished floor	a cardboard box	a lid (that closes/ opens)	discreet
3	3 liters of water	on top of a wall	a bucket	a big wheel	exuberant
4	3 kilos of oranges	on water	a flexible pipe	one or more small wheels	bright
5	2 sets of table cutlery	on cobblestones pavement	a rigid pipe	a handle (to pull)	dark
6	9 empty beer bottles	on grass	a wicker basket	skis / blades	soft
7	1 pumpkin	up some steps	a plastic bowl	one or more brushes	rigid
8	12 paperback books	down some steps	an old chair	a mirror	smooth
9	3 pairs of shoes	on a dirt road	an old pot	one or more suction cups	elegant

The assignment, with slight variations, was used within the nuclear UC (12,5 ECTS) of the First Year of the Undergraduate Course in three consecutive years (2016–17, 2017–18, 2018–19), each time with two classes ranging between 25 and 30 students and 45 hours of in-class work being tutored by five different teachers.

Results

Generally, the assignment was very positively received by the students. An initial feeling of amused bewilderment, followed by some natural perplexity, soon became an entertaining challenge that led them to start thinking critically about design. Without the safety net of a gallery of images and ready-made solutions, the students had to find their own way. While this is just one assignment, we feel that it may be replicated on different instances (in fact, there are already some experiences being carried out on the Fashion Design course on our faculty.) In its several iterations, the properties table has been adjusted.

The results we present below illustrate the type of artefact the students developed (Figures 14.1–14.3). However, examples of the finished product cannot convey how the design process unfolded in each case. The distinction between process and output is vital in design education. Students learn how to design by doing it, the finished artefact is but the outcome of the design process, but we can go as far as to say that the artefact is not the pedagogical aim.

In this case, our goal was to set the stage for a valuable pedagogical experience. We wanted students to experience the design process as an open-ended and unpredictable

Figure 14.1 Design formula: 09727 – a contraption to carry two dozen eggs on a dirt road made of a plastic bowl with a lid and that is rigid.

Source: Work and photo by student Bernardo Sousa, 2017.

journey. From this perspective, the exercise resulted in as many distinct journeys as there were students. Also, the exercise had a significant impact on classroom dynamics; the room was constantly filled with work-in-progress models, half-functional prototypes being tested, and an assortment of varied and unusual materials spread on desks (and the floor). What is more, students were visibly curious about each other's assignments and got involved with their colleagues' ongoing projects, which reinforced the typical social aspect (Dannels, 2005; Wang, 2010) of a design studio setting.
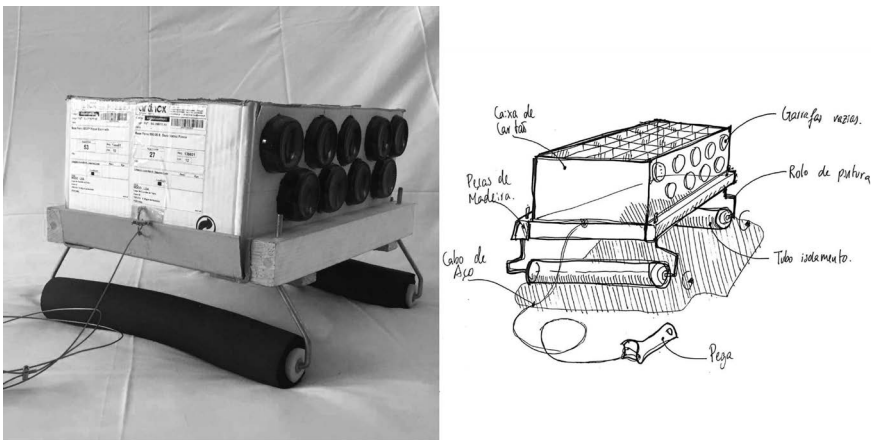
Figure 14.2 Design formula: 65526 – a contraption to carry nine empty beer bottles on cobblestones made of a cardboard box with a handle to pull and that is soft.

Source: Work and photo by student Pedro Santos, 2018.
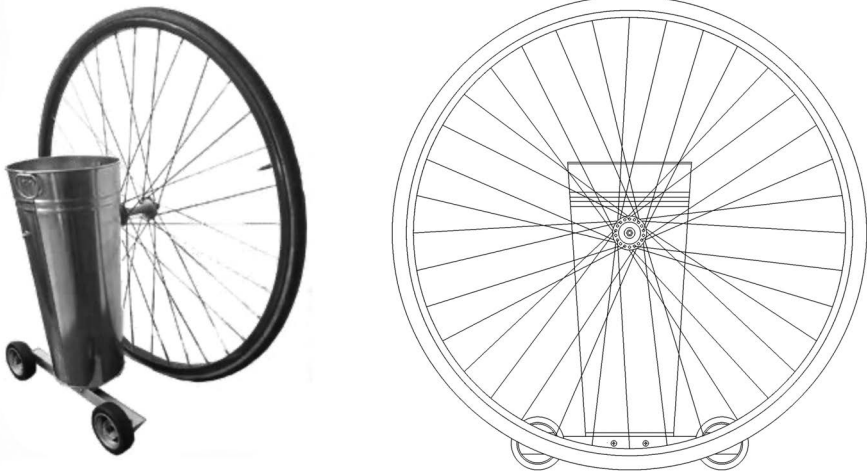
Figure 14.3 Design formula: 39339 – a contraption to carry three litres of water on a dirt road made of a bucket with a big wheel and that is elegant.

Source: Work and photo by student Laura Alves, 2018.

Discussion and Conclusions

This assignment aims to stimulate design capabilities, confronting students with a design problem with *no formal past*. Forcing such a *tabula rasa*, one intends to enhance the ability to interpret and solve design problems without constraints resulting from prejudices (functional or formal), for one, and to go past the catalogues of images and ready-made solutions, for another. It is not one's purpose to force originality for originality's sake. If anything, we aim to encourage the sense of discovery through the design process. To rediscover the way of discovering the ways.

To encourage students to explore formal solutions without clear antecedents is not uncommon in design education; for instance, Rowenna Kostellow's pedagogical approach developed at the Pratt Institute (Hannah, 2002) included a whole semester of formal two-dimensional (2D) and three-dimensional (3D) studies that focused on developing 2D shapes and 3D artefacts without a function; and a similar propaedeutical was established in both the Bauhaus (Itten, 1975) and the Ulm school (Müller & Spitz, 2013). Our case, however, attempted to go beyond the study of form to include an unexpected *function* (the purpose of the artefacts was always *to carry something*) and a series of constraints not unlike the kind one expects in a conventional design brief (materials, features, and characteristics). This renders the case we present somewhat unique.

Of course, this also presents a challenge for design educators who are forced to discuss as many different design problems as there are students in class, and they must do it with the same kind of restrictions as the students (no *notable examples,* no *user groups,* no archetypes, etc.) They, too, will have a problem to solve. But there is an even greater challenge for all (one that this particular assignment tried to

address through a very peculiar method, but that can take multiple different forms): the constant need to reinvent the type of challenges presented to our students in order to keep alive the anxieties and the pleasure that come with every process of discovery.

The tool we described can be altered to fit into different design disciplines (as we stated before, there is already an ongoing experiment in a fashion course) and potentially within more advanced stages of a course; although, considering its exploratory and fundamentally pedagogical nature, we feel the exercise is at home somewhere within the first two semesters of a design degree. Furthermore, it is interesting to note the decisive impact of the assignment for the dynamics of the class as well as, of course, the students' pedagogical experience; in fact, we can confirm that the project briefing is one of the most powerful tools in the pedagogical toolbox of a design teacher.

Acknowledgements

Notes

1 "Design Q&A". *Eames Office*, 15 Sept. 2014, www.eamesoffice.com/the-work/design-q-a-text/
2 In 2015, the word had just gained new visibility – and a renewed meaning – as it was used by a right-wing politician to baptize a new left-wing coalition that, unexpectedly, became the parliamentary support for a new government.

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15 Design Thinking and the Proximity Argument

The Case Study of Engineering
Students at a Portuguese University

Violeta Clemente and Fátima Pombo

University of Aveiro, Aveiro, Portugal

Introduction

Design Thinking (DT) has been well established within design research discourse since the late 1980s to the early 90s and focusses on understanding the processes, movements and methods by which designers address problems and perform their design activity. Since then, DT has captured the interest from other fields and multiple DT models and perspectives have emerged. DT is currently seen as a useful paradigm to manage problems in many professions other than design, as is the case of engineering (Dorst, 2011).

Aiming to complement the "analytical approaches conventionally taught in engineering schools", DT is "spreading within engineering curricula" (Dzombak and Beckman, 2020, p.574). Evidence of such "spreading" is seen, for example, by the fact that a simple search performed at Google Scholar in November 2021, using the descriptors "design thinking" and "engineering education" ("and" being the search operator) returned 1630 results just for the year 2021. Thus, efforts to "embed Design Thinking into (…) classroom experience", have been made not only individually by engineering educators who recognize its value, but increasingly more at an institutional level, with universities making a deliberate effort to formally include DT within engineering education through a "variety of settings, both curricular and co-curricular" (Dzombak and Beckman, 2020, p.574).

Recognizably, this popularization of DT has its advantages. The REDES 2022 Conference theme provided an opportunity to discuss the advantages of proposing Proximity as enhancing "the ability to cross fields and remove boundaries to collaboration between disciplines" (REDES, 2021 website). In fact, DT dissemination among other academic areas certainly has revealed the value of 'designerly' ways of thinking (Cross, 2001) and promoted interdisciplinarity cooperation with potential benefits for all parties. At the same time, it must be recognized that, frequently, some of the core elements of 'designerly' ways of thinking are lost in translation in those popular versions of DT (Johansson-Sköldberg, Woodilla, and Çetinkaya, 2013). From our experience as educators, namely with engineering and technology students, there are usually four major 'lost in translation'

issues, when teaching DT. Prompted by the REDES 2022 challenge to redefine the concept of Proximity, we proposed to explore how the concept of Proximity was involved in these four issues.

Thus, this work does not address how teaching DT to engineering students might contribute to Proximity between design and engineering academic fields, as would be probably expected. It shifts the focus to a different approach which is to add evidence of obstacles within the process of teaching-learning DT activities involving engineering students. By engaging ourselves in a creative exercise, and taking the conference theme as a spark, we deliberately stretched and played with the word Proximity and its various meanings to comprise four DT learning issues. In the following sections, we discuss the approach of the Proximity argument.

Proximity as Contiguity

One of the first difficulties of teaching and learning DT is the fact that it is sometimes simplistically viewed as an exclusively creative process, aiming only at idea generation. This view puts the spotlight on ideation, whereas other skills involved, including, for example, problem definition, empathy, prototyping and testing, are relegated to an inferior position or simply ignored:

> Design thinking is often equated to creativity: Sometimes the popular version 'design thinking' is presented as a way to make [people] think more creatively. But being creative is only part of the competence and practice of the designer's work.
>
> (Johansson-Sköldberg, Woodilla and Çetinkaya, 2013, p.131)

We called this Proximity issue "Proximity as Contiguity". While the word "contiguity" is a synonym for Proximity, referring to entities that are so close they make contact. However, it has a different meaning in psychology: "the sequential occurrence or proximity of stimulus and response, causing their association in the mind". According to the American Psychological Association (APA) dictionary, the law of Contiguity is a "principle of association stating that forming connections between ideas, events (e.g., stimuli and responses), or other items depends on their proximity in space or time" (American Psychology Association Dictionary, n.d). Because DT is addressed to solve open, ill-defined problems, which require a creative approach, it is often associated with ideation, divergent thinking (thinking in numerous possibilities and multiple ideas), creative thinking or even the well-worn buzzwords of "thinking out-of-the box". While this conceptualization of DT is not necessarily wrong, immediately taking DT as an interchangeable term to ideation is a reductive perspective of DT that does not recognize its full potential.

So, the problem we call Proximity as Contiguity is that of two concepts, DT and creativity are so interconnected they become indistinguishable. Even

if one must recognize that creativity and innovation are almost always connected with DT, either explicitly or not, DT involves other attributes and skills such as user centredness, problem-solving and decision-making, iteration and experimentation, gestalt view, tolerance to ambiguity and failure and balance between intuitive and analytical thinking, among others (Micheli et al., 2019). The limited perspective that simplistically equals DT to creativity, taking the part as the whole, constitutes a pivotal obstacle to understand and apply DT fully potential.

Proximity as Immediacy

Another misunderstanding about DT is to see it superficially as a toolbox, easy and ready to use, even by people without knowledge on the subject:

> (…) Design thinking is often equated to a toolbox: Sometimes the popular versions focus on the designer's specific methods taken out of context, as tools ready for use, but the person using the tools must have the knowledge and skill – competence that comes with training – to know when to use them.
>
> (Johansson-Sköldberg, Woodilla and Çetinkaya, 2013, p.131)

We called this misconception "Proximity as Immediacy" due to the fact it wrongly assumes a utilitarian view of DT as it is only a set of nearby hand tools, immediately accessible, that almost anyone can grab and use, without further concerns or knowledge. It is our conviction that although DT tools are easily available, their correct use requires the mastery of certain skills, namely thinking skills, without which one risks to produce misguided or even fruitless outcomes. The same way having a hammer doesn't mean someone knows what to do with it, trying to apply DT tools without understanding its movements and the cognitive skills it requires will probably lead to very poor results (Clemente, Tschimmel and Vieira, 2017).

Mastering DT movements involves the ability to iteratively review solutions as they co-evolve with the problem (Dorst and Cross, 2001) as well as alternate between moments of divergence and convergence, when alternative ideas are explored and judged, respectively (Cross and Roozenburg, 1992).

Ideally, learning of DT also needs to include the explicit learning of meta-cognitive competences. Metacognition, or thinking about cognition, involves self-knowledge and control skills for regulating one's cognitive activities. Metacognitive skills are related "with awareness, observation, reflection and analysis which is needed to become an independent learner" (Sart, 2014, p.131). In previous works, we argued that the learning of DT also needs to include explicit learning of metacognitive competences and that to move through the DT process, students have to develop the ability to self-reflect on their own cognitive abilities, which constitutes a form of metacognition (Clemente, Vieira and Tschimmel, 2016).

Proximity as the Inability to Zoom Out

Another major difficulty we usually find as DT educators is related to the ability of "zooming out" from the problem, looking to the "wider context" of the problematic situation (Dorst, 2015, p.103). When the problem is seen uniquely from a closer distance, a Proximity issue rises because peoples' horizon is constrained, ignoring the variety and complexity of factors gravitating around and influencing the problem.

Without the skills to question the problem situation, people "immediately think about the solution, without really understanding the problem" (Tschimmel and Satiro, 2021, p.165). That leads to the "solutionist" approach, meaning that solutions are delivered before questions have been "fully asked". What sometimes happens is that people become so "seduced" by a "big idea" which usually already includes some kind of "solution", that the problem is "dumbed down" to meet the solution. The real problem is not addressed because an artificial problem is settled to fit the already defined solution (Blythe et al., 2016, p.4968).

That is well illustrated by the well-known exercise of the nine points: nine points aligned in 3×3 matrix must be joined by just four straight lines, without lifting the pencil from the paper. We tend to immediately imagine a square bordering the 3×3 points matrix and try to draw the four lines inside this imagined square, which is impossible. In fact, the square is not there, it is an invisible and inexistent boundary our mind creates, limiting our perspective and restraining us from finding a solution beyond this artificial barrier. Similarly, when approaching a problem, we tend to create obstacles, limits and assumptions that don't exist. Without the ability to fully ask what the problem is, we risk solving the wrong problem and finding a wrong answer. The nine points exercise is an excellent demonstration of the "premature closure of Gestalt" (Tschimmel and Sátiro, 2021, p.124). While this tendency usually helps us to have a better perception of the information received, it also reduces our tolerance to deal with the mental tension or restlessness of uncertainty and incomplete ideas.

Proximity as Attachment

Given our difficulty managing the discomfort of not having a solution to the problem, as explained by Gestalt theory, "we easy fall in love with our first ideas" (Tschimmel, 2019, p.118). This affective attachment to one's early solutions, which can be considered a case of unproductive Proximity, is related to the sunk cost effect, which happens when someone becomes so attached to a given solution that he/she is unable to abandon it or even change it. One of the causes of this attachment is the fear of losing resources such as money, time and effort which were already invested in developing those early ideas (Nguyen and Zeng, 2017; Viswanathan and Linsey, 2011).

The problem of immediately pursuing early stage ideas is that it might lead "to attachment and a premature closing of the problem space" (Dorst, 2015, p.78). Attachment to early solutions also ignores the fact that problems are not static. The

DT approach requires both problem and solution to co-evolve iteratively, until a "matching pair problem–solution" is found (p.59).

We have established the four Proximity issues that constitute the object of this case study and in the next section, we move to the description of the research methods.

Methods

Following a qualitative approach, this chapter reports a case study about the perceptions of two classes of second-year engineering students, from a Portuguese university, regarding Proximity issues when learning DT within a four-week learning module.

Research Questions

Our goal was to explore students' perceptions in two distinct moments: at the beginning of the four-week module and near the end. Within this framing, our analysis was guided by the following research questions:

1 About Proximity as Contiguity, what is revealed about students' awareness on the distinction between DT and ideation?
2 About Proximity as Immediacy, what is revealed about students' misconception of DT being like a "toolbox"?
3 About Proximity as the Inability to Zoom Out, what is revealed about students' beliefs about the necessity to fully explore the problem situation?
4 About Proximity as Attachment, what is revealed about students' attachment to their first ideas?

Course Overview

During the year 2021/2022, a Portuguese university added two new "Transferable Skills I and II" units to engineering curricula, respectively, in the first and second semesters of the second curricular year. Among the different modules offered at the first semester unit, a DT module with four weeks of extension and three hours a week, for a total of 12 hours, was included. The module was lectured by this chapter's authors. Course contents were organized according to Table 15.1.

Evaluation consisted of having student work with a maximum of five students per team, and present a Design Fiction scenario at the end of the four weeks relating it to the themes of Sustainability, Future and Technology. The presentation was complemented by the delivery of any artefacts or prototypes supporting the presented Design Fiction scenario and a 1000- to 1500-word written essay describing the development process.

Participants

The total number of students assigned to the module was 186, organized into six classes, ranging from 20 to 50 students per class. Table 15.2 shows the courses involved and student distribution per course.

Table 15.1 Design Thinking module course overview.

Week (3h/week)	Contents
1st week	From Bauhaus to New European Bauhaus. Design Thinking Expectations: Pre-Module Questionnaires.
	Design Thinking Models Overview. The Model Evolution 6^2.
2nd week	17 United Nations Goals for Sustainable Development (UN GSD). Design Thinking Dynamics: Divergence, convergence, interactivity. Problem Emergence Phase. Tools: Opportunity Mind Map and Intent Statement.
3rd week	Empathy Phase. Tools: Stakeholder Map, Personas, Empathy Map, Users' Journey.
	Experimentation or Ideation phase. Creative Thinking Characteristics: Fluency, Flexibility, Originality and Elaboration. Tools: Analogies and Semantic Confrontations.
	Elaboration Phase: The Value of Prototypes (Marshmallow and Spaghetti Tower activity)
4th week	Exposition (Communication phase) Tools: Storytelling. Cognitive Science behind Storytelling.
	Re-evaluation of Design Thinking Expectations: Post-Module Questionnaires.
	Evaluations: Student Oral Presentations, Written Essays and Prototype Delivery.

Note: The Design Thinking Model adopted within the module was the Evolution 6^2 from mindshake.pt (https://www.mindshake.pt/design-thinking/).

Table 15.2 Students' characterization by course and gender.

	Students	Male	Female
1st cycle degree in Electrical and Computer Engineering	27	25	2
1st cycle degree in Industrial Engineering and Management	15	8	7
Integrated Masters in Industrial Engineering and Management	14	8	6
1st cycle degree in Computer and Informatics Engineering	52	42	10
Integrated Masters in Computer and Telematics Engineering	23	20	3
Integrated Masters in Electronic and Telecommunications Engineering	10	7	3
1st cycle degree in Physics Engineering	7	5	2
Integrated Masters in Physics Engineering	3	1	2
1st cycle degree in Environmental Engineering	1	1	0
Integrated Masters in Biomedical Engineering	3	1	2
1st cycle degree in Materials Engineering	16	9	7
1st cycle degree in Computational Engineering	3	3	0
Integrated Masters in Computational Engineering	4	2	2
1st cycle degree in Mechanical Engineering	3	3	0
Integrated Masters in Mechanical Engineering	1	1	0
Integrated Masters in Civil Engineering	4	2	2
Total	**186**	**138**	**48**

Three rounds of the module took place during the semester, beginning in October 2021 until January 2021. Classes 1 and 2 between October 14, 2021 and November 15, 2021, classes 3 and 4 between November 18, 2021 and December 16, 2021 and classes 5 and 6 between December 20, 2021 and January 24, 2022. During the semester, the system of class rotations allowed students to attend other modules that were also part of the Transferable Skills Unit. At the time of this submission, only the first round (classes 1 and 2) had finished the module (classes 3 and 4 were still occurring and classes 5 and 6 had not started yet). For this reason, results here are presented relative to approximately one-third of the students. A total of 84 students were assigned to the first two classes, 34 for Class 1 and 50 for Class 2. From them, an average of 60 students, approximately 20 in Class 1 and 40 in Class 2, attended lessons regularly.

Data Collection Instruments

Aiming to answer the research questions mentioned previously, two instruments were applied. First, a questionnaire with four questions, each one addressing one of the Proximity issues described previously.

Since our case study followed a qualitative methodology, the questionnaire had no intention to provide statistic results, but provide a mean to explore and discuss student perception. In fact, the questionnaire was applied not only as a data-collection instrument, but more significantly as an educational tool. The questionnaire was made available online through Mentimetre (www.menti.com), and students had the opportunity to vote in the classroom by using their smartphones. The platform creates immediate graphic information about student answers than can be shared and discussed with the class. Table 15.3 summarizes the questions included in the questionnaire.

Each question was formulated to explore one of the Proximity issues, but not directly, as the goal was not only to collect data but to promote discussion within the class. Using the fact that www.menti.com immediately turns results into graphics, students' answers were examined and discussed in the classroom. In the first lesson, the pre-questionnaire allowed us to take the pulse of the students' expectations and to nurture their interest about DT. The post-questionnaire was applied at the penultimate lesson, as the last one was reserved for student presentations. The post-questionnaire provided a new opportunity to deconstruct some student misconceptions. At this point, we should admit that, while this double function was an interesting feature given the short length of the module, it certainly introduced some limitations regarding the questionnaire's research utility. In addition to the questionnaire's answers, essays written by student teams were examined through the content analysis method, considering the four Proximity issues and categorizing each unit analysis according to what were classified as correct or incorrect perceptions.

Table 15.3 Questions included in the questionnaire.

Question 1. Design Thinking contribution to solve 'real life' engineering problems is mostly related to:

Finding the problem	Understanding the problem	Ideating solutions	Evaluating solutions	Detailing solutions	Communicating solutions	Other

Question 2. Some of the Design Thinking tools potentially useful when solving real-life engineering problems that I know and am able to apply are:

Brainstorming	Storytelling	Empathy map	Analogies	Role playing	Mind map	Other

Question 3. A 'real life' engineering problem should be initially approached by:

Strictly adhering to a 'recipe' that has already been proven to work on similar situations	Dividing the problem and then solving parts of it	Writing down all the 'input data'	Clearly establishing the boundaries of the problem	Complexifying it, acknowledging all the issues gravitating around the problem's situation	Getting rid of complexity by considering approximations and/or simplifications	Other

Question 4. When solving a 'real life' engineering problem it is important to...

Stick with our 'first idea', because it is usually the 'right one'	Stick with our 'first idea' to have more time to develop it	Stick with our 'first idea' because, coming from our intuition, it is usually the most original one	Explore numerous ideas until we find the 'right one'	Explore numerous ideas because it improves the chances to find an original one	Other
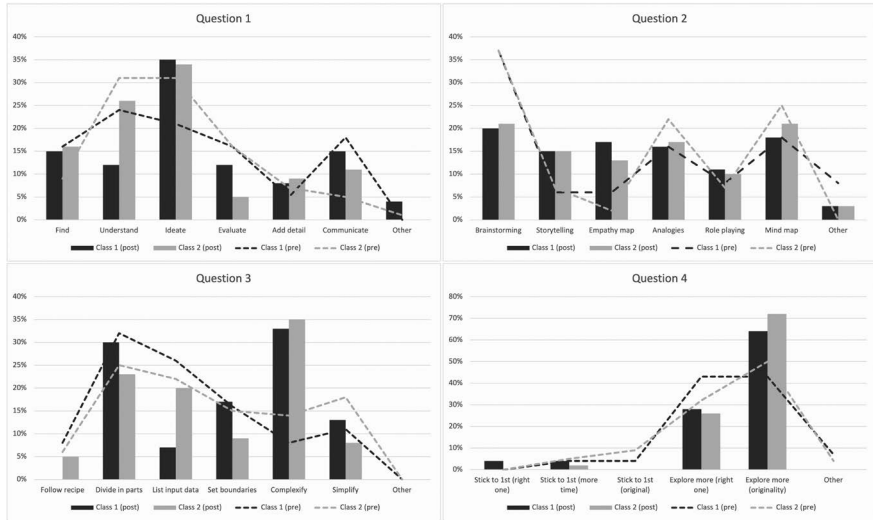
Figure 15.1 Pre- and post-questionnaire results.

Results and Discussion

Figure 15.1 shows the results, in percentage, for the total of students answering pre and post-module questions 1 to 4. The pre-questionnaire was answered by 60 students, 19 from class 1 and 41 form class 2. The post-questionnaire was answered by 59 students, 20 from class 1 and 39 from class 2. Percentages were automatically calculated by www.menti.com. Tables 15.4–15.7 categorizes students quotes, taken from the written essays as unit analysis, regarding the four Proximity issues. It should be noticed that team 4 from class 1 and teams 4, 6, 7 and 11 from class 2 didn't made any reference to the DT process in their reports, choosing to focus only in the result explanation. That is the reason why there are no transcription from these essays.

Regarding Proximity as Contiguity, which is related to the misunderstanding about DT being mostly about Ideation, answers to Question 1 show that in both classes, the problem, which was already visible in the pre-questionnaire, only aggravated in the post-questionnaire, with "Ideate" values raising from 21% to 35% in Class 1 and from 31% to 34% in Class 2. A possible explanation to this result would that the evaluation method consisting of a Design Fiction scenario emphasized the originality of the presented proposals, even in the way of communicating it. That could have led students to put their focus intensively on the Ideation phase. For example, the Team 1, Class 1 interpretation of the evaluation goal was the following: "we were challenged to invent something futuristic and different from the conventional "Out of the box". Another possible reason can be the fact that creativity was much more emphasized in this module in comparison with engineering regular curricula. According to the Team 8, Class 2 essay: "it is important to mention that it was only possible to develop such a project due to the soft skills

Table 15.4 Proximity as Contiguity-related student quotes.

Correct perception	Incorrect perception
In order to facilitate the process (...) we applied the Design Thinking [model], namely, three of (its) six phases (...): Emergency, Empathy and Experimentation. (Team 3, Class 1)	
For the Emergency phase, we created a Mind Map (…) starting with the 17 ONU SDG (...) Of these, we retained two and finally selected Modern Renewable Energy (...) An intent statement also helped us define the beginning and next steps (...) For the empathy phase, we created four personas that represent various user profiles (...). In the Experimentation Phase, we applied a technique named semantic confrontation (...) on one side a falcon (...) known for its long-range vision and on the other side a robot with a thermal camera. In the Elaboration phase, we draw a SOLIDWORKS 3D model to have a more realistic view (of the prototype). (Team 5, Class 1)	
We searched for a series of techniques to generate, mould and work with our ideas (…) we understand that an idea is a complex process and not just a 'static' end. (Team 5, Class2)	
The followed Design Thinking model (…) consists of several stages, namely: Emergency, Empathy, Experimentation, Exposition, among others. However, given the fact we only had about a month to develop the work, it was not possible to explore all (…) the model has to offer, so we only covered the 4 stages described in the following sections. (Team 8, Class 2)	Ideas Generation: In the initial phase of this project, we held a brainstorming meeting to visualize economic, political, environmental or social issues for which we would consider interesting to develop a technological solution. (Team 10, Class 2)

and techniques instilled by Design Thinking (…) that allowed us (…) expand our thinking and perspective (…), as it is a course that encourages the use of different strategies than those usually applied in engineering".

However, for some teams, the fact that DT encompasses much more than just Ideation was demonstrated by their essays, as showed in Table 15.4. At least three teams describe with some detail the different phases of the DT process. A very interesting observation was made by Team 5, Class 2, when pointing to the "complexity" of the process referring that an idea is not a "static end", which possibly

Table 15.5 Proximity as Immediacy-related student quotes.

Correct perception	Incorrect perception
Throughout this work, we tried our best to internalize the techniques and methods that were transmitted to us (…) never adhering only to a recipe with well-defined steps, but, instead, to techniques that allowed us to freely explore the ideas that came to us. (Team 1, Class 2)	
(…) we applied the Storytelling technique, after having conveyed its importance, making up stories about their lives and difficulties they went through in order to trigger feelings of empathy in the audience, through the induction of oxytocin. (Team 8, Class 2)	

indicates these students not only understood the iterative nature of the process but also, that this process involves more than just finding ideas.

For the topic of Proximity as Immediacy, which is related with the utilitarian view of DT, Question 2 asks which DT tools students know and feel able to apply. The questionnaire allowed students to select how many answers they want. At the pre-questionnaire Brainstorming was, by far, the most voted option. At the post-questionnaire, answers were much more equality distributed in both classes. Throughout the course, professors tried to emphasize that is the comprehension of the cognitive processes underlying the use of the tools that, in last analysis, determine

Table 15.6 Proximity as Inability to Zoom Out-related student quotes.

Correct perception	Incorrect perception
In the beginning of our work (…) we made the mistake of letting ourselves be carried away by our more rational and analytical side (…) we soon realized that we were diverging the wrong way, looking for solutions to problems rather than problems themselves. (Team 2, Class 1)	We wrote the Intent Statement where we defined which problems our product would try to solve, which our target audience, then we also worked on trying to answer how our product would solve the problems. (Team 1, Class 1)
[DT] is extremely useful in deciphering problems that are unknown and not decodable at first glance. (Team 9, Class 2)	After carrying out the techniques and phases of Design Thinking learned in class, the solution to the thought problem was (…). (Team 3, Class 2)

Author's note: Even though students from Team 3, Class 2 mention 'techniques' and 'phases' as well as the 'thought problem', it should be noted that none of these were clearly described, identified, or explicitly formulated in their text.

Table 15.7 Proximity as Attachment-related student quotes.

Correct perception	Incorrect perception
Through brainstorming, after several initial proposals that were eventually discarded, we reached a consensus on which one we were going to work on. (Team 1, Class 1)	
Of these ideas, artificial intelligence was the most accepted by the group, but it still would not be the topic, as it was decided that better ideas could arise and so, it was agreed that in a week the group would meet again to make a decision on the idea be worked on. (Team 2, Class 2)	
(…) we went through moments similar to a pendulum: we both advanced in the production and development of ideas and immediately went back to our initial state, always pondering new perspectives. (Team 8, Class 2)	

whether these tools produce fruitful outputs. For example, it was shown by a practical example that a Brainstorming session aimed at producing numerous and original ideas but lacked the metacognitive ability to turn off convergent, analytical and judgmental thinking, or without the domain of some creative thinking 'helpers', would hardly produce great results. Also, when the Storytelling tool was exposed, the focus was not on the technique itself but on the cognitive reasons about why it works, including the neuroscience behind empathy. It is noteworthy that Team 8, Class 2 applied this information when designing their own presentation to the class: "we applied the Storytelling technique (…) in order to trigger feelings of empathy in the audience, through the induction of oxytocin".

About Proximity as the Inability to Zoom Out, Question 3 answers reveal that on the pre-questionnaire, the majority of students chose to divide the problem into parts or apply approximations or simplifications. Those are, as students recognized, well-known and common strategies in the kind of problems solved in engineering courses. On the contrary, just a minority choose problem complexification, which would be the right choice (8% in class 1 and 14% in class 2). In the post-questionnaire, while some students still chose those strategies, a greater number chose the hypothesis of complexifying the problem, considering all the issues gravitating around it (33% in class 1 and 35% in class 2). Student essays also revealed this division. While two teams made declarations showing a correct perception about the necessity to Zoom Out, two other teams' affirmations still showed some weaknesses. For example, Team 2, Class 1 was able to admit that, at first, they were following a solutionist approach, "looking for solutions rather than problems". Also, Team 9, Class 2 recognized the necessity to fully explore the problem situation until "deciphering problems unknow or not decodable at first glance". In the opposite sense, however, affirmation from Team 1, Class 1 about writing the Intent

Statement to "define which problems" their "product would try to solve" indicated that the solution was defined before the problematic situation was "fully asked". And Team 3, Class 2 referred the solution to the problem they thought about, but without making any reference to what the problem was or how they made such a problem emerge. Regarding the five other teams that didn't make any reference to the process on their essays, it is not possible to verify to what extent the ability to Zoom Out was recognized. As an additional note, and even though the quality of the work produced by students is not the scope of this article, it was noticed that the teams that were able to better explain their Zooming Out process were, in general, those who delivered the more disruptive ideas.

Finally, Question 4 helps to explore student perceptions about Proximity as Attachment. Both in the pre- and post-questionnaire, students revealed that they understood that sticking with their first ideas was not good practice. We must admit the possibility that pre-questionnaire answers were probably biased by some content of first lesson, discussed before Question 4 was introduced.

But it is undeniable that it was only on the post-questionnaire that the majority of students showed understanding about the reasons behind it. The fact that the percentage of students choosing the hypothesis of "explore numerous ideas until find the right one" dropped from 43% in Class 1 and 32% in Class 2 to 28% and 26%, respectively, suggests that some students understood that open problems admit several right answers and not only one. Additionally, the hypothesis of exploring numerous solutions to increase the chances of finding an original one, was voted by 43% students of Class 1 and 50% of students of Class 2 in the pre-questionnaire, but these results grew to 64% and 72%, in Classes 1 and 2, respectively, in the post-questionnaire. Written essays, as shown in Table 15.7, reinforced that at least three teams clearly understood the value of not immediately fixating on their first idea. Team 2, Class 2 explicitly decided to delayed the closure of the problem for one entire week, recognizing that "better ideas could arise". An interesting analogy was given by Team 8, Class 2, whose students felt like they were moving like a pendulum, continuously advancing and receding, while seeking "new perspectives".

Final Remarks and Future Work

This work intends to bring awareness to the fact that, while undoubtedly beneficial, taking DT to engineering study programs is not necessarily unproblematic. Four common misconceptions about DT can potentially compromise learning programs' effectiveness were addressed. These four where selected due to our own experience as educators, being the misconceptions we find more common, especially among students from study fields other than design. The main contribution of this work is to address them in one unique study, advancing with some explorative empirical data.

Prompted by the conference theme, we challenged ourselves to play with the word Proximity and its various meanings to arrange the previously mentioned misconceptions around what we called an argument of Proximity, Contiguity,

Immediacy, Inability to Zoom Out and Attachment, where the categories we created to refer respectively to the following errors: taking DT exclusively as an ideation process, taking DT as a toolbox, ignoring the complexity of factors around a problematic situation and assuming an artificial problem and, finally, attaching to early ideas or concepts without allowing the problem and the solution to co-evolve.

The chapter describes a case study within the engineering context of a Portuguese university, which focused on student perceptions about DT related with these four categories at the beginning and the end of the course. Results from the first two classes of students, analysing pre- and post-questionnaire answers and written essays, confirm the existence of these four misconceptions.

In the next step, we intend to expand the analysis to include results from the remaining four classes and, therefore, to consider the quality of the work of all students. In future studies, our goal is to refine the data collection and to explore and test possible strategies to prevent and overcome these issues.

Acknowledgement

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Part III

Teaching-Learning Processes

16 Teaching-Learning Design through the Contingency of COVID-19

Juan de la Rosa, Fabio Enrique Fajardo, and Andrés Sicard-Currea

Universidad Nacional de Colombia – Sede Bogotá, Bogotá, Colombia

Introduction

One of the more recognizable characteristics of design is its tacit and embodied nature (Polanyi, 2009; Wong & Radcliffe, 2000; Budge, 2016; Varela, Thompson & Rosch, 2017) that has defined the predominance of the physical environments for teaching and learning and the defence of practice and design workshops as its main pedagogic tools. This characteristic was threatened by the sudden pandemic of COVID-19 that globally struck humanity and caused a significant reduction in actual time spent in classrooms, labs, and design workshops, as well as produced a shift towards new strategies and tools that allowed us to continue in the search and dissemination of design knowledge (Manzini, 2009; Nelson & Stolterman, 2014). This is not a recent concern, and it is part of an ongoing discussion about the nature itself of the knowledge that is produced through the process of design and the possible ways to access and formalize this knowledge (de la Rosa & Ruecker, 2020).

Although we can observe a growing tendency that predates the pandemic of 2020 to reduce physical spaces and classroom times, increase the use of virtual technologies, and the use asynchronous tools for teaching a technical background, it seems evident that there is an acceleration of this tendency that has come with social distancing and other biosafety measurements caused by the pandemic. It has also strengthened the question about the required times and spaces for teaching and learning design, tasks that traditionally implied long hours of workshop and guided craftmanship that relates to the master/apprentice learning paradigm.

Based on design education's nature of rapid innovation and flexible approach to uncertainty, we hypothesized the emergence of possible trends and ideas that can lead to a change in the way we see academic environments of teaching and learning, especially for design methods and processes. Therefore, this chapter presents a starting point based in the academic experiences of three educators of different fields and areas of design at Universidad Nacional de Colombia, and the qualitative data obtained by opinion-based surveys responded by a group of students that participated on their classes, with the intention to offer an analysis of possible effects on design education that the current pedagogical practices have brought as result of lockdowns and safety measures.

Conceptual Framework

Virtual education has been around for several decades now, and although it has reached many areas, the ones that present a higher challenge require non-traditional forms of knowledge, like embodied (Varela, Thompson, & Rosch, 2017) or tacit knowledge (Polanyi, 2009). This type of knowledge as defined by Polanyi (2009), is characterized by the difficulty to be formalized or transmitted as academic knowledge and in most cases the only way for the teaching-learning process resides in the master/apprentice model.

Historically, this approach has been predominant in design education (Archer, 1981) and the basis for workshops and labs as the main courses of its curricula, implying the physical presence of students and educators in a classroom. As stated before, we see these physical requirements as one of the main concerns with the current pedagogical tools for design education. This idea is based on the notion that the centre of the design process is located on the doing and the practical and reflective learning of techniques and practices (Schön, 1984). Yet currently, programs of design around the globe continued teaching their classes without those physical spaces, relying on virtual platforms to learn, teach, and evaluate through the pandemic.

These joined spaces of tangible education also brought together other main principles of design education: the multiplicity of voices and the spaces of deliberation and feedback that are basic on the design process and on design education. These inclusive spaces have several advantages for the design process, including the foundation for developing empathy towards others, the diversity of lenses for ideation and brainstorming, and the reflective feedback in the process of prototyping (Kumar, 2012). Although many of them are replicable in the virtual space, it seems clear that their origins and discovery are related to the physical spaces of collaboration.

Tangible spaces are also fundamental for the reflective research that has brought the tools and practices we now use to design research, Design Thinking, and design process, therefore, they seem irreplaceable to the advance of design theory and practice. Nevertheless, there are tacit components to virtual and online practice that this new post-pandemic reality can unveil to our eyes and provide future tools for the practice, therefore, the importance of reflection about these new practices.

Academic Experiences

The academic experiences presented in this chapter relate to three main categories: academic regular classes and courses; alternative spaces, like a thesis, talks, and seminars; and real-life experiences, like community and grassroot work. All these activities happened in virtual and digital spaces during 2020 and the collection of qualitative data focuses on the experiences of students and educators through these digital platforms. Although digital spaces for education are not new, we see the acceleration in the implementation of these platforms as the main space for design education as an opportunity for design research to understand possible scenarios of the future.

We see design as a systemic discipline that needs to be aware of the context (Sevaldson, 2017), yet in many educational experiences, we disregard the background of students such as where are they coming from and where will they return after they finish their studies, assuming their context as the here and now of the class. This is perhaps the first notion that was challenged because of the pandemic, the notion of ***place***, since the classes were not imparted in a physical space, many students decided to move out of campus, the city, and even country. Teaching the classes to students in different regions of the globe, like Colombia, the United States, China, or India, as well as rural and indigenous communities, created more awareness about the specificity of their contexts and their realities.

Challenging the existence of a common place brings the reflection of the specificity of spaces and contexts where the participants of the classes and activities inhabit. These new reflections generate among others:

- An increase on the awareness of the real conditions in which some students live.
- A higher sense of empathy towards the reality of the participants.
- The redefinition of practices like the in-class lessons, encouraging the characterization of class material that could be recorded and distributed as video-lectures for asynchronous view.

The newly recorded materials produced in and for the classes became a source for observation and contrast, providing a tool for reflective practice to educators as well as the basis for future classes. They also liberate some of the educators' time and produce a well-needed library of recollection of the tacit knowledge of the educators. In these types of activities, digital tools such as webcams and cell phones became fundamental allies, and digital platforms such as YouTube, Instagram, and WhatsApp became the daily space for educators to share, review, and provide feedback.

These new digital spaces extended the notion of ***situated practice*** that is a common idea to design, encouraging educators to look beyond its definition as a variable to the design process and recognize it as a reality for students (or future designers) that alters their perspective to the problems and their agency in those processes.

As mentioned before, another aspect that was challenged in the pandemic was the idea of creativity through tangible shared experiences. Design is based on creative practice (Daley, 1982), and perhaps this is one of the main challenges faced by teachers, students, and the community in general to carry out their activities in virtual spaces. This is especially true with courses that focus on the work with tangible objects, or through tangible processes at some stage of their work, such as the use of physical prototypes or cultural probes. We noticed that this issue might not have been as abrupt for disciplines such as graphic design, where many tools even before the pandemic have a high digital content.

Virtuality required new forms of design exercises including asynchronous collaborative work followed by individual tangible practice with what students or

communities had in their environment. In this sense, the work with communities was particularly interesting, since it allowed us to search for alternative tools, such as workshops in Zoom or Google Meet, use of cell phones, toolboxes for prototyping, and online data collection. This situation makes us think that this may be a future strategy to face the problems of mobility, time, and presence of the participants (de la Rosa et al., 2021).

Virtual spaces also created new possibilities for exchange, both locally and globally; as the place and travel times vanished, the classroom became a space to collaborate. Educators found opportunities for collaboration and joint efforts. Classes everywhere experienced the chance to invite practitioners, academics, and researchers from around the world, to share and discuss their papers and give feedback and share experiences with students and participants, allowing a transcultural conversation among realities that is very scarce for developing countries. It also allowed the participation in the regular academic spaces of participants coming from spaces that are usually excluded, like rural communities and territories; as well as the opportunity for scholars to produce specific material aimed at these communities, like the virtual TADIC[1], created by one of the authors as an online workshop to teach design-driven social innovation to community members around the country.

This distributed reality opens a conversation around how universities and other education organizations can reach other communities outside the classroom or to avoid the high-investment development of focalized community workshops, opening the opportunity for more equitable access to design education. Nevertheless, it is important to acknowledge that other inequities, like access to the Internet or adequate digital devices, or what Williams (2001) defined as a 'digital divide', complicate a better distribution of knowledge among communities and even for regular students that do not share the same access to their local space or community.

As mentioned before, the spaces for ideation and collaborative work are vital for the design process and for the design education. Those that relied before on whiteboards and brainstorms now have moved to JamBoard, Miro, or Mural as virtual spaces for ideation and, although they offer a competitive space for reflection, they are still limited for the collective discussion and the in-place reflection, particularly the ability to establish conversations in a verbal matter. Losing some of these collective tangible spaces, especially those outside the classroom, have endangered certain situated practices, like the ones that aim to experience and embody traditional knowledge with communities, which still represent a challenge for pedagogical practices on digital spaces.

Nevertheless, there is a silver lining to the use of these tools since they allowed the recording and storing of the analysis and the collaborative production of mood boards, maps, and diagrams; this became a useful tool for research with participants. In some of the classes analysed, we used collaborative boards and the results were highly positive as they provide a second-hand tool to recover the basic points of a conversation, ideation, or analysis. They also produced a visual form of representation of texts and discussions that is a powerful tool of the design process.

One of the experiences worth mentioning was the one of a community-oriented class in which one of the authors decided to implement a design process based on

empathy, define, ideate, prototype, and test, which aimed to address the problems of the community. The intention was to create a space where participants could feel empowered and face the issues of their communities through design.

Initial problems range between the development of objects for bio-protection, like masks and face cover shields in the middle of a world-wide supply shortage, to the redesign of their spaces at home to facilitate their work-from-home situation. Although this initial process had a limitation based on the lockdowns and the inability to acquire materials, it also encouraged creative thinking among all participants, educators included, to find opportunities and solutions based on the daily life resources of the participants, rather than a scripted solution for everyone.

Other design activities for the class included among others, the design of useful objects from the reuse of waste, the use of tools for working with communities through perception with the senses and observation using the cell phone, use of the kitchen as a space for creativity and innovation, etc. In addition, we developed future-oriented prototyping exercises, so students could think of future design scenarios for the problems they were solving or pursue peace and equity in their communities, topics that are very relevant in the current circumstances of a country like Colombia. In these types of workshops, students play a very active role, because they were addressing problems, opportunities, and needs in their context.

Other changes than can be characterized as cultural had a strong effect in the environment of the classes. The use of digital platforms encouraged the respect for each other's ideas and turn to speak, as well as the use of a more conversational way to communicate that led to a more horizontal relationship among the participants. Also, factors like the at-home work promoted more respect for time; since students and educators did not have to travel or commute to attend to class, the late arrival of participants and the complications due to transportation were reduced.

A caveat on the cultural side is that the lack of physical space for students might have produced higher barriers for their work as groups. We attribute this to the lack of a shared space and the feeling of responsibility when related to in-person meetings, as well as the idea that projects can be produced as an assembly of parts produced individually by different authors like an *exquisite corpse*.

Perceptions of Students

After collecting experiences from the courses taught, we decided to test some of the ideas that we generated through observation by collecting perceptions from students of these courses.

Methodology

The purpose of the sampling was to investigate the opinion of the students regarding what had changed during the pandemic in the teaching–learning processes of the courses, in terms of factors and values related to learning. We used the word "factors" to categorize external stimuli that participants observed,

and to promote an externalized objective perception of the methodologies developed through the digital environments. We also decided to use the word "values" to define internal drivers and promote a more emotional view of their experience.

Based on this assessment, they were asked to express their opinion about what changed in the educational processes in a positive or negative way, recommendations to improve the teaching–learning process in virtuality, and what they would like to maintain once classes returned to physical spaces. The sampling was carried out with 39 professionals enrolled in one of two design training courses and 55 regular students from five design courses at the university.

Qualitative Analysis

Surveys

Inside this initial category, we defined three topics of inquiry. First was a revision of academic factors related to the pedagogical changes and the environments and practices and how those affected their experience of the classes. The results are summarized in Figure 16.1. Although there appears to be a significant perception of improvement on factors like the *use of technologies*, *access to contents,* and *the practice of independent work*, most factors remained with only a small sense of improvement.

Table of Perception of Academic Factors Reported by Students

One set of answers that surprised us was the *Ease to attend class*, where the perceptions were varied, even among *Improved*, *Same*, and *Worse*, when we expected to
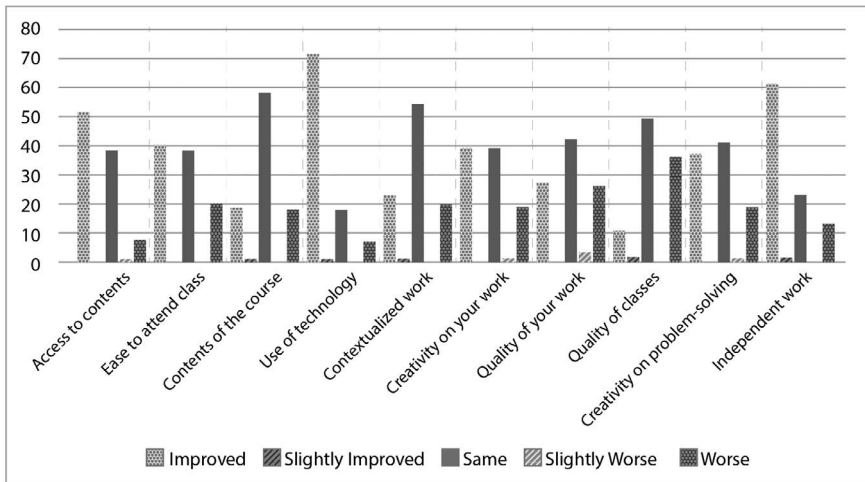
Figure 16.1 Perceived views of academic factors of the digital and virtual environment of the classes (in %).
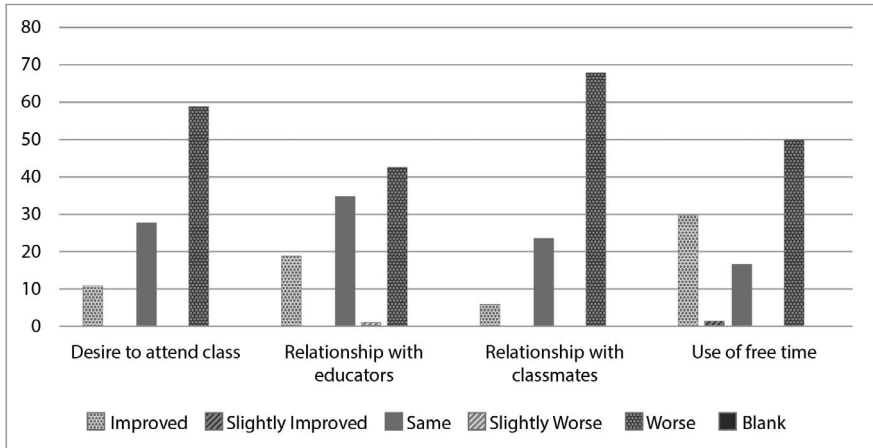
Figure 16.2 Perceived views of students and participants of the emotional factors linked to their experience of the digital and virtual environments (in %).

see a significant improvement based on the ability of students to attend in a virtual space. We explain this result with some the results presented in the "Emotional Factors" category shown next in Figure 16.2, where there was a clear skew of the result to the perception of a worsening of the social and emotional factors of their experiences. We also observe that despite a feeling of some better qualities linked to the digital and virtual environments for learning, there is also a perceived lack of desire from the participants to attend class (Figure 16.2).

Table of Perception of Emotional Factors Reported by Students

Regarding the idea of values, we asked participants to rate how certain values were incentivized throughout the courses. Although results among participants did not show a significant perception of improvement of the four values about which we inquired, it is clear that there was a skew toward improvement, especially on their sense of autonomy (Figure 16.3).

Table of Perception of Assessment of Values Reported by Students

We argue that although the emotional and social factors of the pandemic created a negative environment for participants, the use of digital environments brought many other improvements to their creativity and the distribution of knowledge as was initially argued based on the experience of the educators.

The qualitative responses on the surveys presented a richer view of their perceptions. Next, we present a qualitative analysis based on the students' perceived changes of values and factors in the classroom. Then, we present what they described as positive and negative of those changes. We finish with some considerations and opportunities that they provide for the future of design education.
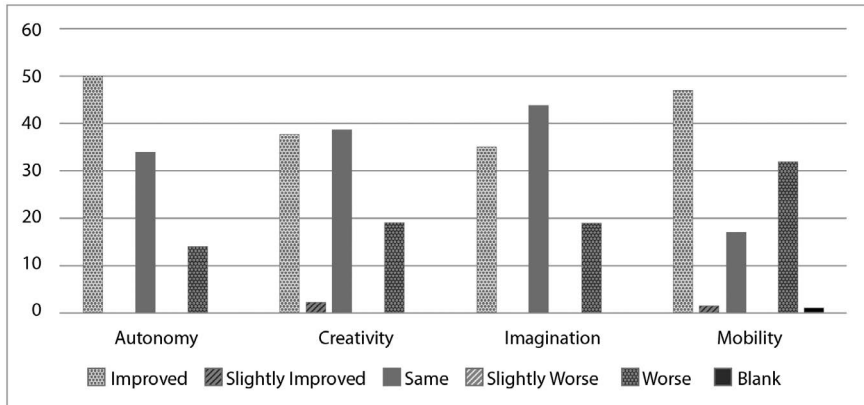
Figure 16.3 Perceived views of students and participants of the values experienced in their courses (in %).

Values and Factors

The analysis of the qualitative responses of the participants brought the following insights:

- Self-learning gained relevance, since virtuality requires the student to consolidate the topics and knowledge on their own, causing them to have greater responsibility, discipline, time organization, and planning of activities.
- Students in workshops courses generally did not have the same resources that they found at the university to carry out their design activities. For this reason, they mentioned that in virtuality, creativity and imagination were enhanced to do the activities, which was an enriching experience.
- Virtuality also saved time and therefore money by not having to travel to the university. This meant a better use of free time, which represented more time with the family or to engage in personal activities. At the beginning, it was difficult to organize time, due to not having the routine of separating daily activities from academic life when they are carried out in the same place, which produced long working hours.
- Working and living in the same place can produce emotional instability due to the lack of appropriate spaces for learning. In general, it becomes harder to sustain an appropriate level of attention due to the distractions that are at hand, such as the Internet and the cell phone.
- As observed before on the Likert scale results, one negative aspect that stands out is the lack of social contact and relationships with colleagues and teachers, both for the importance they have for life and for learning and validating knowledge with them. University spaces that share and exchange learning, internalize what has been learned, and create relationships and bonds of trust were missed. These are values that they find very difficult to promote in virtuality behind a computer screen, which makes human interaction tedious and overwhelming and sometimes causes them not to want to attend classes.

- One concern overly expressed by participants was the apparent lack of flexibility from some educators that were trying to follow the same class structure and methodologies used in the classroom before the pandemic.
- Although changes are needed, participants recognized that the use of virtual tools and platforms has allowed some pedagogical tools to be updated. Collaboration and participation have been further promoted in spaces that were previously less accessible such as events and conferences.

Perceived Positive and Negative Changes

Participants reported some positive changes to the pedagogical practices:

- Geographical barriers seem to be broken and sharing with other latitudes became normal.
- Digital requirements forced educators to reframe their practices and update the use of digital tools in a creative way.
- In general, it has created among all participants, including educators and students, a culture of empathy, flexibility, and creativity.
- Once the students adapted to the new routine, they found that the schedules were positively flexible.
- Availability in some cases to have the classes recorded to consult them later.

Participants also reported some negative changes to the pedagogical practices:

- Some students find it tedious to have a lot of group work, because it makes them spend much more time in front of the screen.
- Some teachers continue to evaluate students using traditional practices that were done in the face-to-face classroom.
- The social dynamics of students were strongly affected by virtuality.
- Physical classrooms are seen as more collaborative spaces. Since people were confined within the classroom and its resources, they were more willing to share, facilitating teamwork, bonds of empathy and affection, which facilitated peer-to-peer learning. In virtuality, much of this was lost and more inequity was created, especially with people who have limited access to technological resources.
- The student–teacher relationship has been greatly affected since it is now much more mechanical and for specific class issues.
- Some educators had difficulties in handling digital technologies to teach virtual content, which suggests why the pedagogical models have not yet been adjusted to the synchronous digital formats.

Recommendations and Opportunities towards New Virtual Practices

Regarding what we should keep from these new developments emerged from virtuality once we return to the classroom:

- Continue using virtual content and research new pedagogical models.
- Maintain the course administration and monitoring system on platforms such as Classroom and others that are now widely used by educators.

- Continue using the possibilities of remote connection with guests who contribute to the class and put their knowledge in dialogues with students and teachers.
- Remote learning experiences begin to give signs of openness to other ways of training, teaching, learning and working in a collaborative and more horizontal way.
- Promote interactions and knowledge creation and development of projects closer to local and personal realities. Connectivity with diverse settings, contexts loaded with cultural and social diversity, and people from other latitudes enhanced learning spaces in the classroom.
- Alternate between face-to-face and virtual practices, since the actions implemented through virtual environments promote responsibility, discipline, and creativity.
- The possibility of using software and virtual media to present work is useful. The work platforms can be programmed and planned, with the purpose of increasing the capacity to develop greater autonomy and self-learning in the activities of the students.
- The lectures or content presentation sessions, as well as the activities that do not require group work in workshops, must be destined to virtuality. While only the practical activities that need to be carried out in a workshop are carried out in person.

Discussion

The abrupt change did not provide sufficient time to adapt, as we went from an in-presence model in the classroom to a full virtual relationship in a matter of days. This change produced in many students and educators a lack of control in the planning of their schedules, which led to strenuous days where people were connected to their computers all day. With the passing of the months and the consolidation of self-learning, we learned to better program both academic and personal activities. This new challenge might require universities to include new courses for time management and stress control and how to redesign their own workspaces to make them more comfortable and enjoyable. This provides an opportunity for design schools to reach other professionals and for practitioners to innovate on the design of tools for the workspace.

In design education, one of the greatest challenges that virtuality has generated is working in workshops and with communities. In the case of a country like Colombia, working with communities from virtuality becomes difficult, because many of them lack or have no knowledge of the use of Information and Communication Technologies (ICTs). Regarding the design workshops, one of the main points that became clear, because many of the students returned to the regions where they lived with their families, was to work around the problems and opportunities present in the context of the students. Moving to other locations, like bedrooms, living rooms and kitchens, also presents a change in the idea of what tangible means in design education, from a first-hand observation of the design craft to a more self-reflective process of experimentation.

The use of methodologies based on Design Thinking proved to be useful in promoting the creativity and craft of students through exercises such as: ideation, prototype, experiment, and finding design solutions to students' everyday problems. This allowed us to open new ways of working and understanding real situations, closer to those that were used in many classrooms before virtuality. The distances and presences in specific territories and places of the students helped generate true dialogues of knowledge with different stakeholders of the teaching–learning processes and to create more tangible relationships.

Some of the previous forms of training will still require a space once we move back to the face-to-face model. Questions arise about the permanence in the classroom, not only in physical conditions, but also in academic ones. It is clear that the creativity and autonomy gained through this process seems like a gain for the future, especially since it opened a space for students to self-reflect while prototyping and sharing their ideas in collaborative spaces that did not require their transportation from one place to another. Therefore, a new design education should increase the use of methodologies more oriented to the development of the projects, prototypes, and problem-framing oriented to local and situated realities that benefit the communities around our students while managing the digital divide and technological inequity. We see this as a new challenge (Rittel & Webber, 1973; Buchanan, 1992) for educators and design researchers to tackle in the years to come.

The pandemic has also helped us recognize the importance of the human factor in education, and the empathy that we should facilitate in academic environments. According to participants, the worst detriment during the virtuality of the classes was the relationships they create with others. Certainly, after the pandemic, some courses will continue to be held virtually, so it is necessary to think of meeting spaces where both teachers and students can share, not only from the academic point of view, but also from the human relations point of view.

Once we return to the classroom, it is important to bring virtual technologies closer to teaching spaces, as well as collaborative learning and work practices both inside and outside the classroom. Virtuality in the classroom was characterized by a series of conditions that many students want to be maintained, such as: ease of remotely attending classes, accessibility of content, guests to learn other points of view, asynchronies to attend classes and carrying out work, greater information management, and availability of conferences, etc. Students see the future where educational processes will be a combination of both virtuality and presence, proposing that classes where spaces are not required can be mostly virtual, while workshops could find new ways to go back to physical spaces.

Finally, from our perspective as educators, the experience of academic environments during the COVID-19 pandemic started to define very specific perspectives for the future of our profession: those who see these changes as temporary alterations and are just waiting to go back to the previous normality, and those who have seen this situation as an opportunity to prototype new forms of teaching–learning, knowing there is no going back to the previous routines and that future practices are altered for good. We should then reflect on the nature of education and which of these changes propose a more adequate method to reach our goals.

Note

1 TADIC is the Spanish acronym for a community-oriented workshop based on design methods to empower participants to find solutions to their daily life problems. It translates *Design Workshop for Community Innovation.*

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17 Tall Tales

Reflecting on the Role of Dialogue in Design Studio Learning

Suzanne E. Martin

Independent Researcher, Ireland

Introduction

Testing a model for studio-based teaching that encourages learners to practice their disciplines differently and to view learning as a sense-making activity was vital in 2020. Author and theorist Arturo Escobar sets out Design as a future-making activity (Yelavich & Adams, 2014) that lays down the potential conditions for systems, societies and relationships to nurture a more accountable future (Mareis & Paim, 2021). In the changing world since the COVID-19 pandemic, it becomes increasingly necessary for Design Higher Education to perform as a stage for developing critical, social theory (Escobar, 2018). This research and work explores how these conditions might be shaped.

The Studio as a Discursive Scenario

The transformative pedagogical model for the remote studio, developed in 2020, takes advantage of the new kinds of learning spaces and situations that became available during the COVID-19 global pandemic. This chapter reflects on the role of discussion, alongside the tools and approaches that activate and become the dialogues, as necessary for shaping an approach to remote and hybrid teaching and learning practices in Design Schools.

In this research, the remote studio is considered a Discursive Scenario. This chapter attempts to describe the ways in which this model re-frames both teaching and learning through the use of dialogue, by building a distinctly participatory, experiential context. The ambition of the model in 2020 was to nurture a social learning community in an open-ended space, where individuals could participate from their positions of autonomy in conversations about possibility. The intent was for it to become a pedagogical model of localism coupled with distributed mesh-worked groups (Manzini, 2015).

Framing the Research Context

The design research employs Integrative Design, applying multiple methods and disciplinary practices to determine appropriate approaches to developing a cohesive methodology for delivering the model of teaching and learning. Integrative Design

is underpinned by principles of becoming conscious and about communicating. As a technique, it acknowledges that many people are part of the realisation of new possibilities and solutions, and that the role of the designer is to develop and visualise these possibilities and solutions in a meaningful and tangible way (Michel, 2019).

Consciously positioning the pedagogical practice as a people-centred Participatory Design encourages the teaching, learning, and designing of it to become an ongoing process that systemically evolves from the insights, experiences and practices of those engaged in the activity. In this model, the remote studio situation might be described as being an uncertain, Participatory Scenario (Huybrechts et al., 2014). Within that, the experience of participation shapes a discursive space. Following Tharp and Tharp (2018), the model understands the role of teaching and the resultant participatory interaction as setting a stage for the [learning] dialogues that take place. In this model, the studio becomes a place to test and explore ways of conveying substantive ideas using a range of design forms, languages and processes as a means of communication.

Situating the Module Course and Delivery

The course designed as part of this model is one of three, new, discrete, 5 European Credit Transfer (ECT) modules introduced to replace an existing, singular 15-credit module. These new modules run across two trimesters of eight undergraduate Design pathways, within a 'Studio+' year – an optional, insert year of study, unique to the National College of Art and Design (NCAD), undertaken between the second and final third year of undergraduate study. Equating to 100 hours of student effort, with a pass/fail assessment mode, the module brings learners together to work in a multidisciplinary cohort for the first time, as one of the initial fully remote modules for the School of Design in NCAD, Dublin, Ireland. The remote studio is designed with a transdisciplinary ethos to create a multidisciplinary teaching and learning experience. To frame the complex challenges set by the course brief, the studio operates in a multidisciplinary manner where participants share their knowledge and experience from the viewpoint of their own disciplines (Muratovski, 2015), resulting in co-designed, transdisciplinary outcomes. In this module during the first trimester of the 2020/21 academic year, three studios of approximately 25 students were delivered by three non-tenured staff, taught across eight weeks within a 15-week trimester.

All three studios address the set theme of 'place'. The module course in this research asks students to speculate on what their place is in the changing world, with the prompt that they should consider how 'design can change you and you can change design'.

Across the delivery, a new 'briefing' is issued weekly, in which learners are invited to challenge a self-selected topic; to take a different viewpoint or position, to frame a particular way-of-working, or to apply a different lens (Figure 17.1). These weekly challenges and activities build from an individual, place-based, observational research task into group-based analytical, interpretive and Action Research-based work. By rooting the remote learning in a physical, real and local focus, each student comes into their second week with something that is familiar and tangible. This sense of an experienced familiarity instinctively creates the personal security
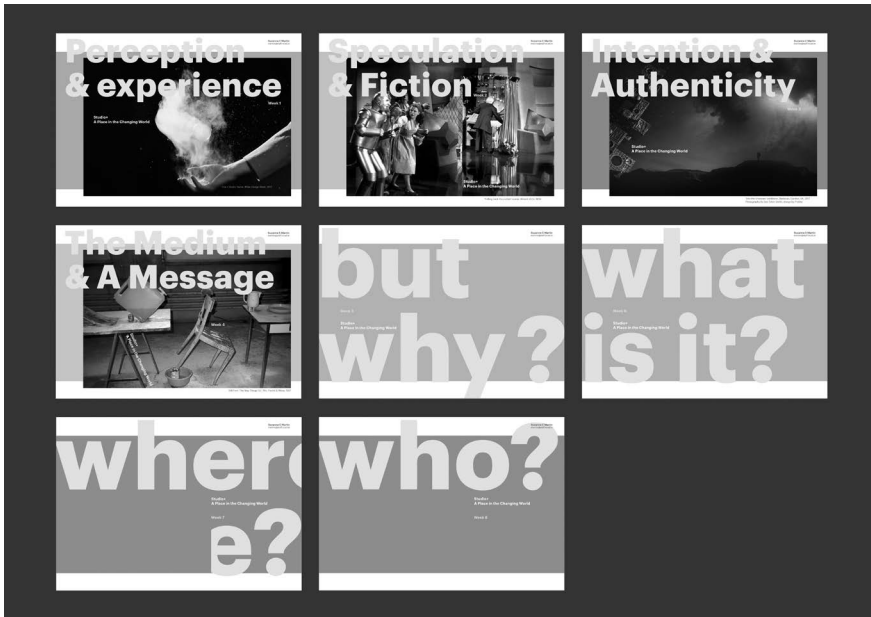
Figure 17.1 Cover pages of the weekly briefings where new challenges, activities, and tasks are set that develop depth, grow knowledge, and enhance critical thinking around each learner's project theme. The briefs are indicated at the start of the course, but only released week-by-week as the course progresses.

needed to work within an unknown, new kind of learning space. It also enables groups to be organised based on commonalities of their observational activity, to operate as Communities of Interest instead of being defined by disciplinary belonging (Arias & Fischer, 2000), which additionally helps de-emphasise the role of disciplinary thinking in this new pedagogical model.

The weekly briefs utilise a considered language to hold space (brown, 2021) that positively encourages learners and groups to respond, to perform instead of following instruction. Telling stories in their design activity is important, but using storytelling as a device, as a design, is equally critical. Design fictions offer a rich arena for visualising future life and picturing both the dangers and promise it holds (Lupton, 2017).

The Remote Studio as a Dissonant Space

Looking back at where Design Higher Education and its learners were, psychologically, emotionally, and physically, in September 2020, it is now clear how vital the employment of a speculative, fictional space was – both conceptually and as a working place – in enabling learners to flourish in their studies. The design of this remote studio experience could be described as providing a 'call to adventure' (Campbell, 1949), inviting learners to step into a strange new place, into an altered studio and state, away from the daily realities during 2020.

The role of dissonance in Discursive Design and Dialogic Design is a central element of discursive work (Tharp & Tharp, 2018). It can be understood in terms of creating a sense of being strangely familiar whilst simultaneously not fitting in, suggesting a cognitive glitch which might lead to notions of estrangement and a feeling that something is different, not quite normal. Building upon the Critical Design language of Dunne and Raby (Dunne, 1999 and Dunne & Raby, 2001). this model employs fiction to shape the discursive spaces, which then inform the learning space. It is considered that the power of these places, spaces and narratives depends on them being familiar but not quite 'real', that they aren't replications of the real (Tharp & Tharp, 2018).

As the global COVID-19 pandemic sustained during 2020, Design Higher Education increasingly found itself seeking ways to replicate studio culture or the studio itself, to compensate for what was lost. The model described in this chapter attempts to positively employ cognitive estrangement, the glitch being experienced by everyone, as a direction for scaffolding a space for learners to engage with other epistemologies, knowledges and understandings (Mignolo, 2007). Beyond 2020, beyond the pandemic, during times of growing intrigue, concern and tension, the employment of disturbance remains pertinent as an opening into a form of critical reflection that positively moves focus from studying the routine activities of everyday life (Koskinen et al., 2011).

Speculative Learning Dialogues

Critical and Speculative Design (CSD), as a discipline, seeks to provoke a future, or a vision of the future through questioning (Mitrović, 2015). Applying CSD methodology to develop teaching and learning models, in thinking towards how to transition Curriculum Design, builds provocative tools for re-thinking Design Higher Education for different Futures.

Disturbing existing models is utilised in CSD as a prompt for critical re-thinking (Malpass, 2017) and, in this model, the remote studio experience applies CSD as a pedagogical technique to support future imaginaries through and with the learning process. The model for teaching and learning occupies a speculative, unfinished virtual space; it employs narrative devices to prompt, frame, shape, stage and review storytelling as if it were a play (Tharp & Tharp, 2018) on the future. It can be understood here that Discursive Design is used to break down an experienced scenario, CSD to structure the plotline, and Participatory Design to characterise the student activity of engaging in uncertain participatory exchange (Huybrechts et al., 2014).

Setting the Speculative Stage

If the remote design studio is considered a Discursive Scenario, the devices and approaches applied to set the stage for 'actors' coming together might be thought of in terms of a movie; to tell the story, aspects such as commentary, scripts, scene-setting, props, sets and ephemera are required to build the fictional world (Sterling, 2013). The dialogic tools and approaches used in delivering this model imply an 'other' learning world for students to step into, designed at a human level.

The 2020 course brief asks learners to use narrative tropes as a means to articulate and communicate a collective narrative or scenario that tells a future story (Mitrović et al., 2021) of the group understanding of 'place'. The storytelling intention of the brief, and the devices created to build collective narratives in the studio space, bridge realities. Following Social Constructivism, they form the scaffolding (Vygotsky & Cole, 1978) for learners to collaboratively construct their knowledge through the studio learning experience (Gergen, 1995).

Framing the Conversations

Viewing the remote design studio as a dissonant space presents opportunity to unsettle habits, challenge perceptions and shape new understandings of what design teaching and learning might look like for participants, the institutions and the sector.

A key aspect of the module delivery is the pre-recorded, weekly audio walkthroughs (Figure 17.2). Evoking the intimacy and accessibility of an in-person studio experience, the behaviours and culture it informs, these audio recordings are uploaded in the virtual classroom in advance of the weekly class, with time
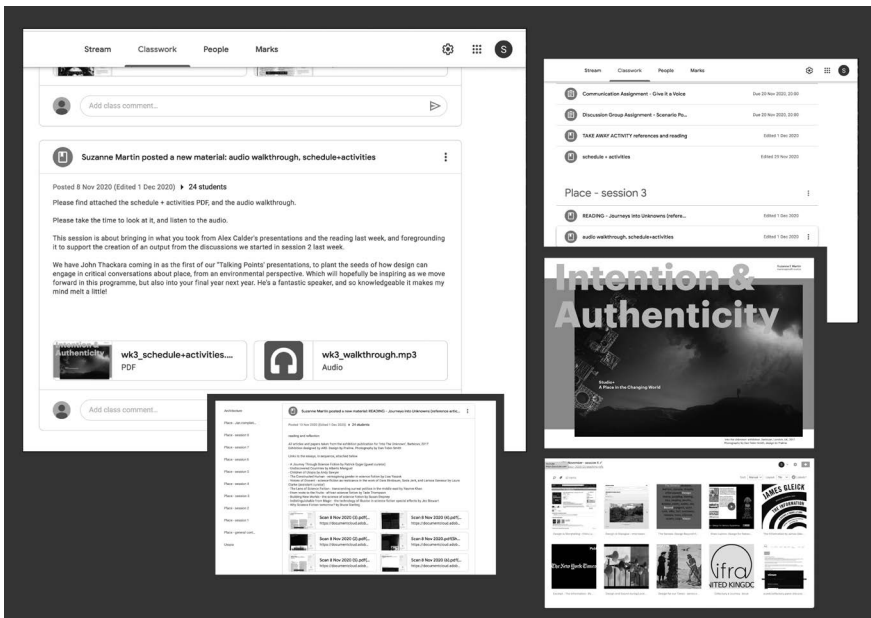
Figure 17.2 Audio walk-throughs are accompanied by a short descriptive text, resource folders, and linked references, all uploaded into the virtual classroom each week. The nomenclature, style, and labelling are consistent throughout, which enhances learner navigation and encourages engagement.

scheduled at the start of each session for listening. It allows everybody an opportunity to listen to an informal, verbal walk-through at a time that suits, either before, during or after the class. As a learning device, it allows the cohort to move directly into group work, challenges and activities instead of coming together as a class on a Zoom call or a lecture. The walk-throughs act as a soundtrack, a framing device for group work and group conversations.

In the audio recordings, an informal conversational style is used to talk through the key activities or challenges in the weekly brief, explaining where they come from, why activities are planned the way they are, what they will lead to and making verbal connections to references or resources. The feedback from learners is that this is the one element which made the learning experience feel like they were really still in Design School, and that somebody was really talking to them, individually and personally. Its authenticity was critical in achieving that resonance. The language is accessible, and mistakes or imperfections are left in the recordings. The audio is accompanied by a visually led briefing PDF each week and a digital folder with references and linked research. This content is labelled clearly, in a recognisable nomenclature, consistently, every week, in the virtual classroom.

Participating in Dialogues

Learners work in groups of three or four (assembled based on their initial place-based research) in private group studio areas (a virtual whiteboard), with a meeting link for them to meet on, and when there is a full-class studio session everybody meets in one central virtual whiteboard (Figure 17.3). This range of places creates a sense of ownership and allows for the quieter, smaller collective dialogues alongside the larger class activities and community conversations. The fluid movement between spaces and scales encourages what may be understood as conscious engagement through [virtual] somatic movement (Neely, 2019) and dynamic peer-initiated peer learning. In one activity, groups are invited to share their studio spaces with each other in the main class studio, prompting learners to move around the group boards consciously and curiously.

In the virtual, group studio spaces and the central class studio, staff, guests and learners use the same tools and language. Post-its or emojis are dropped on if they are in the studios working, and if they are not online, comments are left so that the input is easily identified when the learners return to the space.

Forming and Staging Conversations

Setting the stage with props and scenes where dialogues can take place is critical in shaping the learners individual thinking so that it helps them to establish common ground within the groups, which builds the confidence to connect and collaborate virtually. The digital artefacts created across the studios are considered [in]tangible dialogue tools (Møller et al, 2016) and the virtual studio spaces, as the participatory design context (Ehn, 1988). This initial version of the module course, during the
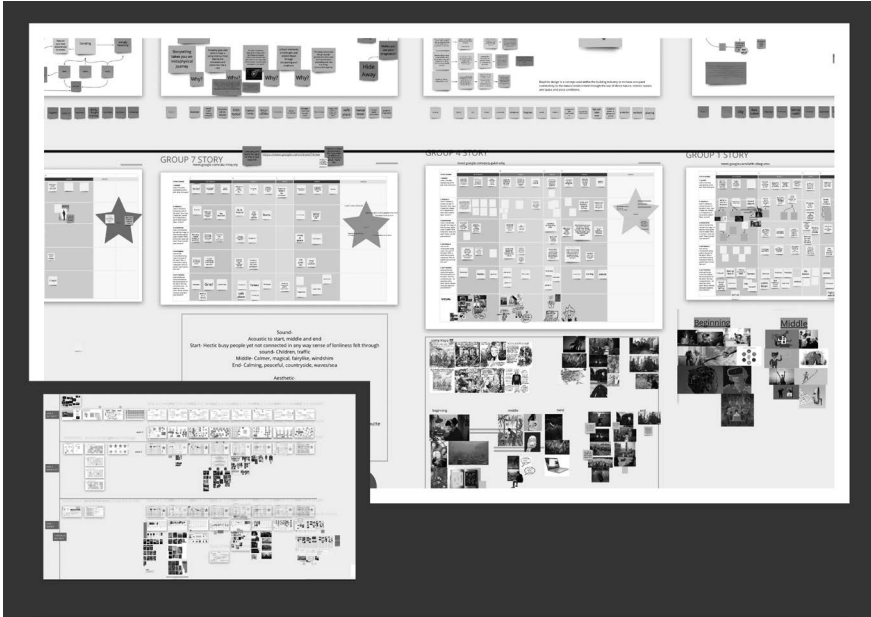
Figure 17.3 An example of a session in the class studio where everybody is working on a common activity in a shared space, but in their individual group meeting links where they can verbally/visually collaborate as a team on the challenge set by the briefing.

COVID-19 pandemic, was the first-time learners were together in a class. Therefore, at the time, a consideration in developing the methodology and model was to negotiate a geographically dispersed cohort, experiencing diverse psychological, social and economic realities during the lockdowns. Anything being developed to structure their conversations and project storytelling had to be designed with care; a core motivation of the learning was to empower these learners to design through dialogue.

In the class studio space, learners join on their group meeting links, which allows their group conversations to continue whilst everybody is visibly working in the shared studio space. This duality of communal and separated spaces supports increased capability in the cohort (Sen, 1992). Learners are observed working in an uninhibited manner: the group meeting link and those dialogues frame a decision-making space, where freedom and flexibility are created between stimulus and response (Covey, 2004). During class activities, groups are observed working with their own tools or artefacts, then moving around the class space to look at other groups' work as it was being produced, then coming back to their own and continuing to work. Following the notion of conscious engagement through movement, the introduction of synchronous working (within universal structures) is observed as supporting self-initiated, self-regulating, peer-to-peer learning (Powers, 2017) in a virtual space.

Structuring the Narrative

In creating purpose-built, universal templates and devices for the groups to work with in the class studio, an equity of contribution within each group becomes apparent (Figure 17.4). The activity of co-populating, adding text or visual content into provided structures, appears to balance the intuitive leader and follower tendencies within group-work. Organising community knowledge (through the application of collaborative, narrative devices and tools) represents an opportunity to shift perceptions of what teaching might look like, alongside re-thinking the ways which learners might comfortably share wisdom, or thinking, with peers in a class or studio scenario. It suggests the potential of moving towards a pedagogical practice of shaping devices and tools for facilitating visual, learner-led learning, self-appreciation and self-value (Cooperrider & Avital, 2004). Using these devices as collaborative 'thinking' tools, prompts new design processes by employing reflective ways-of-working, as designerly ways (Cross, 1999) of practicing learning. Reflection becomes incorporated into everyday design practicing and learning.

The working output of the learners projects can be considered as pieces of Content Design (Richards, 2017), their research processes becoming a design product in, and of, itself. Their dialogues and conversations become a performative activity positioning collaborative knowledge creation as a communication form, and further challenging the ideation of design research modes (Frayling, 1993).
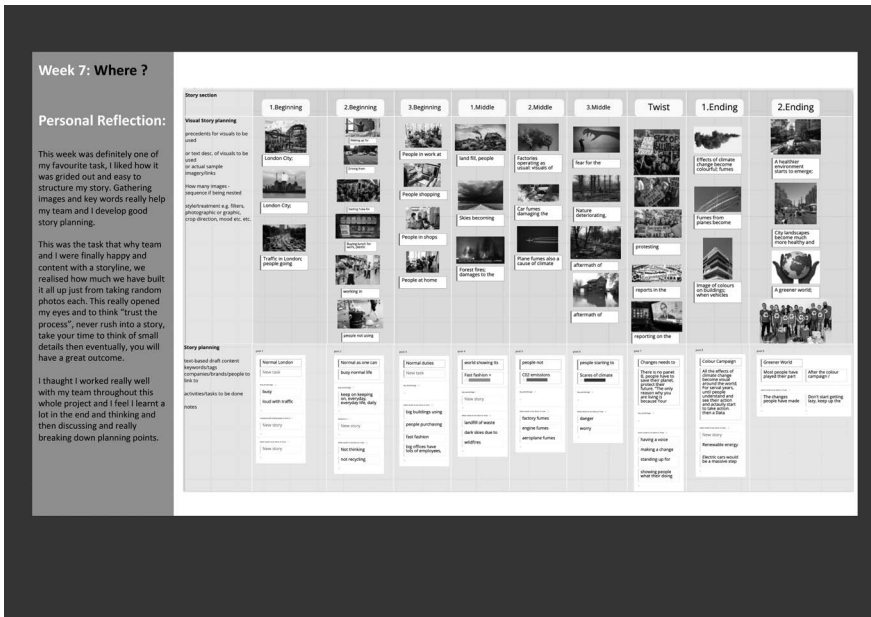
Figure 17.4 One artefact designed and used in the class studio is the group storytelling boards where the learners can begin to assemble their visuals, ideas, content and plan together as a group within the shared space alongside their peers in groups.

Reimagining Critical Dialogues

In the context of the remote delivery of this module course, a new studio experience is created, which provides opportunity to reimagine the modes, methods and rationale for introducing external, critical dialogues. It shapes an opportunity to re-think how a diversity of voices and critical perspectives might be brought into the teaching and learning structure to create value and impact.

This course featured informal, public interviews (Figure 17.5) conducted with thought leaders from across industry, as relevant to the course brief. The cohort are invited to join these as the audience and asked to engage in the discussion themselves. The accessibility of conducting an interview, which puts some of the design research tools being learned into action, engages learners in the process; they gain experience of researching as well as knowledge from observing a research activity.

Accessibility to dialogue was critical in the context of this module course in 2020. A mix of real/live, pre-recorded and downloadable content was featured across the eight-week structure (Figure 17.6). A high-profile guest lecture framed the wider environmental, social and economic context for the module course. A pre-recorded discussion introduced an epistemological and a phenomenological perspective – accompanied by a transcript and explanatory notes with reference links – which is intended to inform and support learners in sense-making the content of the course. A series of pre-recorded visual lectures walked through the
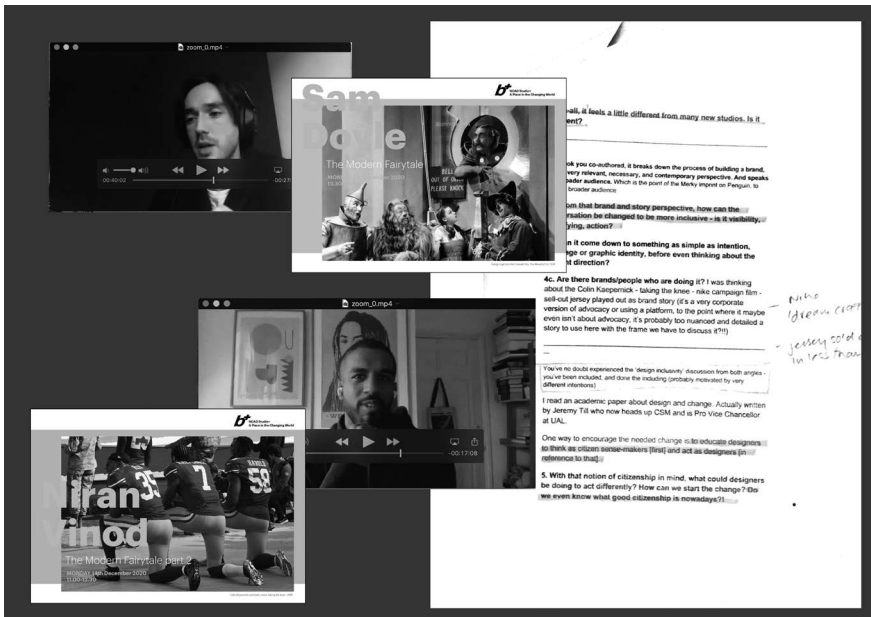
Figure 17.5 An example of two interviews conducted during the course, alongside the draft structure shared with learners prior to the interview.
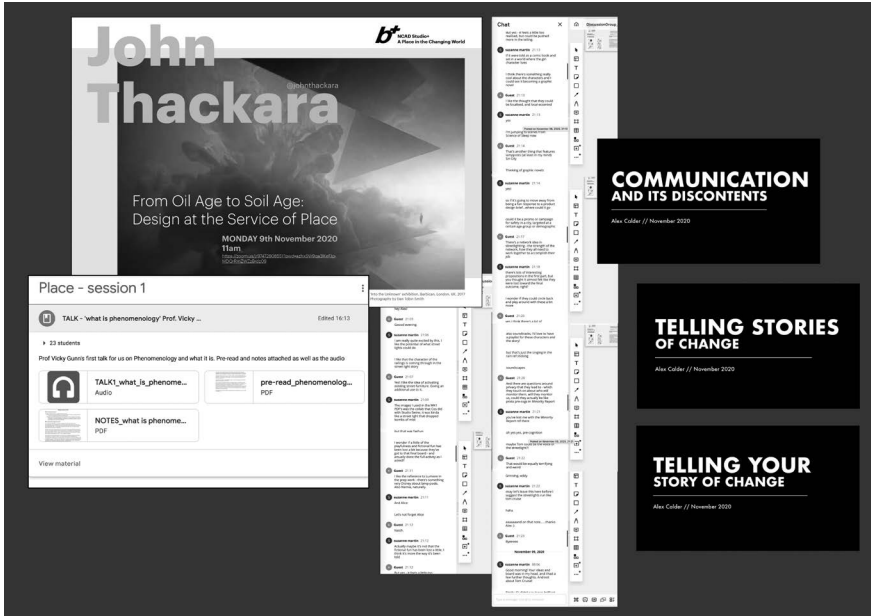
Figure 17.6 Examples of some material, communication approaches, dialogues, and talks that took place during the course.

sectoral context and a set of guest interviews introduced professional perspectives on the topics and themes around the course brief.

In this initial course, one guest was invited into the group studio spaces to take part in text-based conversations with staff in the whiteboard chat stream. As an accessible, open dialogue happening in real-time, learners in the studio were able to join the chat or read it afterwards as a text-based dialogue about the project work. It was observed that some groups pulled comments from the dialogue thread across into their studio spaces to use as prompts for re-thinking or evidencing their direction.

Conclusion: Telling the Tales of Designing Teaching and Learning

The experiences of teaching and learning during the COVID-19 global pandemic forced different perspectives upon Design Higher Education and its design studio cultures; learning became inextricably linked to living during 2020. Through that inescapable intimacy, the way that educators teach and the way learners learn, moved towards a vision of education as a process of living and not a preparation for future living (Dewey, 1897). This vision suggests a fluid boundary between states, activities and roles. It presents an idea that education is without an ending (Lindman, 1926). In the altered reality of a virtual studio experience, there is an expanded understanding of time and access, of the studio as a space of unfinished, unlimited sites of work where such visions, notions and ideas are realised.

The Action Research conducted in 2020, and reflected upon in the paper presented in 2022, sought to map the delivery, methods, tools and processes of a pedagogical model that is based on an adapted Discursive and Dialogic Design methodology. As a sense-making exercise, the dominant mode for building a coherent understanding of the use and the role of dialogue in this remote studio model is auto-ethnographic reflection (Pace, 2012) through a creative narrative process. This mode draws previous working experience together with an integrated methodology to shape the model and execute the design of learners learning. The chapter seeks to contextualise the inherently interventionist design processes of the research (for the delivery of the teaching and learning) in a wider critical ecology where their role and value might be understood. Taking an auto-ethnographic approach provides distance from, and perspective on, the immediate events of the delivery of the teaching and learning activity and the accompanying research (Adams, 2006; Ellis, Adams & Bochner, 2011; Lamott, 1995). Reflecting on the research activity and paper from a greater distance, in 2024, it can be considered that this work perhaps sits at the intersection of autobiography and ethnography (Goodall, 2006).

Acting as a design educator, whilst thinking for design research, is a position that creates the critical knowledge which leads the research activity to reach its objectives, to learning and to the knowledge creation that supports thinking towards a Design Learning Culture (Bochner, 2016). The research tested in and nurtured through this model can now be viewed as initial, formative approaches that have informed a Creative Futures Pedagogical Framework (Martin, 2024) within which a Participatory Evaluation System (Martin, 2023) provides an engine for infrastructuring different Design Higher Education Futures. Developed and piloted for the NCAD within a €10 million Irish Government funded, multi-institutional, Creative Futures Academy project (2021–2024), the research and work reflected in this chapter developed into proof-of-concept designs, systems and design research promoting the pivotal role of discussion, dialogue and conversation in pedagogical innovation.

This reflective chapter narrates the research, understanding and experience of building one module course with imagination, in a time of necessity. In 2024, the need for shaping narrative-led, relationship-based pedagogical tools and models is vital in transitioning any Design Higher Education Institution from now, to next. Discursive Design and Participatory Design offer routes for fostering designers who are facilitators of knowledge, rather than disciplinary experts (Escobar, 2018). Educating future designers and design leaders in models that equip them to bridge states and adapt fluidly (Renfro, 2009) can enable them to respond differently to the planetary crisis, to better comprehend their impact on human and non-human actors and to be sensitive to their environments.

Throughout this chapter, and in the design research undertaken since, the subject focus of teaching and learning, and the development of pedagogical models, distinctly use Design Storytelling devices to communicate (Ellis, 2004) the design narrative. Utilising Design Storytelling as both a method and a focus for teaching and learning, encourages participants – staff, learners, leaders, institutions and the sector – to actively rethink Design Higher Education. In the closing chapter of

Beyond Speculative Design (Mitrovic et al., 2021), author and educator Matt Ward writes of a need to incubate an ecology of trust, to nurture a space where fiction can activate thinking, asking how we might reimagine the tools, processes and practices to empower young designers to engage in alternatives when we hear screams of no future ringing in our collective imaginations.

In reflecting on this chapter two years after presenting the initial paper, perhaps the closing question might now be framed as one that asks how we use tools, processes and practices to enable an aging system to engage in alternatives that are led by a reimagining of collective Futures?

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18 Portuguese Design Education on Materials

An Overview

Pedro Ferreira and Rita Assoreira Almendra

CIAUD, Research Centre for Architecture, Urbanism and Design, Lisbon School of Architecture, Universidade de Lisboa, Lisbon, Portugal

Arlete Apolinário

Departamento de Física e Astronomia, Faculdade de Ciências da Universidade do Porto, Rua do Campo Alegre s/n, IFIMUP – Institute of Physics for Advanced Materials, Nanotechnology and Photonics of the University of Porto, Porto, Portugal

LaPMET – Laboratory of Physics for Materials and Emergent Technologies, Rua do Campo Alegre s/n, Porto, Portugal

Gabriela Forman

CIAUD, Research Centre for Architecture, Urbanism and Design, Lisbon School of Architecture, Universidade de Lisboa, Lisbon, Portugal

Introduction

Material Selection (MS) is usually ascribed to materials science and engineering, though it has gained space in several design areas, in particular industrial and product design. Notable authors in the field of engineering have already reflected on the MS process where technical and functional requirements were prioritized (Piselli, 2015). The distinction of MS between science and design has been supported by the properties of materials or their characteristics (Hasling, 2015). The term "properties" is usually associated with technical language and refers to the material physical world, based on quantitative measurements. The term "characteristics", on the other hand, is associated with the language of Design and represents the social world of materiality (representative of everything that is experience-based and measured qualitatively). This view is discussed by several authors, mainly because under ideal circumstances of realization of the MS process, both properties and the characteristics of the materials could occur together (Karana et al., 2014).The MS process combines criteria meeting technical, production, and economic functional requirements, with sensory and intangible properties, as well as ecological and usability ones.

In regards to the Design field, the traditional academic approach to teach materials' subject is more related to Materials Science and Engineering. This may devalue the design requirements associated with the non-technical component of

the materials. Design programs containing subjects related to Materials' education are dominated by Engineering content and students learn more about the technical properties than the experimental characteristics of materials (Collina, 2011; Zhou et al., 2018).

MS has various methods and could be characterized by the multi-criteria decision model (MCDM), which is divided into traditional, non-traditional, systematic, and comprehensive methods (Dhanalakshmi et al., 2020; Piselli, 2015). It can be an integral part of the design process "that determines the appropriate material(s) for product design, taking into account design criteria – manufacturing processes, availability, environment, cost, function, shape, the context of use, as well as meanings, associations, emotions, user characteristics, and cultural aspects"(Karana, 2009a, p.131–132). Doordan (2003, p.5) argues "that materials are not only a given to incorporate in the designer's calculations, but these are also part of the design problem". Their knowledge is crucial to know how to apply them, recognize their particularities, and reflect on their usability, abilities, and possibilities in the context of the various functions of the product throughout its lifetime.

The complexity of the MS process can make it difficult for students and designers to learn how to choose materials. Thoring and Mueller (2012) mention that knowledge in Design can be generated through theories and models. MS methods supported by models and theories enable a better understanding of materials. This is based on the idea that more than methods, there must be specific material courses that prepare students to work at all important levels to the design process (Asbjørn Sörensen et al., 2016; Collina, 2011, p.126).

Materiality is a part of the design language or the process called material culture, which enables the creation of an artificial world of objects and things (Ferreira, 2018; Cross, 2006). The knowledge of materials becomes a crucial element of design education. However, traditional practices should be changed to a more interactive process (Zhou et al., 2018). In particular, in a study conducted by Karana (2011, p.135–138), the author presents three proposals to teach materials in Design: (1) design projects should be sustained together with materials; (2) a new course on design materials; and (3) and the development of a physical materials' library such as "Material Connexion" in Milan, Italy, and "Matter Material" in Eindhoven, Netherlands. This work has sparked interest in this study because it indicates that teaching in the Materials field requires continuous improvement; the field of materials depends not only on the technical properties but also on the experimental features that form the basis of a design project. The question that arises to understand the teaching of Materials in design is: what other methods related to Materials' education can inform or influence the present Portuguese Design curricula, in regards to content on Materials or Material Selection?

In this work, a general mapping of all higher education institutions of Design in Portugal was carried out and data was collected, such as the Design programs and specifics on the subjects of Materials. Four higher education institutions were selected for this exploratory study: University of Aveiro [UA] (UA-Universidade de Aveiro, 2016); Faculty of Architecture, University of Lisbon [FA-UL] (Faculdade de Arquitectura – ULisboa, 2013); University of Beira Interior [UBI] (UBI-Covilhã, 2020, 2021), and Polytechnic Institute of Cávado and Ave [IPCA] (ESD-IPCA, 2016).

Aiming at the understanding of the Materials subject and its teaching in Design courses in Portugal (Product, Industrial, and Fashion Design), the relevant literature was reviewed to analyze and compare various approaches. Using models and theories from MS will enable designers to develop a broader perspective and an improved materials curricula and further support the materialization process within design projects. The work contributes by offering insight on strategies that can be adopted in a Portuguese Design Education context, regarding Materials topics.

Methodology

This exploratory study used qualitative and inductive methods to define a position on the issue raised. The document analysis was carried out based on the mapping of selected higher education institutions: UA, FA-UL, UBI, and IPCA. Table 18.1 shows the general information associated with the programmatic content to represent the course, the study cycle, and the scientific area to be analyzed.

Different institutions and their adopted methodologies (both theoretical and practical approaches) were analyzed (Table 18.2); the purpose of this phase was to understand how content is presented to students, in particular, what practical methods are used to support knowledge transfer in Materials and MS. The theoretical lessons help the student to develop practical work, by allowing the

Table 18.1 Generic information from the curricular units of materials topic.

Academic institution	Course	Cycle	Scientific area	Curricular unit
UA	Design	Undergraduate	Science and Engineering of the Materials	Materials and Technology I, II
UA	Product and Technology Design	Undergraduate	Engineering Science	Principles and Applications of Materials
FA-UL	Design	Undergraduate	Architecture, Urbanism, and Design Technologies	Design Materials
FA-UL	Fashion Design	Undergraduate	Architecture, Urbanism, and Design Technologies	Fashion Materials I, II
UBI	Industrial Design	Undergraduate	Science and Technology	Materials
UBI	Fashion Design	Undergraduate	Textile Science and Technology	Materials for Fashion and Creative Textiles Laboratory
IPCA	Industrial Design	Undergraduate	Product Development	Materials Laboratory and Materials Selection

Table 18.2 Methodologies adopted – theoretical and practical classes.

University	Curricular unit	Theoretical classes	Practical classes
UA	Materials and Technologies I, II. Materials Principles and Applications	**Exhibition of the subject** (use of audiovisual media) **Work Group** (stimulate cognitive learning)	Use of digital databases Laboratory classes
FA-UL	Design Materials	**Exhibition of knowledge** that may be worked in curricular unit practice	Aggregation of knowledge acquired by theoretical classes
FA-UL	Fashion Materials	**Exhibition classes** Resolution of exercises	Preparation of a catalog/ glossary associated with textile materials
UBI	Materials	**Exhibition Classes** Resolution of exercises	Development of a project; Support tutorial; Approaches to case studies associated with methodologies for Selection of Materials; Report and Presentation
UBI	Materials for Fashion	**Content exhibition;** Realization of simple and demonstrative experiences of the properties of materials; Resolution of exercises with applicability to posterior for practice	Students are encouraged to bring samples to classes, promoting discussion and understanding of materials
IPCA	Material Selection	N/A	Several simulation works are carried out for the selection of materials with the ***CES-EduPack*** computer program

choice of materials according to the context of use and by the familiarity with MS processes. However, a question may arise from this analysis: what are the models and theories of MS adopted? Except for IPCA's Material Selection curricular unit (CU) (which uses CES-EduPack software), the other CUs rarely mention which approaches are being used to case studies related to MS methods.

To analyze this survey, the Grounded Theory methodology was used (Charmaz, 2003). This method made possible the achievement of results through categories and potential themes of the study (theoretical and practical).

Results

Table 18.3 demonstrate the results of the analysis that allowed us to cross the Portuguese content with the practical considerations that Karana makes in each of the proposals mentioned in the introduction of this chapter.

Table 18.3 A comparison between Portuguese content with practical considerations.

Methodologies adopted	Portuguese content	Practical considerations
Theoretical and practical	Presentation methods (digital content)	Different activities focused on different materials
	Group works	Projects linked to materials (explore and create)
	Theoretical exercises	Workshops and lectures (by professionals)
	Rarely use digital databases	Create exhibitions (companies) and digital platforms
	Rarely use case studies	Using a set of methods and tools
	Rarely use samples	Physical library of materials

The methods used in Portugal to teach materials for Design are essentially theoretical and consist of learning through the presentation of content, collaborative working, and resolution of exercises (Table 18.2). In contrast, the literature review on MS mentions approaches that contribute to the understanding and the improvement of the teaching methods for materials (Asbjørn Sorensen et al., 2016; Collina, 2011; Rognoli & Levi, 2004). As indicated in Table 18.3, the content transfer of materials for Design should include more practical attention.

The result is that theoretical aspects should be supported by practical aspects. These components together can be seen as important approaches to the application of Design. The theoretical aspect (of intellectual) and the practical aspect (of undertaking) become essential in the design process (Swanson, 2020). For example, content presentation may focus on the use of different activities and materials; in collaborative work, students may create projects from the materials to product (when usually materials are chosen for a certain project); the exercises could be combined with workshops and lectures; if databases cannot be used, digital forums could be developed to allow the creation of a network of materials; exhibitions with companies to promote the exchange of knowledge on new materials; the use of more case studies exploring different methods and tools to support the MS process could enable the acquisition of knowledge; and finally, a physical library of materials, with samples that are normally developed or used regularly by students.

By studying the Portuguese programs and content through the data analysis, by category and topic, it is noted that the knowledge of materials includes their classification, properties, manufacturing processes, production technologies, and applications (UA, 2016; UBI, 2021). On the MS content, only knowledge about the relevant properties of materials and their processes is mentioned. As can be seen in Table 18.2, these considerations are taught in theoretical classes and the practical component is only used to acquire this knowledge and apply it in practical work (FA-UL, 2013).

Using MS methods and tools, students not only acquire knowledge about the materials studied but also learn how to use tools that support their creative process and help them choose one or more materials for their projects.

The materiality should be the basis of a project, creating experiences that provide the student with a better comprehension of material application. It is vital that the student not just focus on technical properties but also integrate them with others, such as experimental and emotional characteristics. Within the MS, it is suggested that it is relevant to use a set of methodologies associated with each stage. A "physical library" of materials helps designers to choose materials, introduce them, and support this complex process (providing samples and basic information of all criteria associated). Several authors value an archive, or physical library of materials, stating that it allows for material recognition, handling, sensing, a deeper perception or reflection of it, etc., and, therefore, enables for greater awareness, familiarity, and knowledge (key for informed decision-making) (Collina, 2011, p.129; Sousa & Bastos, 2014).

From a practical stance, it could be of great interest to create exhibitions with companies and workshops delivered by professionals or to develop a digital platform to promote discussion about materials between students.

Certain practices such as the development of various projects focused on the use of different materials provide the students with broad knowledge of materials – explore and create experiences through different associated activities.

Integrating workshops, lectures, and conferences with various professionals in the area would not only show the company but could also help to establish new partnerships between industry and academia. This would offer the possibility of integrating projects with the use of market standard materials, encouraging the practice of research and innovation by seeking materials that ultimately lead to the development of critical and informed decisions.

The use of a methodologies set and/or tools would enable a greater awareness of strategies to be adopted at each stage of the project and could relate to the complex process of material selection (e.g., cost, production, manufacture, ecological, culture, product-user interaction, and other issues).

The teaching of the materials' subject in Design should provide students with curricula that allow for the applicability of mixed methodologies. The presentation content can be in the development of a practical project to transmit knowledge about the material or materials to be selected. To complement this study, the student must provide complementary working tools (methods) that support an appropriate selection of the material for the project. This theoretical-practical task can be performed individually or in a collaborative working manner, providing the development of soft skills and interpersonal one. The use of digital bases should be considered according to the specifics of each project. It should also be proposed practice-creative methodologies (design thinking) that allow discussion, iteration, and interaction.

Discussion

Overall results reveal the importance of a contemplation process, mainly regarding the use of methodologies and tools associated with MS. According to Swanson (2020, p.104), it is estimated that by 2025, designers should acquire key competencies that guide their decisions, implementing positive change and encouraging

people to act on reflection. The designer has the role of informing society and the materiality of the product is another way to implement this change.

In the creation of new systems that are vital to protect and preserve the environment, the natural resources must be used without waste and in an efficient form. The fourth industrial revolution emerged with recent beliefs (circular economy) a regenerative process, inspired by nature, and linked to a shortage of material (Lacy et al., 2020). The research and use of bio-based raw materials (renewable) and secondary raw materials (industrial symbiosis and waste management) to produce bio-based products allow for a "relook" or a better new look or shape of something. The designer needs to adopt a new creative process closer to this reality. This change enables us to think about products linked to "matters of concern" (Latour, 2008) (biodiversity loss, geographical limitation, prices material, and ecological footprint). Thus, it is vital to rethink strategies and methodologies that may be implemented by education that guide students to design for all (people and planet).

The change to disciplinary approaches in the field of MS in Design courses in Portugal may start from the standpoint in which it is believed that the Designer has responsibility for the chosen processes and materiality of a project. Therefore, and because these actions impact all contexts of society (economic, environmental, social), it is important that the designer plans in an informed way and that he knows well the mediums with which he expresses himself.

In the methodological part of this study, the question was raised as to which models and theories can be adopted from MS. Under the CES-EduPack software, the following can also be explored: the Meaning Driven Material Selection (MDMS) model, which encourages the designer to work with the concept and think about materials not only by their technical qualities but also by intangible attributes (Collina, 2011, p.135; Karana, 2009b) and the Materials in Product Selection Tools (MiPS) which consists of a set of techniques integrated into the MS process (questions, pictures, samples, and datasheet with properties). This tool aims to identify and clarify the interaction between the user and the materials about a product and an effective MS process (Van Kesteren, 2010, p.183); and finally, through holistic approaches that create a set of factors involved in the MS process to respond to a specific problem. This approach makes it possible to involve several professionals (designers and engineers) in the process of MS, thus relating different attributes (technical, intangible, sensory, durability, and legislative issues) relevant to a given situation (Piselli et al., 2016, p.22–23). Thus, the appropriation of MS models and theories stimulates the teaching of materials and makes the design process even more enriching and fundamental for the development of new products.

Conclusion

This work addresses the Materials and Material Selection topics within the Portuguese academia context. Furthermore, an analysis of different ways of imparting knowledge toward an efficient, far-reaching process of material acquaintance and selection for product development was performed. This work highlights different perspectives and results, emphasizing their importance in the creative process.

Throughout the reviewed literature and assessment of analyzed data, it is suggested that the applicability of a hybrid methodology, with content presentation linked to a practical project, provides the student broader knowledge of the materials under study. Holding workshops and conferences with companies and professionals in the area is encouraged, since a greater proximity to the industry provides the designer with awareness and knowledge of the materials and the markets, which boosts the search for "new" materials that can be considered innovative elements in a project; it calls for the development of a design of excellence, contributing to a responsible proposal where society and the environment are the major beneficiaries.

Through materiality, the designer has the role of informing but, correspondingly, the opportunity to be an actor of change by offering possible solutions for several issues or to impact society positively (in social and economic terms and in regenerating the environmental capital).

The numerous current societal challenges generate relevant questions, mainly for designers and concerning the "how's" of creating goods for a better society. This is precisely where the pertinence of this study lies, since the implementation of teaching practices, sensitive to the material aspects and selection methods, can contribute significantly to an improvement in Design education and practice on Materials in Portugal.

Acknowledgments

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19 Supporting the Understanding of Complex Concepts through Play Situations

Lotte Agnes Lausen and Eva Maria Oberländer

Independent Researchers, Denmark

Introduction

Educators continuously attempt to support and expand students' theoretical and practical knowledge, understandings, and perspectives. In our practice, we have found that some theoretical concepts are more difficult for students to comprehend than others, and not least for educators to explain in sufficient depth for students to incorporate these concepts in reflections on future professional practices. As part of the Playful Learning Research Extension (2019–2024), this research project centred around playful moods and atmospheres in social and teacher education, focuses on how playful atmospheres through playful practices can support students' possibilities for reflection about their own future professional practice. In this chapter, playful practices and play situations are considered not only connoting play but actual play situations as known from, for instance, childhood. This chapter will discuss how playful learning practices, understood through the notion of being in the atmosphere of a play situation, can be one way of attuning students towards a closer proximity with, and thereby a better understanding of, theoretical and potentially complex concepts.

Methods

The findings this chapter is based upon stem from a research project, part of the Danish nationwide overarching research project Playful Learning Research Extension, where the methodological approach takes its springboard in design-based research. Being a research project evolving around playful learning practices in the educational context, the empirical landscape of education challenges the research with its complexity, where the site of the classroom can be seen as multi-confounded (Brown, 1992). Design-based research addresses this complexity explicitly by offering a systematic methodology, mainly by researching through iterative design experiments and, hence, researching through and not against these confounded conditions in educational settings (Van den Akker et al., 2006). By way of these central design experiments, design-based research offers an intermediary between practice, theory, and research (Mckenney & Reeves, 2019). The analysis is drawn from empirical material from one design experiment amongst a

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set of three design experiments in a higher-educational context. These experiments are designed in collaboration between the two authors from the perspective of researcher and educator. The design experiment which the analysis in this chapter draws upon, stems from the context of social education in Denmark.

The Atmosphere as a Productive Approach in Education

Researching the specific atmospheric qualities of a playful approach, and for students to 'be in' the atmosphere of the concept, requires methodological guidelines which can address this research angle productively. The methodology proposed by Sumartojo and Pink (2019) has been followed as a methodological guideline in this research. By following a route to researching atmospheres by way of three dimensions of knowing *in* atmospheres, knowing *about* atmospheres, and knowing *through* atmospheres, it has been possible to both design through the notion of atmospheres, at the same time as participating in those as a researcher, when these atmospheres unfolded in the confounded messiness of the classroom (Sumartojo & Pink, 2019, p.37). For us as a researcher and educator, this means we have the opportunity both to intervene by way of didactical design through the concept of playful atmospheres, and to investigate what this might create of new understandings for those involved in the design. The methodological framework of *in*, *about,* and *through* atmospheres inspired by Sumartojo and Pink (2019) offers both an analytical frame for how to go about investigating the concept of atmospheres, but simultaneously offers a guidepost for how to design and create interventions through the concept of atmosphere (p.119). The design of the experiment has been guided by the framework of what can be known when being in the atmosphere, opposed to when reflecting on an atmosphere.

Strategies for Analysing the Empirical Material

The empirical material consists of video recordings of teaching lessons including the design experiment and sensory ethnographic fieldnotes. Sensory ethnographic fieldwork guides and gives attention to not only the visually and auditive perceptive engagements but also the multiple and complex sensory perceptions in the field (Pink, 2015). The analysis of the empirical material was conducted through a video stimulated recall interview (Rowe, 2009) in which we, together as researcher and educator, watched the video recordings both from the design experiment and from the teaching session right before the experiment. The recordings were primarily used to recall being in the atmosphere of the classroom before, during, and after the experiment. This gave us the opportunity to analyse the situation from two different perspectives as the educator performing the experiment and the researcher being in the periphery of the playful exercise. Through the framework of thinking *in* and *about* atmospheres, this methodological strategy made it possible to analyse the data through the notion of these different forms of knowing atmospheres, thereby being aware of what was possible to state when analysing atmosphere, as opposed to being in the proximity of atmosphere or working through atmospheres.

Theoretical Outlook

Play and Ambiguity

Theorists like Caillois (2001), Spariosu (1989), and Sicart (2014), among countless others who have been interested in play and playfulness, state that play causes the ambiguousness of the world to be drawn forth again.

Ambiguousness can function as a way of making it possible to question things in other ways than if the concept, theory, or practice is only seen from one perspective. If we accept the premise that play creates the potential for opening the world towards a greater ambiguousness, then designing for playful atmospheres through play situations can possibly be a way of allowing for other forms of reflection on subjects, concepts, or theories in the educational context.

The Playful Experience

Bateson (2000) has already shown that everyone involved in play must realize and follow the metacommunicative signalled framing that "*this is play*" (p.178). This framing signals that even though what is experienced might look like some form of combat, the activities do not carry the same meaning as they would have if it had been real combat (Bateson, 2000, p.179).

Apter (1990) elaborates on the point towards play as a specific metacommunicated framing, where he states that: *"(...) we need to look not so much at* what *is experienced in play (...) but rather the* way *of experiencing what one is doing in play"* (p.14). Apter (1990) hints that it is not as much the specific characteristics of activities that is important for something to be play, but the question is rather if the activities leave room for the individual to be able to experience it as playful. According to Apter (1990), for an activity to be experienced as playful, the metacommunicative framing must make clear that what the individual is engaged in by themselves or together with others does not have long-term consequences outside of the play situation. This framing can, for instance, be set through rules in a game (Apter, 1990). If the playful protective frame disappears due to a lack of trust or confidence that the activity will have no further implications, the subject's playful engagement disappears (Apter, 1990).

Even though both Apter (1990) and Bateson's (2000) more complex theories of play cannot fully be accounted for here, the aim of including some notions of these theories of play, is to provide a theoretical guidance for what aspects needs to be brought into consideration to design for a playful experience in an educational setting.

Empirical Analysis

The design experiments generate abundant and differentiated empirical material, which in the analysis have been divided through the notions of knowing about, knowing in, and knowing through. This has been done to analyse how different

atmospheres of proximity make way for different forms of understanding and reflections about the concept in question for the students.

Knowing About

The teaching lessons before the actual design experiment carried out together with the students was characterized by teacher presentation scaffolded by PowerPoint slides made by the educator. The slides were based on important notions from theory central to the subject, and the presentation intermingled with small inter-ruptions of student reflections on the concepts and theory in study groups. While listening to the presentation from the educator, some of the students took notes and some did not. The scene before the design experiment is described in the field notes as follows:

> The educator comes to me in the little break between two lectures and says: "they really seem tired today". I propose that it might be because it is Monday morning, and the educator says with a laugh: "I guess we should blame it on that then". We both laugh. The educator starts the lesson again and asks the students if they remember an example from the last lesson they had together online. None of the students respond, silence in class, and the educator tells the practical example of the theoretical concept in question again. The stu-dents are asked by the educator to reflect in groups together two and two (…) The educator closes the group talk and asks if anyone would like to share what they have been talking about. Two students from two different groups raise their hands and share their insights from their group reflections.

When reflecting on the students' contributions in class discussions, many factors are to be taken into consideration, for instance: temporal issues such as time of day, the relationship between students and educator, educators communication, teaching and facilitation skills, students' arousal, classroom atmosphere, study topic, etc. In the fieldnote described previously, many of the students appear passive in the discussion, and even though some of the students raise their hands, they do not participate and engage themselves in a particularly enthusiastic form and do not contribute to a further dialog. It is not uncommon to encounter different degrees of commitment in the conversations and discussions from students when asking *about* subjects and concepts, and the educator understands blaming the passivity of the students on the time of the day is only said as a fun remark and cannot be taken seriously as a reason for the lack of engagement from the students. It is obvious by being in the atmosphere of the classroom that the students either find the subject boring or difficult.

The teacher presentation unfolded was not intended to be purposefully playful, but instead intended to explain *about* the central concept of the days lecture. From the description in the field notes, the students were not participating in especially playful ways by not participating very actively at all. It seems reasonable to claim that the above-mentioned scenario cannot be perceived as intentionally playful

nor contributing to the creation of playful atmospheres in the situation. A playful atmosphere requires more participation and active-subjective involvement from all the participants in creating and unfolding, which a lecture in a complex concept does not always immediately facilitate. Complex concepts can inherently be difficult to understand, especially the first time one is introduced to them and can, therefore, be experienced as problematic for students to participate in elaboration of in front of the whole class when asked by the educator to do so. This contributes to a seriousness between the students and educators, thus obscuring a more playful atmosphere of engagement and involvement by everyone. A serious atmosphere in the classroom when trying to understand complex concepts can spur reflection and a serious attempt to understand the concept. From this empirical situation, it seems more strenuous for the educator in this more serious atmosphere to create the needed proximity with the novel and complex concept needed for students to generate in-depth understanding for them to be able to perspectivate the meaning of the concept towards future practices. The lack of proximity and the serious atmosphere of the classroom seem to facilitate students thinking through a more cognitive scaffolding of the concept, whereas the bodily subjective experiences with the concept can be more absent in this form of didactical practice.

Knowing In

After the teacher presentation, the educator leads the students into a different classroom, where tables have already been moved and the educator explains the exercise for the students step-by-step while they are placed in a circle around the empty classroom:

E: *Okay, what happens is, that you take the bottle. And then you spin it (...) It's you. Yes, you are the first one.*
I will explain it all. Then you draw a feeling. And you do not show it to anyone else. This feeling, you have to show with your body. And then your partner (...) Then you read the feeling. Come, let's try it the first time. (Someone laughs while the student is showing the feeling).
E: *Nobody laughs (the educator says with a certain tone in her voice.)*

After the educator has instructed the students, she asks them to just keep on going with the exercise.

After a while, where a student has tried making an emotion and her partner haven't guessed it, the educator says:

E: *Yes, and it's not like you have to keep on going until she guesses the right feeling, so that you just stand there, thinking: 'Oh God, read that feeling alright'. (Everybody laughs)*
S4: *Can we guess too?*
E: *You are welcome to do so if you want.*

The scene from the playful situation is further described in the fieldnotes:

> The students laugh a lot in the situation (…) One of the students makes a little funny situation when her partner and the others don't guess her card (…) This seems to loosen up the situation for those a little uncomfortable in the situation. Their bodies relax a little more. All the students are very focused in the situation.

Spin the bottle was selected in this specific teaching context in the hope of it being a recognizable playful game for the students and because it could support the subject on the agenda for the day. Another game or playful situation could have been chosen if it would support the central theoretical points in relation to the concept. That said, an educator initiating a game or any other supposedly playful situation in an educational context does not necessarily make it playful for the students. The educator needs to design for the possibility of the situation being playful for the individual student, making clear for everyone involved that there is a playful framing around this experience through a playful protective frame. The protective frame is established by choosing a known play situation as well as through the rules of the game, the stern voice from the educator pointing out "nobody laughs", and students being able to get help from both their peers and the educator if in doubt about how to express the drawn emotions. In this situation, it can be presumed that the playful protection frame is established because the students laugh together and participate in the atmosphere of the play situation. The play situation is not guided by any theoretical reflections while in the situation. This to enable the possibility for the students to experience being in a playful atmosphere with no external agendas and, therefore, not feeling that their reflections are externally directed towards a specific aim in the immediate situation.

Knowing Through

After finishing the rounds of "spin the bottle", students were to talk about their experience. In an excerpt from the field notes, the scenario is explained:

> The students are now back in their classroom again. They have been asked to sit with their partner from the exercise. Some sit on the table, some sit on their regular chairs. The educators ask for silence, and it takes a little while for everyone to look silently up at her. She asks them to now discuss how they experienced each other during the exercise, not when they were the ones "doing the emotions", but between performing the emotions for each other. Many of the students immediately start laughing, looking at their partner, some with a surprise in their looks. Then they start talking together. The sound volume is now near deafening in the classroom. The educator looks at me with an equal surprise in her look as the students just had. The sound volume is very different from the first part of the teaching lessons before the exercise

The educator is now asking the students to reflect together in class about what they just talked about:

The students reflect in all sorts of ways on the subject and the concept in plenum. (…) Some of the students raise their hand and radically question their own practices experienced in their internships.

After finishing the play situation, students were asked to initially reflect upon the experience and to reflect about the central concept of the lecture theme through questions guided towards students' future practices. Distinguished through the change in the sound volume of the classroom from before the play situation, the atmosphere in the classroom was transformed. From being very silent and only a quiet humming of voices when the students were to reflect together in groups, to a very loud sound volume in this reflection round, where the students were asked to reflect in groups in the same way. When observing the students, they all talked about the questions, discussing them with renewed engagement as opposed to before the exercise. Without doing anything different in the way the reflection part was organized, the students were engaged in this reflection round in a completely different way, distinct from before the play situation was introduced. The practices from the play situation lingered in this reflection round illustrated through the way the students laughed and talked loudly just as in the play situation. The atmosphere of the play situation seemed to be brought into the reflection situation. Amongst different aspects of the experience, it could be described how through the characteristics of play as drawing ambiguousness forth again and experiencing the concept at work in a completely different context than it would normally be experienced, the play situation resulted in what seemed to be a more exploratory and playful reflection round in the groups. Here students were able to radically question their practical experiences from the internships, which was not something that came up as reflections before the play situation.

Discussion

Designing for and supporting a playful atmosphere in the educational context is not an easy thing for an educator to do. It is not immediately known if students find the play situation playful and thereby if the educator's attempt to create a playful atmosphere will succeed. Designing for a play situation in and outside of the educational setting always only brings the potentials for the situation to be perceived as playful by those participating in the situation. At the same time, because of the usually strong intentionality and aimed focus of an educational context, some thoughts are needed towards what the educator should be aware of when designing for a playful atmosphere to emerge through play situations in the educational context. The important part in designing for students to experience the play situation as playful in an educational context is among other potential aspects as mentioned, that the educator must frame the metacommunication of the situation as being a play situation, where there are no consequences involved in taking part in the playful atmosphere through, for instance, the rules of the game and providing rules of conduct.

Even though it can be a challenge to design for a playful experience to occur in the educational context, what we found through our empirical data is a striking increase in students' willingness to share their reflections in the discussions after the play situation. The residue from the play situation that seemed to linger in the classroom affected the student's participation in the classroom dialogue afterward. At the same time, not only did the students participate more but they also started radically questioning their own practices.

This framework has directed our attention towards the difference between what can be learned when reflecting about a theoretical concept as opposed to what can potentially be learned when reflecting through an experiential atmosphere and how this can work as a constructive distinction when designing didactically in higher education. Using play situations as a way of creating this didactical distinction between knowing about and knowing through create a more present experience through which the educator can guide the reflections. At the same time, situating this knowing *through* in a play situation also provides a space for students to experience practical aspects of a concept in completely different contexts than where these would normally occur. The characteristics of play help re-ambiguate and question anew complex concepts that could otherwise be difficult to know how to question.

We propose that these properties of the play situation in the educational context as explained in this chapter form a fruitful perspective for students in design education through which to experience different dimensions and support their understanding of complex concepts. This facilitates a different kind of proximity with a complex concept than when, for instance, design students understand these concepts through working with them in their own concrete design practices in teaching situations. Parallel ways of achieving closer proximity through play situations, such as through serious games, could be interesting to examine considering this subject. What is intended here is to divert a need for the educator to have extensive technological competences, which research shows is needed to facilitate a learning situation through serious games (Hauge et al., 2021). At the same time, being together in the atmosphere of the play situation is central in terms of how the students afterward reflect as a group through the atmosphere of the play situation, which might not in the same way be easy to facilitate through individual or group facilitated educational games.

It must be acknowledged that not every educational practice or complex concept can benefit from being scaffolded through proximity with atmospheres of play situations. It is proposed that the atmospheres of a play situation can be especially aiding in support of students' understanding of complex concepts where reflections about future practices is central.

Concluding Remarks

This chapter points towards the acknowledgment of different atmospheres of knowing, for which educators can didactically design when supporting students' understanding of novel and potentially complex concepts. We claim that these different atmospheres of knowing allow for different forms of proximity with complex concepts and serve the purpose of differentiating students' reflections. Here,

it is proposed that one way of designing for this is for the educator to facilitate opportunities for students to be in the atmosphere of play situations that represent dimensions of the concept in question. Leveraging the characteristics of play as a phenomenon to call forth an ambiguousness towards the experienced, it is proposed that being in the atmosphere of a play situation can bring a different proximity with concepts for students in teaching. We propose that inviting play situations into the didactical context can provide a productive aspect towards supporting students' experiences with proximity and understanding of complex concepts in teaching.

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20 A Pilot Study for Introducing Designing Materials in Design Education

Aline Teixeira Souza Silva

Federal University of Uberlândia, Uberlândia, Brazil

Rita Assoreira Almendra

CIAUD, Research Centre for Architecture, Urbanism and Design, Lisbon School of Architecture, Universidade de Lisboa, Lisbon, Portugal

Introduction

The world of materials for product design is a complex and unlimited place. Everyday, new materials are created or applied in new uses. Manzini (1986) presented the field of materials as a novel "possibility horizon" once the field is totally opened and expansive. Still today, the options are wide if we consider the growing application of alternative materials. Within this context, the materials' selection can be a complex challenge for designers who make choices based on project aims.

Nonetheless, the unlimited use of materials brings interconnected issues as challenges for global sustainability (Kandachar, 2014, p.93): climate change, environmental degradation, health and well-being, resource consumption, etc. From this perspective, Manzini and Vezzoli (2008) present strategies related to selecting materials with low environmental impact: minimization of material consumption, selection of nontoxic and harmless materials, selection of renewable and biocompatible materials and improvement of lifespan of materials.

As a way to minimize these problems, some individual initiatives from designers in small studios, from researchers and from traditional industry are emerging. These initiatives aim to create solutions for the innovative, creative and more sustainable use of materials. In the challenge "molding a new future for design and materials", designers have a special role as facilitator. According to Thompson and Ling (2014, p.203):

> Designers are in unique position to be able to reinterpret the opportunities presented by such developments, and apply them in creative ways, to bring about new generation of product experiences. It is possible to make new grades and fine-tune materials to meet specific technical requirements, if the unique properties of the material are well understood. This part will explore how designers can begin to shape future material experiences, by steering material development, to create technically and emotionally innovative products.

Within this context, the materials are not selected, but they are explored. Van Bezooyen (2014) explains that when materials are explored (not selected), the exploration occurs in the beginning of the design process, which means the use of materials-driven design. The author defines material-driven design as the "natural way of learning in developing more understanding of materials in design" (van Bezooyen, 2014, p.283). We understand material-driven design as a research approach, not as a scientific method. The scholars we used as references present innovative perspectives for material exploration (Pedgley, 2014; Bramston and Maycroft, 2013; van Bezooyen, 2014; Thompson and Ling, 2014; Rognoli et al, 2015; Karana, 2010; Ferrara, 2015) motivated by "learning by doing" (Wick, 2000) and experiential learning (Smith, 2010).

Considering the early stage of the materials-driven design approach, our research question is: how to introduce designing materials content in design studio classes?

We argue that design students should become familiar with materials-driven design content facing the changes to materials around the world: social, environmental, economic and social issues. Moreover, they should be touched by the subject, considering the innovative character involved. To illustrate our proposition, we planned workshops and exercises using the materials-driven approach based on personal experiences of participants.

Understanding limits, possibilities and applications of materials is fundamental for designers once an artifact is shaped by ideas and the way to make it viable. We consider that the learning-by-doing approach is more effective in the learning and assimilation process of the programmed content.

As successful cases from theory to practice, we can cite: (1) García (2014) developed a method to encourage designers to learn about materials. His method was applied in a course and it was based on three main areas: processes, materials and design. The delivery of the experiment with a material begins with the process chart containing the location of the material, materials required, tools, photo recipe, description, footnotes and key shot. (2) Parisi et al (2017) describes a course on Polimi based on tinkering with self-produced materials from activities in which students developed innovative and creative material proposals and improved pragmatic skills and a particular sensitivity about the experiential and sensorial quality of materials.

This chapter demonstrates the materials-driven design approach through a case study of a workshop. The aim of the study was to test a step-by-step workshop structure for introducing designing materials in design education.

Designing Materials in Theory

The selection of materials for artifacts occurs due to different factors: esthetic product appearance, ergonomic requirements, manufacturing and market aspects, laws, the environment and all aspects of product operation (Lima, 2006).

Most recently, considering the emotional aspect of user experiences with products, scholars started to investigate the "materials experience" (Karana et al, 2014). This approach embraces hedonic needs to materials selection. Hedonic needs

"determine the need for people to 'feel good' about products" (Karana et al., 2014, p.337). Then, hedonic needs are related to the pleasure of use.

Pedgley (2014, p.338) explains that:

> What differentiates engineering and industrial design perspectives on materials is the centrality of the user for the latter perspective. It is not just a matter of materials interconnecting with other materials: it is about the user's perception of, and interaction with, material-product combinations.

In addition, challenges facing a negative environmental impact by materials have been increasingly discussed.

> Designers have always been tasked with a responsibility to improve quality of life and can influence the sustainable use of resources through the ethical and moral decisions related to their creative outputs. Their ability to think and to consider available options before any specific commitment to materials or process provides the opportunity to ensure that appropriate directions can be followed without the need to squander resources and compromise the environment.
>
> (Bramston and Maycroft, 2013, p.123)

The designer has a relevant role in the choice and application of materials, despite knowing that he will not be involved with the origin or end of these materials when the product's life cycle ends. Within their scope of competence, the professional can provide alternatives with low environmental impact.

Traditionally, materials can be chosen accordingly to a previous briefing or in the middle of the design process, depending on the project nature and aims or technical requirements. However, considering all the cited aspects involved in the materials and design field, some design methods bring materials selection to the beginning of the process. Van Bezooyen (2014, p.283) defines this approach as material-driven design.

> Materials driven design is all about bringing materials at the beginning of the design process. Traditional design methodologies are often focused on sketching and visualizing. Materials driven design is about hands-on explorations and prototyping with materials. The challenge is not to develop perfectly finished presentation items, such as renderings, but more raw/rough objects made of reals materials within a workshop environment.

Experimentation is a key factor in the process of creating new materials. Even when new materials are created in the industry (this is not the case discussed in this chapter), experiments, tests and prototypes are essential to guarantee the success of the product. Thompson and Ling (2014, p.204) explains that "materials science innovation is the result of their extracting from raw material in a new way, by mixing a unique combination of base ingredients".

According to Thompson and Ling (2014, p.203):

> Designing materials involves either creating new versions with existing and well-understood ingredients, combined to create a new set of characteristics, or building from the bottom-up, such as with chemistry and nanotechnology. Materials developed from existing ingredients can still redefine product experience, by encouraging us to interact, play or consume an object in a more meaningful way. Prototyping is fundamental part of the development process: helping to realize the potential of the material development; explore the look and feel; understand the mechanical properties; and because importantly, when you manipulate new material, you will find new ideas.

According Rognoli et al (2015), more recently, the approach toward materials, both in educational and professional practices, is shifting to experimentation through a hands-on approach. The didactic notion of "learning by doing" from Bauhaus inspired many scholars to develop design methods and tools for material experimentation.

Materials-Driven Design Methods and Tools

In this section, we will present methods and tools for the materials-driven design approach.

Material-driven design is a design method created by Karana (2009) which aims to explore materials by user experience with the material-product and, then, support the designer in selecting/creating materials focused on user needs.

The **Meanings of Materials tool** was created by Karana (2009) and aims to support materials selection for the design according to the user experience. "It aimed to translate the main findings of her research into meanings that people attribute to product materials into a tool to assist meaning-driven materials selection" (Pedgley, 2014, p.343).

Design-driven material innovation methodology supports materials' selection from the interpretation of a technical opportunity and social need. This methodology is focused on the Italian historical identity (Ferrara, 2015).

The **Question tool** is a material-driven design tool created by Van Kesteren (2010) which considers the user-material interaction. According to Pedgley (2014), this tool, such as others developed by the same author, "had the aim of improving designers' materials selection activities in circumstances where designing for materials' perception and user appreciation are critical. The tools are intended for use during the early phases of a design project as a discussion and sensorial inspirational source" (p.342).

Do-It-Yourself (DIY) materials is a given name to the approaches used by designers who create materials on their own (Rognoli et al, 2015). It is not a method but a totally experimental approach in which designers create materials, often in conjunction with the product itself.

Case Studies: Materials-Driven Design Workshop

Disruptive Materials is the title of the research in progress in Federal University of Uberlândia (UFU). This research aims to clarify the materials and processes for design undergraduate students considering the complex nature of this content. Within the scope of research, numerous actions are carried out to learn about the possibilities and limitations in teaching materials. In this case study, through the workshop "New Materials, New Design", we studied more properly the materials-driven design content.

Objective

The aim of this study was to define a framework for teaching designing materials considering strategies and guidelines for future workshops.

Challenge

For this study, we asked to participants to create a concept design product and its material. We asked for something useful, even if it was not a finished product. We wanted natural materials and asked them to use construction tools they could easily handle. We wanted something they could make through hands-on experimentations. We argue this experiment is valuable for students and designers because it is based on creativity and experimentation. Experimental practices deliver innovative artifacts since they create novel and original possibilities in the process. Participants were asked to produce a design made from plant, food, mineral, non-toxic or other natural materials.

Approach

We presented design methods and tools focused on materials-driven design. Participants could choose the method or tool they wanted to use. Brainstorming sessions were held on personal experiences with physical substances that could be worked into potential materials. We encouraged students to test, experience, reflect and synthetize what they learn about the experiment. We explained to students that this approach is not an alternative to traditional material selection in design, but it could be helpful to generate unique and meaningful artifacts. Finally, despite being an academic exercise, this approach helped designers understand their role in developing new materials.

Process

All the workshop participants were undergraduate students from second period of Design undergraduate course of UFU. The workshop lasted 16 hours, divided in four sessions: In the first session, we presented the proposal, the challenge, the theory and the design methods and tools. The second session included brainstorming sessions on personal experiences with natural materials and then defining the matters through user experience. In the third session, students created practical experiments with the matters, created samples and patterns and tested patterns with potential users (Figure 20.1). Finally, in the fourth session, they designed the product and the material.
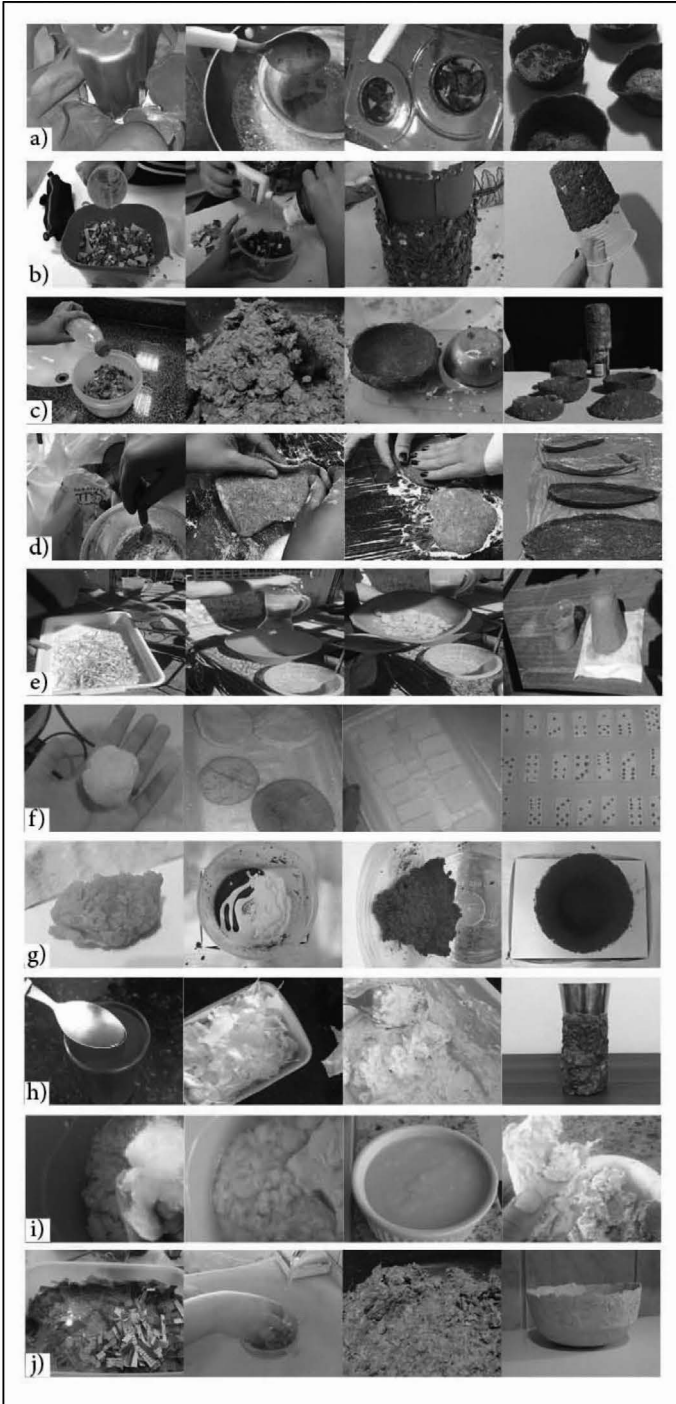
Figure 20.1 Manufacturing processes at "New Materials, New Design" workshop.
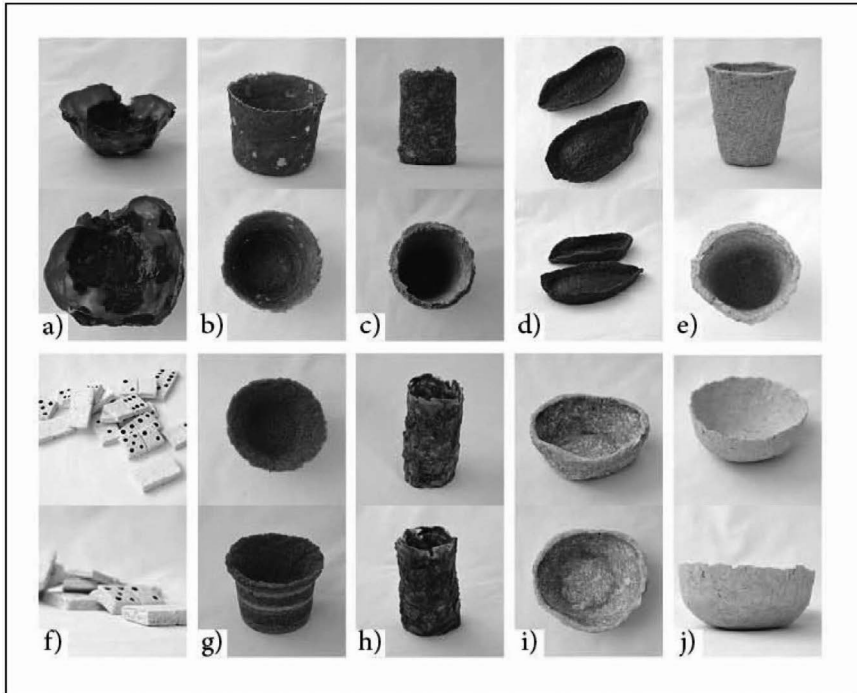
Figure 20.2 Concept design products developed at the "New Materials, New Design" workshop[1].

Results

The design concept products were developed by teams with three or four members. They delivered more than ten objects (Figure 20.2).

Outcomes

Participants reported that before of the workshop, they did not realize they could manufacture or design new materials. This exercise helped them to understand that designers can also produce materials for their projects. By using personal experiences, they could create original artifacts; the products resulting from the workshop were different from each other. All concept design products were manufactured by their creators with simple processes in a hands-on approach. Students used design tools to concept the pieces when they were defining the theme, selecting information, testing with potential users and building the delivered objects. The experimental character of the exercise supported the learning-by-doing concept. During the workshop, we discussed sustainability issues and more sustainable ways of making things. Participants reported that the experimental character of transmitting the content was a very pleasurable way to learn.

Pilot Study for Designing Materials

In this section, the pilot study for designing materials is presented. Following the findings of the research in Disruptive Materials, mainly in the "New Materials, New Design" workshop, we formulated a step-by-step structure which supported students in designing materials activities using personal experiences, a hands-on approach and user perception. This pilot study encourages designers to seek personal experiences with matters that become potential materials considering their perceptive value (Figure 20.3).

Step 1: To present, analyze and discuss designing materials literature (Pedgley, 2014; Bramston and Maycroft, 2013; van Bezooyen, 2014; Thompson and Ling, 2014; Rognoli et al, 2015; Karana, 2009; Ferrara, 2015). This step is marked by the understanding of the driven material design concept. **To illustrate the subject with examples,** we used these examples at the workshop: *Decafé* by Raúl Lauri, the miccelium collection by Maurizio Montalti, the *Full Grown* project by Gavin Munro and furniture projected by Mathias Benson. **To present, to analyze and to discuss design tools and methods,** we used the following at the workshop: the Material Driven Design method by Elvin Karana, the DIY materials approach by Valentina Rognoli, the Design-driven material innovation by Marinella Ferrara and the Question Tools by Ilse Kesteren.

Step 2: Present Challenge Question 1: What natural matter could become a material? Then, the session focused on brainstorming an answer. Next, **present Challenge Question 2:** What user experiences does this material allow? Then, session brainstorming on answers.

Step 3: To instigate hands-on experience. Design methods and tools have already been presented and those that are most appropriate should be chosen. In addition, the hands-on approach works well with practical experiments. Wanted actions: **To manufacture samples, to discover patterns, to mix matters, to adapt, to rearrange, to modify, to revise, to adjust, etc**. Then, with the materials samples ready, the material-product proposal should be appreciated by potential users. Once again, design tools and methods must be chosen and applied. This is a qualitative and intuitive process.

Step 4: To deliver the material-product. The samples and concept products designed most adequately should be refined and delivered as a final proposal.

Step 1	Step 2	Step 3	Step 4
> Designing materials theory	** Challenge Q1 **	Hands-on	Deliver material product
	Brainstorming		
> Examples	** Challenge Q2 **		
> Tools and Methods	Brainstorming		

Figure 20.3 Step-by-step prototypical framework.
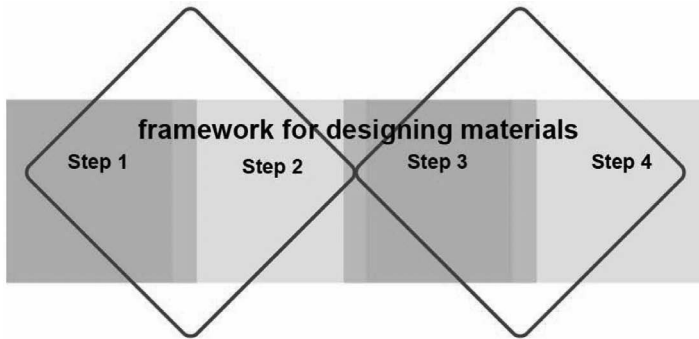
Figure 20.4 Pilot study syllabus in the Double Diamond diagram context.

To situate our proposal in the design, we use the Double Diamond diagram (Design Council, 2005). The Double Diamond diagram describes the design process as a simple graphic way. The design process has four stages:

Stage 1: Discover. Where the initial idea is sourced from project information.
Stage 2: Define. The second stage represents the definition phase where the project information and designer interpretations are aligned and synthetized.
Stage 3: Develop. The third stage represents the development of ideas and solutions for the design problem.
Stage 4: Deliver. The fourth stage is where the best solution is delivered.

Considering the materials at the beginning of the design process, the Discover stage represents the place where materials information is explored. At this moment, two challenge questions ask designers to expand the possibilities about matter and its transformations through materials. The Define stage is formed by the decisions when the challenge questions are solved. The Development stage marks the exploration phase of doing things in an experimental way. Finally, Delivery marks the stage where a solution is presented. Figure 20.4 summarizes these convergent and divergent stages at the Double Diamond diagram.

Discussion

The pilot study allowed us to understand the questions that should be considered on development of a framework for future classes about designing materials.

Although the materials' properties and characteristics are not deeply discussed (it is not the intention of this study), participants absorbed other relevant aspects of materials and selection knowledge such as: limits and potentialities of natural materials; practical know-how through a hands-on approach; visual and tactual qualities depending on the material's "ingredients"; texture variations according to material manipulation; and the surprise of discovering new textures, forms and "recipes".

We argue that a simple and basic exercise such as the one presented is a good option to interest participants in designing material content. We understand that it could be done using other resources, but learning by doing is more effective for creators. Also, in this approach, students learn more effectively through mistakes they make in the process – something that may not work at a specific time, can work well in another. They don't have a list of wrong things but a list of things that could be used in this or another project.

The pilot study was fundamental in identifying what aspects need to be improved. In our study, students could select any natural material or materials they want. Therefore, creating and presenting a procedure or criteria could help them to focus the search in potential materials. They could also do it faster. It is fundamental to offer a form to students to fill out with the material's information. We asked them about the basic information of the material, but each work was presented differently. Still, these templates would be used as a materials' catalog.

Conclusions

The prototypical framework presented is still in the explorative stage. It was the first practical exercise applied within the scope of the Disruptive Materials research. The application of this framework is far from traditional and conventional industry and we recognize its limitations. However, it is important to highlight the contribution of the exercise to the building materials design culture with design students and its role in reflecting on more sustainable choices. Workshops like the one presented can elucidate these relevant discussions in undergraduate schools.

The combination of knowledge about the subject (presented theory) and holistic approach (personal experiences with matters) often results in innovative product ideas. It is a challenge for designers to be creative with traditional materials and conventional processes. Hands-on approaches, such as the one presented in this study, help the generation of new and original ideas in a learning-by-manufacturing process. In this approach, the selection of the material becomes also a creative tool through the possibility of discovering new things. Thompson and Ling (2014, p.204) explain that "materials science innovation is the result of their extraction from raw material in a new manner, or by mixing a unique combination of base ingredients".

It is also important to state that the entire process was focused on the potential users' needs, who effectively participated in the material construction process and also on defining its application in the final product. Therefore, the process was focused on the user's experience with the product, which is indispensable for the design of artifacts.

This study intended to solve the research question: how to introduce designing materials content in design studio classes? We consider that, through workshops and exercises in the model, learning-by-doing is a good alternative. Once students could use a previous personal experience (mostly from childhood), they were motivated with their concepts' design. For instance, in experimentation practices, students easily focus on the design problem, emerge in the process of seeking solutions and are motivated by the work process.

Note

 1 (a) Vase made with natural jelly colored with flowers; (b) Pencil holder made with recycled paper and natural starch glue; (c) Pencil holder made with recycled paper and natural starch glue; (d) Vase made with recycled paper and natural starch glue colored with tea; (e) Vase made with sugarcane bagasse and natural agglutinating sugarcane; (f) Dominoes game made from wheat flour; (g) Candle holder made from natural jelly colored with fruit; (h) Pencil holder made with recycled paper and natural starch glue colored with flowers; (i) Vase made with recycled paper and natural starch glue; and (j) Vase made with wheat flour and starch binder.

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21 Exploring Student Perceptions of Product-Service Systems

Pierre Yohanes Lubis

*Department of Design, University of Waikato,
Hamilton, New Zealand*

Bahareh Shahri

*School of Product Design, University of Canterbury,
Christchurch, New Zealand*

Introduction

There is much interest in the topic of Product-Service System (PSS), which can be defined as the network, infrastructure, and governance structure needed to "produce" a product-service (Tischner & Tukker, 2006) and the perception towards PSS has been well documented. One study found the public has concerns that a PSS always entails entering into contract-based service agreements (Cherry & Pidgeon, 2018). Other studies focus on small and medium enterprises (Hernandez-Pardo, Bhamra, & Bhamra, 2013; Rapitsenyane, 2014) and consumers (Armstrong, Niinimäki, Kujala, Karell, & Lang, 2015; Catulli & Reed, 2017; Long, Wang, Zhao, & Jiang, 2016). Insights to students' perception towards various design approaches towards a circular economy are available (Ramirez, 2007a, 2007b, 2018). However, studies are lacking in terms of PSS designs, addressing the problems of people living in poverty. This study sets out to investigate Product Design students' perceptions towards PSS to provide a richer set of perceptions towards PSS across a different demographic, less privileged communities. This study explores how students perceive PSS, its significance, and positioning in the field of Product Design. Student comprehension is an important factor to examine the success of PSS education.

Background

"No Poverty" is first on the list of Sustainable Development Goals, the latest iteration of the sustainable development agenda first set by the United Nations (UN) in 1992. However, Polak (2009) argued that the strategies employed by the UN are heavily flawed. Big infrastructure investments, agriculture projects, and budgets controlled by governments of developing countries have failed multiple times in the past and have simultaneously undermined all the efforts of the poor rural people living on small farms. Emphasized on top positions of power (i.e., governments, institutions, and corporations), they are treated as an outlet for philanthropy without considering the outcome of such actions. Heffner (1975) argues that the outcome

is where the judgment should have been placed rather than upon the intentions. It is self-evident that no amount of increase in donations, national economic growth, and big business is truly capable of ending poverty (O'Shea, 2013). Various forms of free-market capitalism, however, have lifted more than a billion people in developing countries out of poverty between 1990 and 2010 (Horwitz, 2016; The Economist, 2013). Moreover, markets generally work better as compared to government planning (Sowell, 2001). Philanthropy can impede human dignity, but market-based solutions can foster community engagement and cultivate self-esteem. Manzini (2015, 2019) elaborated on how people (re)discover the power of collaboration to increase their capabilities, and how this (re)discovery gives rise to new forms of collaborative organization and design intelligence. Esteem, according to Maslow (1943), is desired by all people who need a stable and firmly based high evaluation of themselves, for self-esteem and for the esteem of others.

Scholars classify poverty differently. Some maintain it at $2 a day while others look to whether certain people have access to basic services or whether they are excluded from the social and political sphere (Karnani, 2016; London, 2007, 2008). Scholars also acknowledge the ineffectiveness of traditional development strategies in addressing the problems of the poor and suggest a market-based approach instead (Hart, 2007; London, 2008; Prahalad, 2006). Labeled as designing for the Base of Pyramid (BoP), this approach reframes the poor as small business owners and entrepreneurs. The focus on BoP has shifted to PSS design regarding addressing poverty (Emili, Ceschin, & Harrison, 2016; Jagtap, Larsson, & Kandachar, 2013; Letaifa & Reynoso, 2015; Santos, De Sampaio, Silva, & da Costa Junior, 2014; UNEP, 2006). The International Learning Network on Sustainability (http://www.lens-international.org/), a network of universities with the aim of internalization, intercultural cross-fertilization, and accessibility to Design for Sustainability, focuses on Distributed Economy and PSS for communities of middle- and low-income context. PSS with such focus can be categorized as PSS design for the BoP (Ceschin & Gaziulusoy, 2016).

Researchers and designers have focused more on social issues and exploring design implications for the BoP compared to the previous decade (Castillo, Diehl, & Brezet, 2012; Ceschin & Gaziulusoy, 2017). The main focus of a PSS is the customer's satisfaction rather than exchanging product ownership (Aminoff & Kettunen, 2016), and a sustainable PSS focuses specifically on solutions that reduce environmental impacts, lower usage of resources, and minimize waste (Clark, Kosoris, Hong, & Crul, 2009; Kang & Wimmer, 2009), thus, contributing to sustainable development (Retamal, 2017). Designing a PSS requires better insights into the stakeholder's value chain and the cultural and economic dimension of the stakeholder denotes the requirement for a tailor-made design process. The pursuit of a universal solution is futile as the context differs across the board. However, the lack of individual ownership in a PSS may present problems concerning individuality, but there is a considerable amount of control that can be retained in terms of product use. The product has a lower likelihood to be misused or abused. The integration of services to a product increases community involvement. The expansion of design activity to include service design also supports the concept of sustainability. By designing both products and services holistically, designers

are now designing systems. This is in complete accordance with the mindset of sustainability, which emphasizes the interconnectivity of things and how everything should fit together in a system.

The market for PSS innovations is growing and the awareness towards sustainability is increasing. However, the topic of sustainability at universities is mostly limited to the discussion of material sciences, material resourcing, life cycle, and recycling, without much emphasis on social innovations. The failure of complete comprehension of the concept of sustainability is also demonstrated in how most sustainable design tools underperform in a pillar of sustainability (Ahmad, Wong, Wong, & Tseng, 2018). To establish a firm grasp of sustainability facing global concerns, we should include the design for poverty and people living at the BoP. Thus, it is important to measure student comprehension of PSS education.

Research Approach and Methods

To understand the students' position in the introduction of PSS in developing countries, a qualitative approach was used in this study. The participants were seven volunteers from the third (final) years in the bachelor's degree of Industrial Product Design. All third-year students were approached to participate since they were tacitly posited to have sufficient knowledge and skills in the field of Product Design. The students were invited to participate via emails and posters on news bulletin boards around the School of Product Design at one university in New Zealand, from mid-March to mid-April 2020. Interested students then contacted the researcher via email, and a time for interviewing was arranged. Before the interview, participants were provided with a sheet containing all the information about the study along with a consent form to sign. This study was conducted in accordance with the Declaration of Helsinki and the protocol was approved by the Human Research Ethics Committee of the University of Canterbury. The method of data collection was a semi-structured in-depth interview, conducted in two parts, with the assistance of visual research tools, inspired by IDEO Human-centred Design Tools: Conversation Starter Cards and the Jakarta Context Board. Conversation Starter Cards contain examples of design solutions specifically targeted at the poor in various regions of the globe. The Jakarta Context Board included examples of PSS found in Jakarta and highlights how they were unique geographically. Visual research tools such as cards help "break the ice" between the interviewer and the interviewee and therefore smooth the interview and keep the topic on point. Cards, as an informal and friendly mode of communication, espouse more casual responses from the participants (Muratovski, 2016). At the beginning of the interview, participants were given a short introduction about the topic and the progression of the interview. They were then handed a series of A7-sized Conversation Starter Cards (Figure 21.1). One side of the card illustrated an image of the intervention and the other presented the name of the product along with a brief explanation. The images were borrowed from 15 design projects. Some of them were in the form of stand-alone products while others were PSS innovations. Most of them were from a cluster of projects called WASH (Wash, Sanitation, and Hygiene) by UNICEF. As

Hippo Roller

The Hippo Water Roller enable rural communities to transport water more easily and in less time than with traditional methods

Clean Team Toilets

Clean Team Toilets offers in-home sanitation services for a low-monthly fee.

Water Vendor Project

Water vendors retail water using a long cart to people living in dense housing complex. The water is typically not potable and only used for bathing, dish-washing and sanitation purposes.

PlayPump

PlayPump is a sustainable water pumping system powered by the play of children

Figure 21.1 Examples of conversation cards.

well as projects conducted by IDEO.org. The rest were identified and collected by the researcher. Most of them were first introduced in the past 20 years but still operate today. This indicates their high success rate. For instance, the Hippo Roller, a water transportation tool for rural communities which was first introduced in South Africa in 1997, now has expanded to 51 countries.

Participants were given approximately five minutes to observe the cards and then solicited their opinion. This discussion took approximately 25 minutes. Some of the questions asked at this stage were:

- What do you think of these design solutions?
- Which one is your favourite? Why?
- Some of these solutions were crafted due to the weak socio-economic status which prevents people access to basic services, such as sanitation. Do you think these solutions are really necessary?

After participants observed the cards, the interviews were then directed to the context of Jakarta. One of the reasons for this was to present contrast between different regions of the world and consequently seek out if the participants think the examples can be implemented in the Jakarta context. Here, the participants were presented with an A3-sized board (Figure 21.2) that contained 11 examples of PSS innovations found in Indonesia.

Each PSS innovation shown on the board was accompanied by a short description and participants were given five minutes to observe. Participants were then probed about the context and their comprehension of PSS design. This took approximately 30 minutes for each participant. The following are some of the questions asked:

- What do you think of the Jakarta and Indonesian context?
- What do you think about PSS design?
- How do you compare the design of products alone to the design of a combination of products and services?
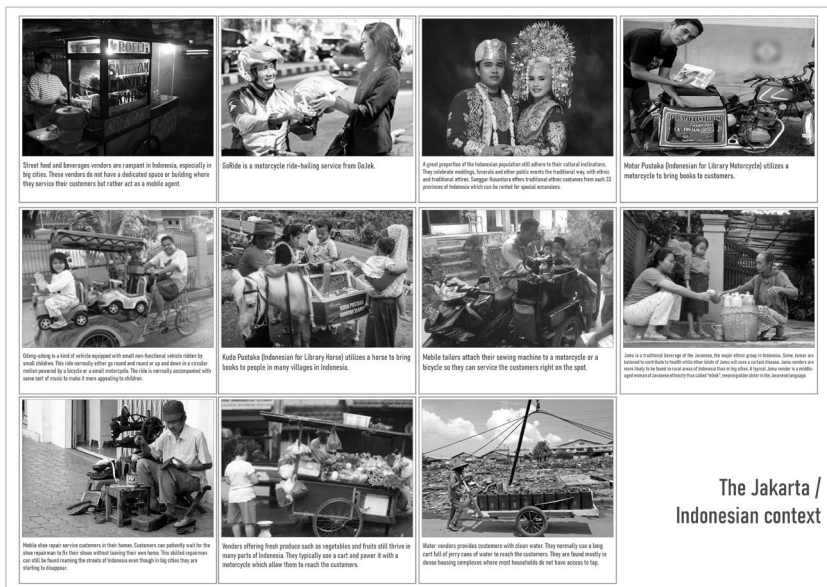
Figure 21.2 The Jakarta and Indonesian context.

The interviews were carried out until concrete themes emerged, as the answers became repetitive and no more new information was being added (Muratovski, 2016). Thus, the data collection process was concluded after interviewing seven students.

Results and Discussions

As a result of the thematic analysis technique, five different themes were identified.

Cultural and Economic Context

The importance of context was recognized by the participants. Culture has a significant impact on whether a product or service is accepted by stakeholders and thus deemed successful. A product designed to fit a particular demographic may not be as successful when implemented as others. The cultural and economic context holds a significant impact on the appropriateness of the solution. Understanding the target demographic is key to finding solutions that will not go to waste and can survive for a longer time (Murphy, 2016). Designers must immerse themselves in the community to understand the particular group of people that they are designing for (Martin & Hanington, 2019; Muratovski, 2016), as pointed out by three participants.

The examples provided in the Jakarta and Indonesian contexts (Figure 21.2) were unique to the Indonesian and Asian contexts. They were typically in the form of servicemen or -women taking their business to the street, offering various products (e.g., food and beverage, produce, and water) and services (e.g., cobbler, solder, and tailor) to people with lower socio-economic status. They were identified to be PSSs, which focus on customer satisfaction rather than exchanging product ownership (Aminoff & Kettunen, 2016; Bonvoisin, 2016; Clark et al., 2009; Niemann, Tichkiewitch, & Westkämper, 2009).

After observing the examples of service providers in Indonesia, participants were asked whether they could acknowledge any difference between the Indonesian context and the culture they were living in. Distinct from developed countries, where the argument for PSS is towards efficiency, sustainability, and the environment, the proliferation of PSS in developing countries is largely due to the lack of affluence.

Several Indonesian PSS innovations are smartphone app-based solutions such as ride-sharing apps (e.g., Go-Jek and Grab), which have been diversifying their services to other areas such as meal and grocery delivery. Diversification of services denotes a successful PSS innovation (Spangenberg, Fuad-Luke, & Blincoe, 2010).

Participants' responses indicate a discrepancy in a "one-size-fits-all" approach to product design. No one solution can be offered to different situations, with different cultures and economic situations. It can also be highlighted that the participants share the global concerns towards different cultures and the context of developing countries. When managing stakeholders, designers should be cognizant of those variations, because doing so can affirm the value of human dignity (Buchanan, 2001) as well as the attempt to see the world from the eyes of the stakeholder (Abras, Maloney-Krichmar, & Preece, 2004; Hanington, 2017). It is futile trying to create one universal solution that works for everybody, every time. Realistically,

there are no solutions, only trade-offs (Sowell, 2019) the stakeholders are willing to consider. This is why designers should properly identify the type of community and its values first before commencing a design activity (Ceschin & Gaziulusoy, 2017).

Philanthropy or Market-Based?

On the topic of the poor, participants were asked how poverty should be addressed. What proper method is best to address poverty? The interviewer laid out two different approaches in addressing the poor: philanthropy and a market-based approach. They were then asked which method would work better. Participants acknowledged the shortcomings of a pure philanthropic approach by highlighting how the act of philanthropy could create a dependency on people at the receiving end and only perpetuate the condition. Most agreed that in the long run, philanthropy was not very effective. While philanthropy could help for a short period, their main concern was its sustainability and how to maintain it for a longer period. Studies show that forms of developmental aid do not contribute to long-term economic growth and even damage the development of economic markets (Bourguignon & Sundberg, 2007; Prazeres, 2010). Thus, such solutions cannot be classified as a successful product design because they fail to address the root cause of the problem and benefit the stakeholders in the long run (Easterly & R., 2006).

The balance between the two approaches is often recommended. Participants can relate to the idea that the philanthropic approach is inherently materialistic as it is leaning towards providing products alone without any kind of community engagement. On the other hand, market-based solutions are perceived to be an investment to the community as well as affirm its autonomy (Polak & Warwick, 2013). Adding a service also means putting local people into employment, which is beneficial for economic growth.

The topic of self-sustainability, how a community should be able to sustain itself independently without outside intervention, was also addressed. This is an element of the topic of sustainability that is often overlooked. This contributes to individual self-esteem (the next theme) and gives the individual an optimistic view of life.

The Question of Individualism and Control

Participants were asked to compare product and a PSS to draw reasoning behind different implications of offering a product alone or a PSS. A conflict of power was acknowledged. In one scenario, a product changes ownership and with it the transfer of authority and control. Thus looms a possibility for the product to be misused. In the other scenario of PSS, there is no ownership transfer and, thus, no transfer of control. The provider retains control and can uphold product use as it is intended. However, the latter scenario can undermine unfair or oppressive cultural inclinations that may exist in particular communities.

The proliferation of PSS innovations in the last decade begs the question of individuality because ownership transfer does not occur. Providers maintain ownership but left the benefit of the product to the clients. This is a shift in the realm of individualism

because ownership of certain properties can indicate certain status for the individual. Owning certain products can mean happiness to certain individuals. Products can serve as an expression of identity and a social marker (Douglas & Isherwood, 1996). Ownership of certain objects can also develop to be a part of an extended self (Belk, 1988; Crewe & Gregson, 1998). Freud coined the term "narcissism of small differences" to explain how communities with adjacent geography and similar way of life are most likely to ridicule and make feuds with each other (Freud, 2002). Similarity, relatedness, and uniformity can drive the individual to break out from conformity. A propensity to separate from others is a way to preserve a sense of self.

Classical liberal scholars recognized property as an economic resource that encouraged individualism, natural possessiveness, entrepreneurship, and self-reliance (Turner, 2008). Hayek (1962, 2013) argues that any infringement upon property entails the kernel of totalitarianism with the statement "where there is no property there is no justice". Von Mises and Greaves (2005) echo this by stating the property is the soil in which the seeds of liberty are nurtured and in which the autonomy of the individual and ultimately all intellectual and material progress are rooted.

People prefer to buy products that induce emotional attachment to their owners (Livette, 2006; Schrader, 1999) and appreciate ownership of products that deliver value and project meanings about themselves (Barone, Shimp, & Sprott, 1999; Belk, 1988). This indicates that consumers expect more than just functionality from a product (Catulli, Cook, & Potter, 2017). PSSs, therefore, restrain the struggle for individualism because they lower attachment to the product (Bardhi & Eckhardt, 2012; Moeller & Wittkowski, 2010). Nevertheless, this does not entirely diminish the possibility of attachment to the product (Chen, 2008) because other kinds of relationships with the product can happen. It only indicates that personal ownership is being gradually replaced by more sharing platforms. Participants were able to point out several things that could have been transformed into PSSs to avoid inefficient use of resources. Therefore, it is important to identify consumer identity in the diffusion of sustainable consumption solutions such as PSS (Catulli et al., 2017).

The Expansion towards PSS Design

A PSS can be defined as a marketable set of products and services capable of jointly filling a user's need (Goedkoop, van Halen, te Riele, & Rommens, 1999). Therefore, the field of Product Design is being expanded through the integration of services. Product Designers are required to widen their horizons to see the "big picture" and with it, the implicating complexities. Since its conception, the Product Design field has only been concerned with matters like aesthetics, ergonomics, and manufacturing. The integration of services adds many coinciding factors to be considered. The participants were asked if they were aware of this transformation in the Product Design field. They affirmed the potential complexities of service integration and were perfectly aware that it affected the field of Product Design. This expansion was welcomed as it was comprehended to be a better way to engage the stakeholders. This attitude can be traced back to education on sustainability, which encourages us to perceive everything in terms of systems and not overlook

the impact of one chain link with other links in the strand. Given the larger scope of PSS, it requires better insights into the context of design and innovation (Reinders, Diehl, & Brezet, 2012) as well as stakeholder value chains (Ceschin & Gaziulusoy, 2017). The integration of services can lead to a better relationship with the community and, therefore, improve the product and services. By engaging the community, designers can offer more effective products that the community wants and needs. Participants acknowledged this is an opportunity for designers to engage more closely with the community as well as obtain feedback from them and, therefore, update, upgrade, and maintain the product where necessary.

PSS, Sustainability, and the Future

Participants hold the view that sustainability can be achieved regardless of geographical constraints. Most participants also acknowledged that PSS follows the concept of sustainability, especially in terms of the decrease in materiality through sharing the benefit of products and services collectively (Clark et al., 2009; Kang & Wimmer, 2009). Users benefit from a cheaper buy-in and providers have an opportunity to make profits. PSS offers advantages over offering products alone, including the success rate of implementation and related economic growth. The community can become involved with the product and services. By integrating a service, trained specialists can disseminate product usability and benefits to the target users as well as maintain the product to operate optimally.

In microeconomic theory, an implicit cost is a type of opportunity cost that equals something a company already owns and does not pay rent for (Lipsey, 1975). This is an area on which many PSS innovations are focusing. For instance, a man who drives his car to work daily and lets the car sit stationary the whole time he is at work is suffering from an implicit cost by not offering the car to be rented, making a profit for the owner. This leverages owners to commercialize the benefits of a product that they own. By doing so, more people benefit from a single product instead of the owner alone. This reduces the material needed to satisfy a particular need.

By designing systems rather than products alone, product designers are on the path of the pursuit of sustainability because collaborating with organizations, businesses, policy-makers, and community members are some of the quickest paths we can take to achieve sustainability (Wright & Ceroni, 2017). Participants agreed that the transition to PSS design would be unavoidable and already happening organically.

Conclusion

Studies demonstrated the shift of focus to PSS design when addressing the poor. This is largely due to the failure of traditional approaches and their underwhelming results. PSS design as an alternative approach enhances community engagement and affirms human dignity. Literature shows how various demographics perceive PSS. This study aimed to build on these previous findings and further examine how industrial product design students comprehend PSS design and present its current standing in academia.

The results section began with the discussion of the importance of cultural and economic context in regards to PSS design and the part that followed touched on how PSS design reframes the poor as enterprising people with a lot to offer. How a lack of ownership in a PSS can be a detrimental force to the human psyche was discussed, reinforcing various studies that confirm people still regard the value of ownership quite highly (Bardhi & Eckhardt, 2012; Catulli, 2012; Cherry & Pidgeon, 2018; Moeller & Wittkowski, 2010). This also presented a conflict between control and proper product use. The shift to PSS was discussed at the end along with the transformation of the design field. Finally, the viability and future of PSS education were raised in close association with the overarching concept of sustainability.

The development of PSS design can be linked with the increasing awareness of the concept of sustainability worldwide and how people are increasingly striving to be more sustainable. This can be interpreted as an achievement for the Sustainable Development Goals set by the UN. In any case, the market for sustainable products and services is growing more than ever before.

The literature review showed the lack of focus on PSS comprehension in the case of industrial product design students. This study addresses that gap through the discussion of various themes and the aspects of PSS design with the students. The evidence suggests that students were able to identify characteristics of a PSS and its impact as well as map PSS in the bigger scope of sustainable design. Students were able to list the advantages of PSS innovations and, therefore, were deemed capable of building a compelling case for it.

This study explored how students perceive PSS design, along with its characteristics and implications. The study has revealed students' perception of the product design field that is evolving to embrace sustainable approaches to address the needs of people living in poverty. Students understood the scope of sustainable design and the connection between PSS and sustainability was established.

Limitations and Future Research

This study is limited to the scope of one university and lacks an extensive review on the input of PSS design education, e.g., the amount of PSS content in the curriculum or the number of lecturers well-versed in the subject. Future research could investigate a larger scope and such research could present a more impactful insight to design pedagogy.

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