

# Transformation of Architectural Design-Research Pedagogy

Guidelines for the design of an experimental master's course based on disorienting dilemmas

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## Abstract

This paper addresses the concept of transformation as a restorative practice with great potential in architectural education. The concept was used as the foundation of a post-professional, research-oriented master's degree design studio held for the first time during the spring semester of 2022 as a collaboration between two European universities. Conventionally understood as the action of 'transmuting something into something else', transformation implies acknowledging and reinterpreting pre-existences, and therefore challenges creation ex novo, which is a notion traditionally more prevalent in heritage and conservation courses rather than in design courses. However, the potential of this concept can be exploited at different and complementary levels, as this paper aims to demonstrate. This choice was motivated by the imperative of sustainability, where the ethos of reutilisation takes precedence by purposely narrowing scope and concentrating design research strategies on transformative processes.

To be precise, the above-mentioned pilot course explored the concept of transformation from a twofold perspective. Firstly, transformation was understood as a research-through-design strategy that showed students how transformative design actions could be used as actual methods for theoretical research at postgraduate level, interweaving the logics of the creative act with the logics of research and thinking processes. Secondly, transformation was explored from a deeper pedagogical perspective, in line with constructivist approaches and theories of the self, with the specific ambition of triggering significant changes in the way students and teachers think and act. This latter approach led to the application of Jack Mezirow's (1991) notion of 'disorienting dilemmas' as the main educational device of the course, which in turn became a key innovative input for reconsidering the research-through-design methodology. Both levels in which the concept of transformation was used in the course were tied together and intertwined thanks to their interpretation as *Raumgeschehen*, ('spatial events'), borrowing Hille von Seggern's (2019) term.



To evaluate the implications of such a pedagogical proposal, this paper poses and tries to answer three main questions: 1) What are the contributions of the concept of transformation – as conceived, implemented and tested in this course – to the body of knowledge of research through design in educational contexts? 2) To what extent can this understanding of transformation be considered a restorative practice for the architectural discipline? and 3) What would the main guidelines to follow to refine the course for future iterations or to put it into effect in other contexts be?

To answer these questions, authors have used a mixed-method approach, combining a literature review on the concept of transformation and a critical analysis of the students' performance and other empirical data extracted from a post-course survey taken by both students and teachers. The paper shows the relevant work of the students participating in the course. By assessing their specific achievements, this analysis also serves to identify key guidelines for future iterations of the course or application in other contexts. Ultimately, the study reflects upon the values and possibilities introduced by the concept of transformation within architectural design-research pedagogy on a more general level, inspired by a wide understanding of sustainability.

**Keywords:** transformation, architectural design studio, research through design, constructivist pedagogies, disorienting dilemmas

## Introduction, hypothesis, and research questions

This paper provides a theoretical and methodological reflection based on experiences of a pilot course in architectural design, inspired by the concept of transformation, that took place within a research-oriented, post-professional master's degree. This concept was interpreted by the teachers who designed and taught the course from two complementary perspectives, which in turn become the leading threads of analysis in this paper: 1) transformation as a research-through-design strategy and 2) transformation as a pedagogical procedure to promote significant change in students' and teachers' mindsets.

The pilot course was carried out in the spring semester of 2021–2022 at the Universidad Politécnica de Madrid's School of Architecture (ETSAM) (Figure 1). Its format was that of a 3.5 ECTS design studio taught once a week over eighteen weeks. In this first iteration, six teachers and two guest lecturers were involved, and seven students from different countries attended the course in hybrid mode.

As a point of departure, the course relied on the following hypothesis (H):

H1. The combination of research-through-design strategies based on transformative actions, and pedagogical approaches based on transformative pedagogies, constitutes a restorative practice with great potential in architectural education from the perspective of sustainability.

The goal of this study was to answer the following questions (RQ):

- RQ1. What are the contributions of the concept of transformation – as conceived, implemented and tested in this course – to the body of knowledge of research through design in educational contexts?
- RQ2. To what extent can this understanding of transformation be considered a restorative practice for the architectural discipline?
- RQ3. What would the main guidelines to follow to refine the course for future iterations or to put it into effect in other contexts be?



Figure 1. Poster of the pilot course taught at ETSAM, during the spring semester of 2021–2022.

*The experimental character of the course is founded in an exploration of the concept of transformation and its pedagogical application 1) as a research-through-design strategy and 2) as an educational process that promotes significant change in students' and teachers' mindsets.*

*Authors have used a mixed-method approach, combining a literature review on the concept of transformation and a critical analysis of the students' performance and other empirical data extracted from a post-course survey.*

*The meaning of transformation, 'transmuting something into something else', is the leading idea that was used to conceive and implement the course.*

## Methods

Responses to the questions posed are grounded in the following methods, which guided the revision of the pilot course from a theoretical perspective as well as from a practical point of view based on empirical data.

- 1) Literature review of the concept of transformation as a research-by-design strategy and as a key asset of constructivist pedagogies and theories of the self.
- 2) Critical analysis of the pilot course based on assessment of the students' performance as well as on the results of a post-course survey taken by the participants.

The students' performance was assessed based on Biggs and Collis' (1982) Structure of the Observed Learning Outcome (SOLO) taxonomy, which consists of a scale of five levels of achievement: 1 – prestructural, 2 – unistructural, 3 – multistructural, 4 – relational and 5 – extended abstract.

The students' section of the post-course survey consisted of a total of 51 questions, including the following sections: A) self-assessment of performance, B) assessment of the course and C) assessment of the teachers. The teachers' questionnaire was less extensive and focused on self-assessment of performance. This other form comprised 26 questions, including those focused on the twofold aim of the course: A) transformation as a research-through-design strategy in design studios and B) transformation of mindsets and ways of thinking. Some fields on both surveys were meant to provide a numeric evaluation across a scale of 1 to 5, and others were left open for registering qualitative assessments. Moreover, they included a final, open-field question, so that anyone could freely make additional comments.

## Theoretical framework and state-of-the-art review

### The concept of transformation

Transformation is first and foremost understood in this study as a procedure that brings about significant changes – in the sense of transmutations – to existing ideas, models, structures, conceptions and situations, so that they become something else. In the architecture field, the transmutation process involves converting existing realities into new ones, as opposed to creating variations on the same theme, which involves making alterations to a previous or generic model and which inevitably refer us to the concept of 'type'. To some extent, the purpose of typological variation is conservation, while transmutation implies a greater degree of modification. This does not detract from the fact that transformation implies recognising pre-existences in a conscious and deliberate manner, reinterpreting the past with an eye on the future. This past can be material, but also conceptual, linked to a more intangible architectural and design culture, as Helio Piñón (2005) claimed in his book *El proyecto como (re)construcción (Architectural Design as (Re)construction)*.

Transformation understood as transmutation is thus a creative procedure that necessarily introduces novelty. Innumerable examples of this can be found in the field of art, where practitioners often take fragments of previous works to compose new pieces. Such reactions to the past are what the Spanish philosopher Juan Martín Prada identifies as 'appropriation', a close relative of transformation. Prada intentionally links such a concept to a dominant postmodernist attitude characterising the culture of our time and, more specifically, contemporary art. He defines it as a process that takes place mainly through contextual relocation, a critical strategy that goes beyond frivolous reproductions of historical references and instead guides artistic reflection towards the social and political realm (Prada, 2001).

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*Directly in between architectural theory and practice lies a notion that has deeply inspired the conception of this course: that of research-through-design.*

Taking fragments of previous works by other artists, or even ordinary material from everyday life, to compose an original artwork is nothing new. It was ubiquitous as a creative practice throughout the 20<sup>th</sup> century and still happens now. The work of Marshall Brown is a good example of its relevance, lying as it does between artistic and architectural practice. Brown has even coined a term to describe his own methodology: ‘creative miscegenation’ (Brown, 2016). His work includes all kinds of variations on the traditional concept of collage, from superimposing to layering, mixing, cutting, quoting, or cribbing.

In the field of architecture, one of the most recent and insightful academic studies on transformations can be found in a collection of essays edited by the Aarhus School of Architecture in 2018, titled *Concepts of Transformation*. Apart from relating to a general ‘ethics of reuse and to the idea of reducing the footprint of the built and the expanding cities’ (Boris et al., 2018), transformation is further discussed in this book as a palimpsest of both concrete and abstract realities involving aesthetic, cultural and societal values within architectural culture. This attitude deeply aligns with Piñón’s theories, which posit the possibility of generating new realities without starting from scratch, thereby challenging the idea of creating ex novo. This alignment underscores the idea that transformation is a restorative practice, countering prevailing disciplinary trends that often overlook both material and conceptual pre-existences in architecture.

#### **Transformation as a research-through-design strategy**

Directly in between architectural theory and practice lies a notion that has deeply inspired the conception of this course: that of design research (Fraser, 2016), also called – with small nuances of meaning – research-through-design or research-by-design (Verbeke, 2016). Since the well-known 2002 pedagogical experiment of TU Delft, *Ways to Study*, which announced for the first time, in a conscious manner, ‘the potential of design as a form of academic research’ (Till, 2002), many authors have weighed the main assets and liabilities of such an approach in postgraduate education (see, for instance, Grillner, 2016; Martín-Blas, 2023; Moloney, Smitheram and Twose, 2015; Nilsson, Dunin-Woyseth and Janssens, 2017; Rendell, 2003).

Building upon this current state of knowledge, the pedagogical project analysed in this paper considers students as both designers and researchers in their own right. As designers, they are bound to use transformative actions (responding to a series of specific design tasks) to shed light on the relevant concerns of contemporary society through their particularised proposals. But, just as importantly, as researchers they are expected to identify and provide responses to research topics within these precise design decisions and decide which topics should be further tested for their viability as generators of consistent knowledge in the short, mid and long term. Ultimately, the key challenge of this proposal lies not only in the ability to produce new insights and knowledge by using design processes and techniques as the actual methods of research (Verbeke, 2016), and in maintaining a certain degree of openness about the outcomes and the procedures leading to them (Fraser, 2017), but also in doing both things at the same time by exploring the potential of ‘transformation’ at different and complementary levels.

#### **Transformation as a pedagogical process**

The pedagogical basis of the course is derived from constructivist theories. These call for moving from abstract notions to concrete solutions through a process of experimentation by the teachers-researchers along with students (Helmersen, 2021). Accordingly, a strong basis of experiences, perceptions and interactions between people is at the core of the teaching method (Verbeke, 2016).

*The course draws on a series of constructivist theories that pay special attention to the role of personal growth and transformation of mindsets in adult learners. It builds upon Jack Mezirow's transformative learning theory and his concept of 'disorienting dilemmas'.*

In line with this, the course draws on specific theories that pay special attention to the role of personal growth and transformation of mindsets in adult learners. More specifically, it builds upon Jack Mezirow's transformative learning theory and his idea of 'disorienting dilemmas' (Figure 2), which shed light on the learning process that occurs when students – and teachers – adjust their thinking as they gain new insights about the world and reflect critically on their assumptions and beliefs (Mezirow, 1991).

A disorienting dilemma emerges when learners face an unexpected situation that challenges what they think about a given reality. It may be a piece of information about a topic with which they are totally unfamiliar, an argument that questions a simple habit of their everyday lives, or a radical provocation that puts them in an awkward position. In any case, this situation triggers the transformative learning process. Then, according to Mezirow's theories, there should be a process of self-reflection, which encourages learners to examine their own beliefs about the world and connect past experiences to the specific challenge posed by the disorienting dilemma. The goal of this phase is to move towards a critical assessment of past assumptions, which would cause the recognition of one's dissatisfaction and the desire to produce a meaningful change in one's individual perception. This should be done through experimenting oneself, but also through collective debates among equals, who, in turn, may have made their own discoveries. The next steps would be to establish a plan of action, to experiment with new roles and, finally, to fully integrate these new perspectives into one's life.

The term 'transformative learning' has been widely popularised in recent decades and has been used so loosely that it may have lost its original meaning (Tisdell, 2012). This pedagogical experiment tries, however, to overcome such a tendency by focusing on how the concept of disorienting dilemmas could be productively applied to an architectural studio with aspirations to conduct research through design.

Although in the specific field of architectural pedagogy Mezirow's theories are not especially widespread, many scholars have defended similar positions with different words, claiming that the design studio is fundamentally a space of experimentation, mutation, speculation, proof, critique and analysis (Allen, 2007; Steele and Vidler, 2013; Vidler, 2004; Wigley, 2004). This strand calls into question the common understanding of design studios in architectural education as 'simulators' of practice, based on problem-based methods and the mimicking of professional environments as teaching and learning activities (TLAs). As a response to this, some prefer to advocate for the introduction of 'pedagogical devices' (Lee-Camacho, 2022) that generate the necessary knowledge for practice to evolve, while preventing it from exhausting itself due to a lack of self-reflection, thereby ensuring its sustainability over time. Based on the latter perspective, this teaching proposal seeks to concretise disorienting dilemmas as a fruitful pedagogical device that uses the concept of transformation as a driver for the meta-analysis of the architectural discipline, with the ambition of testing and proving its present and future operativity.

#### **Transformation in between: Seggern's concept of *Raumgeschehen***

Bridging these two bodies of knowledge – research through design and transformative learning theories – is Hille von Seggern's article 'Crossing Fields: Designing and Researching *Raumgeschehen*' (2019). Seggern argues that the architect's area of research should be tackled as *Raumgeschehen* ('spatial events'), that is, 'as a complex, non-hierarchical, performative field of spatial interaction'. Based on this premise, von Seggern argues for a design approach based on 'a transformative interplay [with the pre-existences and context] of thoughts, methods, practices, and formats of design, science, everyday



**Figure 2. Sequence of the chain of stages comprising Jack Mezirow's Transformative Learning theory.**  
Source: Häggström & Henriksson 2021.

*The design studio is fundamentally a space of experimentation, mutation, speculation, proof, critique and analysis.*

*Working with disorienting dilemmas based on transformative challenges facilitates navigating between intuition and rationality, and ultimately promotes 'creativity as understanding'.*

*The main ILOs of the course were located between the evaluative and creative cognitive dimension. Likewise, they could be classified as part of the knowledge dimension of being.*

practices, crafts and arts in a jumping, iterative process, switching between intuition and rationality' (Seggern, 2019).

Inspired by how Seggern unravels the intricacies of *Raumgeschehen*, the pedagogical object of the course was to employ transformation as a research-through-design strategy that pushes students to dissect, re-situate and reimagine pre-existing architectural ideas and objects, resulting in novel and enriched architectural outcomes. These outcomes are not simply considered design products, but rather research seeds. In this sense, the use of transformation as a research-through-design strategy offers students the opportunity to engage with Seggern's notions of architectural theory and practice as dynamic, adaptative and evolving entities. Moreover, it encourages students to view their designs as continuous processes to which their work adds, delving into the fluid nature of spatial events, as Seggern argues. All in all, working with disorienting dilemmas based on transformative challenges facilitates navigating between intuition and rationality, and ultimately promotes 'creativity as *understanding*', which is another notion put forward by Seggern (2019).

## **Materials: the pilot course**

### **Structure and bridging topic**

The pilot course was structured as a sequence of thematic modules, each led independently by two or three teachers working in close cooperation. One of the teachers acted as a general coordinator and followed the whole semester's classes.

The topic bridging the modules was the critical revision of the term 'collective habitat' through the specific lens of transformation. This meant reflecting upon the changes in contemporary lifestyles in recent decades, and which have become especially relevant since the pandemic, and the call for radical transformations of conventional housing types. Thinking about the nature and viability of these transformations was precisely what teachers asked the students to do in their 'disorienting dilemmas' brief and corresponding tasks; they were to restrict their interventions to existing architectural and urban structures – built stock of either housing facilities or other architectural programmes.

### **Pedagogical basis and curriculum: ILOs, TLAs and AMs**

#### *Intended Learning Outcomes (ILOs)*

In line with the above-explained theoretical framework, the main ILOs of the course also related to Mezirow's transformative learning theories, and, more specifically, to the acquisition of core skills relating to one's ability to process new information and develop a critical awareness of one's thinking processes and react in a creative way, through disorienting dilemmas. Along with this, teachers expected students to acquire specific knowledge on the proposed bridging topic, always from a critical standpoint.

From a pedagogical perspective, and according to Krathwohl's taxonomy (2002), the main ILOs of the course were located between the evaluative and creative cognitive dimension. They could be classified as part of the knowledge dimension of being (at the metacognitive level), according to Barnett and Kelly (2005). The secondary ILOs were intended to help students reach the main objectives and included a wide range of competences like cultural literacy, collecting and selecting information, problem-solving, decision-making, time management, and communication skills. These competences were also considered when defining the course and were promoted during its development, although in pedagogical terms they were located at a less demanding level (Figure 3).

		COGNITIVE PROCESS DIMENSION					
		Remember	Understand	Apply	Analyse	Evaluate	Create
KNOWLEDGE DIMENSION	KNOWING	Factual knowledge	SECONDARY ILOs				
	Conceptual knowledge						
	ACTING	Procedural knowledge					
	BEING	Metacognitive Knowledge			MAIN ILO		

Figure 3. Grid showing the location of ILOs according to the cognitive and knowledge taxonomies of Krathwohl and Barnett & Kelly.

*The main TLAs of the course were based on Mezirow’s idea of disorienting dilemmas. This meant defining a sequence of triggering questions – one for each module – associated with a corresponding brief task.*

*Teaching and Learning Activities (TLAs)*

As anticipated above, the main TLAs of the course were based on Mezirow’s idea of disorienting dilemmas. This meant defining a sequence of triggering questions – one for each module – associated with a corresponding brief task, with the goal of engaging students in a field of tension and driving them to think out of the box about a particular theme dealing with the contemporary collective habitat. Just as importantly, all these tasks had to be addressed using a research-through-design approach in which time played a key part.

To understand how this worked, it is useful to describe the disorienting dilemmas posed in each of the modules, along with the corresponding task that the students were asked to undertake.

The question posed for the first module was: ‘How to address the mismatches that arise between the demands of contemporary living and the possibilities offered by the physical – allegedly obsolete – support inherited from modernist buildings?’. In their responses to this question, students had to choose a modernist housing project from the 20<sup>th</sup> century and transform it through the manipulation of a single drawing or image, submitting a direct confrontation between the original image and the proposal, and the existing and the re-signified situation. The composition technique was open: students could use collage over real photographs, scalar manipulation of floor plans, re-contextualisation of working models, addition of alien items into a section and so on. This graphic

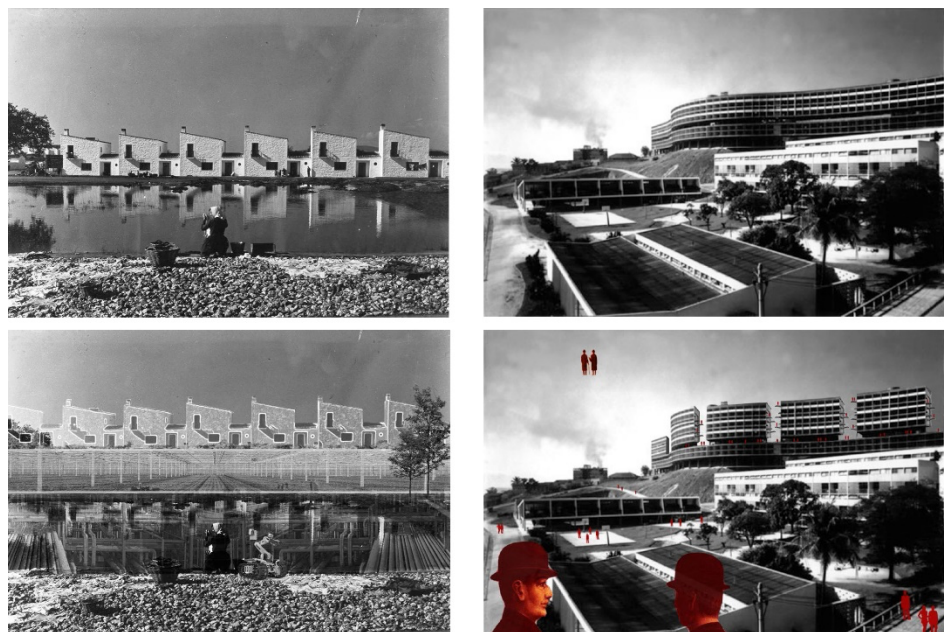


Figure 4. Students’ proposals for module 1: ‘Modified modernists’. From left to right: submission done by Alejandro Caraballo Llorente and Mathias Naranjo Chrambach.

exercise was to be accompanied by a short text defending the pertinence of the chosen approach. The overall goal was to identify and problematise a relevant topic within the transformation of modernist buildings and prove its significance using the force of this image confrontation (Figure 4).

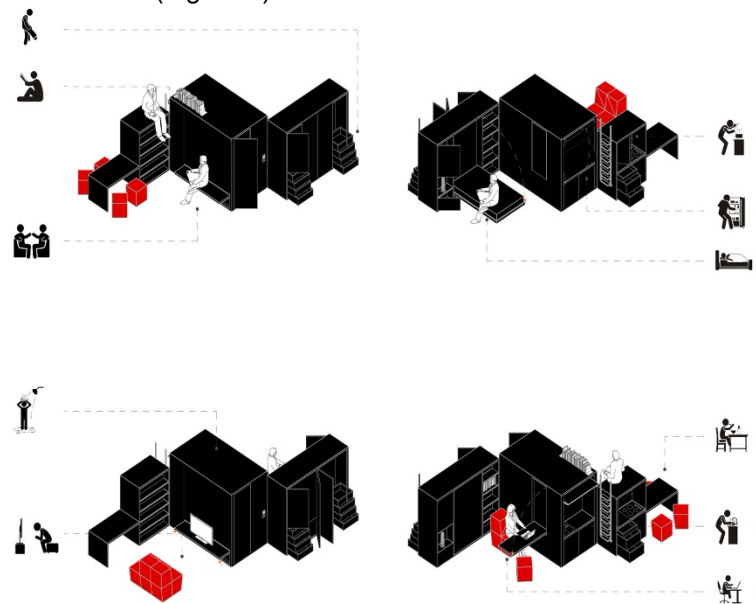
In the next module, the disorienting dilemma was built from this question: 'How to transfer the intuitive and sensory condition of the poetry of chimeras to the conception of contemporary housing?'. The corresponding task was to design a collage window combining and grafting houses and iconic design objects from the 20<sup>th</sup> and 21<sup>st</sup> centuries and to include a manifesto-style text alongside it. Once again, the key was to shed light on generalisable topics of interest through the manipulation of very specific objects, spaces and situations (Figure 5).



**Figure 5. Students' proposals for module 2: 'Chimeric windows'.** From left to right: submission done by María Andrea Gutiérrez Canz and Sebastián Báez Henao.

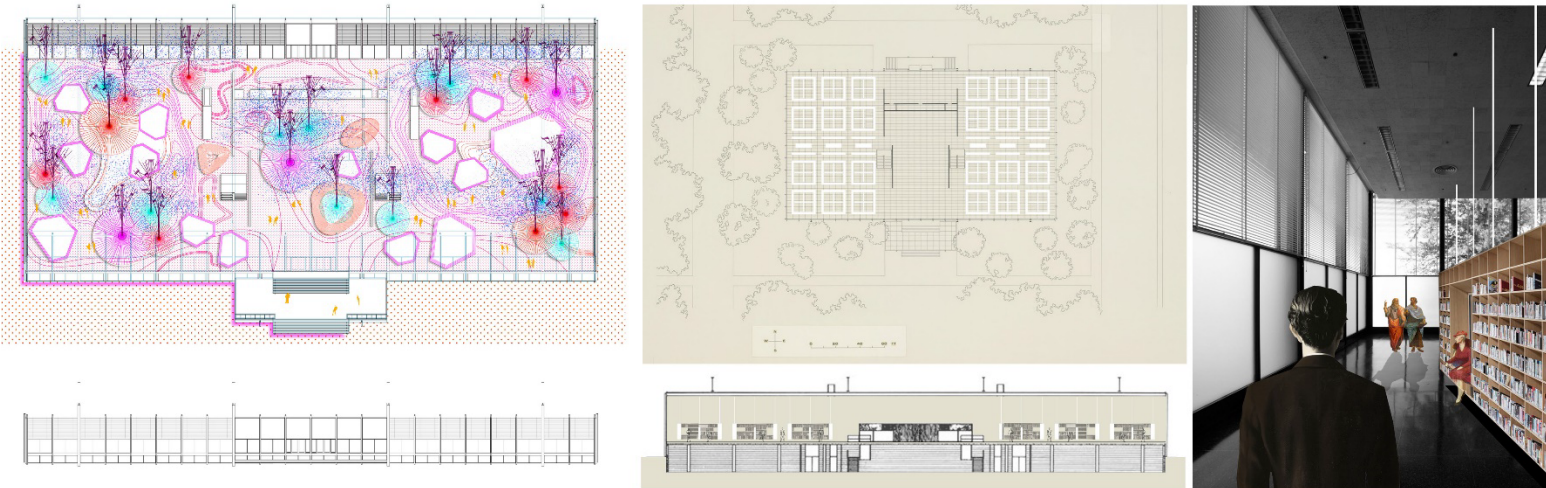
In the third module, the disorienting dilemma came from a double-barreled, tricky question: 'Can furniture be conceived as a house? And what about a house as furniture?' To explore the potential of such a chiasm, the students were asked to take a concept from Vilém Flusser's (2017) book *Shape of Things: A Philosophy of Design* and translate it into a 'total furnishing unit' proposal. Their designs should, furthermore, have the capacity to transform themselves, integrating different uses synchronically and diachronically, thus constantly altering their relationship with the surrounding space. Again, dealing with the specific shape of things was considered an opportunity for critical reflection at a theoretical level, to be explained through a short text (Figure 6).

**Figure 6. Students' proposals for module 3: 'Total furnishing unit'.** From left to right: submission done by Mathias Naranjo Chrambach and Felipe Cisneros Jerves.





The fourth module leaned into the concept of flexibility through a new provocation. Students were confronted with a hypothetical design competition for Mies van der Rohe's Crown Hall, which had to be transformed into a low-rent residential building for researchers and visiting professors. The challenge lay in getting over the controversial nature of such a decision to establish a strong compromise with the possibilities offered by the architectural object itself in its confrontation with a totally new use and re-signification. This time, the submission was a competition panel including both graphic and written information (Figure 7).



**Figure 7. Students' proposals for module 4: "Transformation of the Crown Hall".** From left to right: submission done by Alejandro Caraballo Llorente and Mathias Naranjo Chrambach.

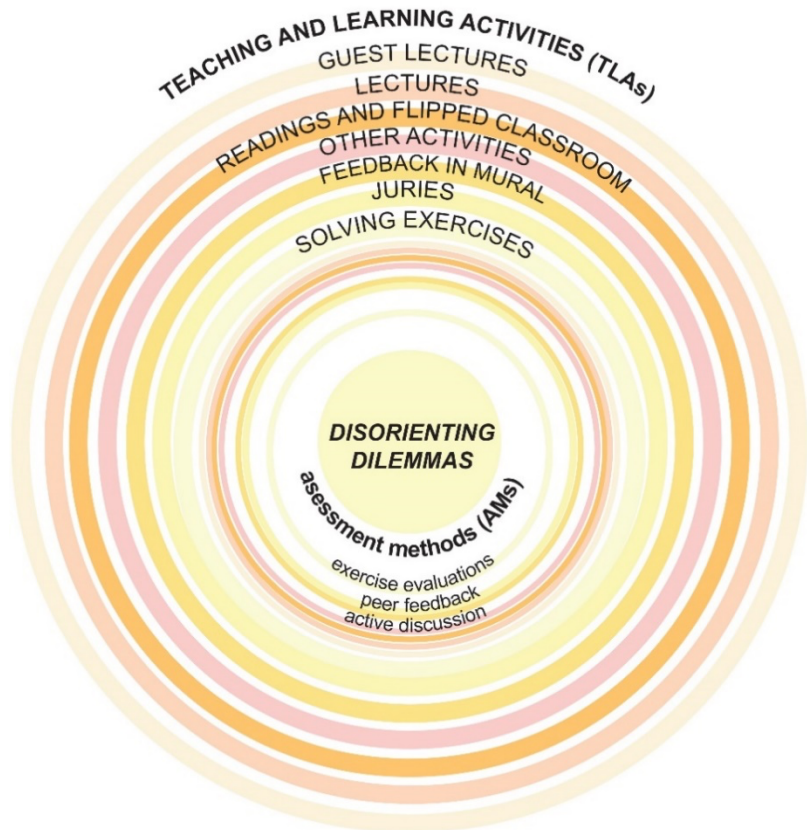
The fifth and sixth modules were initially conceived as two more disorienting dilemmas, but their content was deliberately left undefined, so the students could adapt it in one or another direction, according to their own evolution. Actually, the formulation of these dilemmas in the middle of the course became a proper disorienting dilemma for the teachers themselves, as will be explained.

Apart from the bridging topic, what tied together all the modules was the boldness, or even polemical character, of the posed questions and the brevity of the tasks: only two weeks per module, to begin with. Likewise, although each module functioned independently, the aim was for them to be interrelated, like the links of a chain that incorporate incremental complexity one after the other, from the punctual manipulation of a single image in module 1 to the conception of a whole project in module 4; from the straightforward updating of a housing program or external appearance in module 1 to the transmutation of less direct points of departure in the subsequent modules where scale grew incrementally – from a window, to a furnishing unit, to a full public building.

Along with these design-led research tasks, the course incorporated a series of secondary TLAs to provide students with further tools and knowledge to respond more intensely to each of the disorienting dilemmas. These pedagogical elements were quite diverse. In-class activities included participatory lectures (from guest professors and the teachers), readings to be discussed in flipped classrooms, juries and visits. The in-class sessions were synchronous, with some of the participants attending physically at the school and some remotely, via Zoom. For their part, out-of-class activities not only included independent work on the task by students, but also asynchronous feedback from teachers and peers via the online collaborative tool MURAL, where students displayed their work on an interactive panel and on which anyone could make comments and open a discussion at any time. All together, these TLAs were intended to function like Vygotsky's 'scaffolding pedagogical elements', helping students to transcend their 'zone of proximal development' to reach a higher level of knowledge (Vygotsky, 1978) (Figure 8).

*Altogether, the Course TLAs were planned to function like Vygotsky's 'scaffolding pedagogical elements', helping students to transcend their 'zone of proximal development' to reach a higher level of knowledge.*

Figure 8. Diagram showing the relationship between TLAs and AMs; all of them revolving around Mezirow's idea of disorienting dilemmas.



*With this course the teaching group aimed at both radicalising the constructivist methods used in design studios and adding a new dimension derived from theories of the self.*

*'It is only around the core of being that knowledge can be accumulated into something fruitful: into creative work' (Pallasmaa, 2021)*

#### Assessment Methods (AMs)

All the TLAs were subject to assessment on a regular basis during the semester according to the SOLO taxonomy. Follow-up of students by the teachers was continuous via MURAL and grew more intense in every weekly session. However, students were only provided with a final grade at the end of the course. The work on solving the disorienting dilemmas accounted for 80% of this grade, while the rest of the TLAs made up the remaining 20%. This criterion was shared from the beginning with the students, but not a more detailed rubric.

Students' responses to the disorienting dilemmas were assessed based on their submissions at the end of each module. This work was later refined according to the feedback received and handed in at the end of the course. The rest of the grade depended on the active participation of students – i.e. commenting on the reading materials, giving peer and teacher feedback, and attendance at the course sessions.

#### A twist on constructivist approaches

Architectural design studios regularly draw on the different branches of constructivist pedagogy, i.e. cognitive (e.g. Baddeley, 2000; Bloom and Krathwohl, 1956; Gardner, 1983; Riding and Cheema, 1991; Sternberg, 1996), social (e.g. Bandura, 1977; Vygotsky, 1978) and situated (Lave and Wenger, 1991). Design studios are also usually considered communities of learning and communities of practice (Lave and Wenger, 1991), where students and teachers perform actively in the construction of the teaching and learning experience and, ultimately, in the advancement of joint architectural knowledge. As already mentioned, with this course the teaching group aimed at both radicalising the constructivist methods used in design studios and adding a new dimension derived from theories of the self (e.g. Kolb, 1984; Maslow, 1970; Rogers, 1983; Schön, 1983), particularly Mezirow's theories (1991). This was done due to a

conviction that ‘it is only around the core of being that knowledge can be accumulated into something fruitful: into creative work’ (Pallasmaa, 2021). Although at the beginning of the course teachers set a course brief, including the course syllabus and calendar, and gave it to students, this was deliberately left ‘unfinished’. In other words, the syllabus was left open to revision and reconstruction by teachers and students during the semester. These transformations took place at several points throughout the course; thus, the teachers had to resolve their own dilemmas posed by the students and the ongoing dynamic in the class. The first alteration occurred after the first two modules, when teachers realised that the proposed tasks were too brief for students to assimilate into their own responses. As a reply to students’ feedback, the sixth module was removed from the syllabus and the time devoted to the rest of the modules was extended; one more week was given for each of them. Later in the course, again based on students’ feedback, but also on the results of the midterm jury, the fifth and final exercise – as noted, initially planned as another disorienting dilemma – was substituted with a wrap-up exercise. This was to help students fit together their previous work in a more conscious and reflective way. Moreover, it was hoped this capstone would aid students in finding a potential research topic for their master’s theses, what we called a ‘research seed’ (Figure 9).

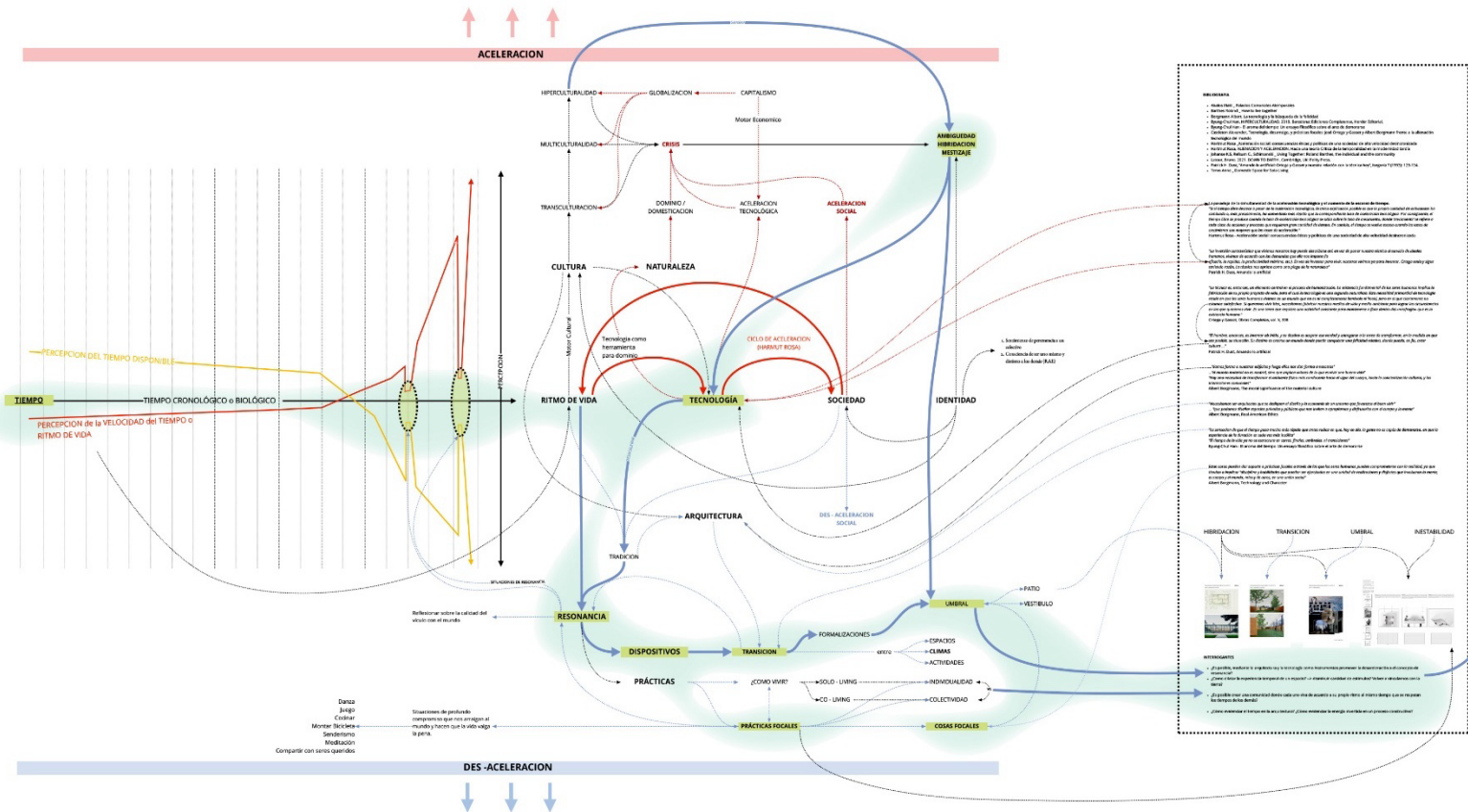


Figure 9. Student’s proposal for module 5: ‘Research-seed diagram’. Submission by Manuel González Veglia.

The incorporation of the last, new exercise derived from adding two new ILOs to those planned at the beginning of the course, relating precisely to the students’ discovery of their own research interests (Figure 10).

All in all, the aim of the course was that the students would achieve rational autonomy, freedom of thought and creativity via the critical challenging of preconceptions acquired during their years of education and architectural practice. The same applied for the experienced teachers.

Transform m5 in a Capstone

Weeks	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18								
Modules	m1				m2				m3				m4				m5									
Teachers	SM + GM				GM + MS				JM				MS + FN + RR				SM + FN + RR									
TLAs	L0	L1	R1	FC1	J1	L2	R2	FC2	J2	O I	L3	R3	FC3	GL I	J3	O II	L4	R4	FC4	GL II	J4	L5	R5	FC5	J5	J final
AMs	(ad + pf) 1		e1		(ad + pf) 2		e2		(ad + pf) 3		e3		(ad + pf) 4		e4		(ad + pf) 5		e5							

INTENDED LEARNING OUTCOMES (ILOs)	TEACHING AND LEARNING ACTIVITIES (TLAs)									ASSESSMENT METHODS (AMs)		
	In class activities					Out of class activities				Formative, Sustainable & Summative		
	Guest lectures	Lectures	Flipped classrooms	Juries	Other activities	Feedback in MURAL	Readings	Exercise solving	20%		80%	
After this course, students will:	GL	L	FC	J	O	F	R	E	ad		pf	e
<b>KNOWLEDGE</b>	<p>1. <b>Understand</b> the concept of transformation as a design tool.</p> <p>2. <b>Learn about</b> the method of research-through-design.</p> <p>3. <b>Get to know</b> topical design issues related to the contemporary collective habitat.</p>											
<b>ACTION</b>	<p>4. <b>Use</b> the concept of transformation as a design tool.</p> <p>5. <b>Put in practice</b> the method of research through design.</p> <p>6. <b>Address and tackle</b> topical design issues related to contemporary collective habitat.</p> <p>7. <b>Create</b> a research-seed diagram.</p>											
<b>BEING</b>	<p>8. <b>Think</b> out of the box.</p> <p>9. <b>Formulate</b> a research topic of personal interest and research plan to address it.</p>											

Figure 10. Above: final distribution of TLAs and AMs per module and along the 18 weeks the course lasted, highlighting the final capstone that was added to the syllabus in the middle of the semester. Middle: relation between ILOs, TLAs and AMs; highlighting the additional ILOs that were incorporated along with the final capstone. Below: legend for both charts.

PEDAGOGICAL ELEMENTS OF THE PILOT COURSE					
PEDAGOGICAL THEORIES	TEACHING AND LEARNING ACTIVITIES	TLAs	ASSESSMENT METHODS	AMs	grade
Cognitivism	Guest Lecture	GL	active discussion	ad	20%
	Lecture	L	active discussion	ad	
	Reading	R	active discussion	ad	
Constructivism	Flipped classroom	FC	active discussion	ad	
	Other activities	O	active discussion	ad	
	Feedback in MURAL	F	peer feedback	pf	
	Juries	J	peer feedback	pf	
	Solving exercises	E	exercise evaluation	e	80%

*The aspiration of the course was that the students would achieve rational autonomy, freedom of thought and creativity via the critical challenging of preconceptions acquired during their years of education and architectural practice.*

*The students who reached the fifth level of the SOLO taxonomy were capable of adopting a role that shaped their behaviour, design approach and thought process.*

*The materialist's research-seed: exploration of textiles as sustainable building materials for enhanced flexibility, usability and adaptability of living spaces.*

**Figure 11. Materialist role in module 2 and 3.**  
Submission by Maria Josefina Petrini.

## **Analysis: assessment of the pilot course**

### **Assessment of students' performance by teachers**

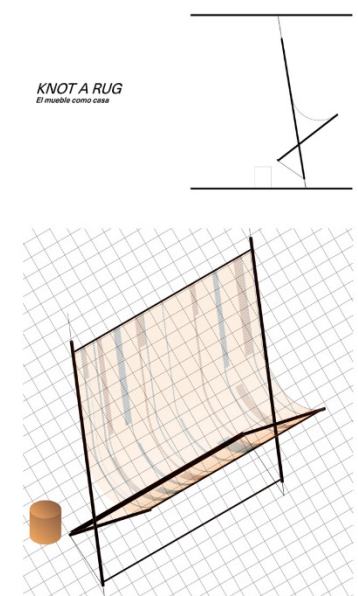
According to all teachers, three out of the seven students reached the fourth level of the SOLO taxonomy – that is, a relational level – meaning that they were able to understand and use the concept of transformation as a research-through-design strategy, to some extent. These students were also able to reasonably tackle topical design issues related to the contemporary habitat and, similarly, they acquired new knowledge and action tools that allowed them to transcend some established ways of thinking and to intuit potentially relevant research topics. Operating on this relational level also meant participating actively in the weekly sessions, discussing the texts in the flipped classrooms, and giving constructive feedback to both their peers and teachers.

The other four students reached the fifth level, i.e. the extended abstract level, meaning that their performance included all the above-mentioned achievements, but, in addition, their thinking processes showed higher conceptual changes and they arrived at unexpected outcomes. Curiously enough – and this could be understood as an achievement in the context of the course – all four were capable of adopting a role, a kind of personal character in response to the disorienting dilemmas, an attitude that shaped their way of behaving, designing and thinking, which they reinforced iteratively, throughout the whole course. Some did it from the beginning, others from a certain module on, but, in any case, this deeply affected their way of responding to the dilemmas.

To give evidence of the contributions of these four students to the objectives of the course, a summary of their work is provided. The students are named according to the role they played.

#### *The materialist*

The organoleptic qualities and material structure of modernist designer Lena Bergner's textiles and her weaving loom were the leitmotif that boosted the transformation strategy in the work of this student. She proposed designs that added nuance, dynamism, flexibility and tactility to the pre-existences, evidencing the possibility of responding to contemporary habitat demands by juxtaposing different modernist approaches from a materialist perspective. After different yet interrelated experiments on the initial modules, this student found, in the final exercise, a prospective research topic in the exploration of textiles as sustainable building materials for enhanced flexibility, usability and adaptability of living



spaces, charged with phenomenological nuances and justified by their potential for low environmental impact (Figure 11).

*The surrealist's research-seed: the study of intermediary spaces, stemming from the city's political fragmentation.*

#### *The surrealist*

The dreamlike imagery of surrealism triggered transformation in the work of this student. His first collages were inspired by René Magritte's defiant attitude towards conventional reality, which helped him to explore the relationship between images and meanings through the act of decontextualisation. For instance, the student explored ideas such as the re-signification of habitational complexes or units through their relocation in unexpected places – either real or virtual – or by operating on them in unusual ways. Speculations also included the exploration of the concept of the city being made out of fragments overlaid in a negative space. As a synthesis of the results of each of the four modules, this student concluded that his research would focus on autonomous intermediary spaces, stemming from the city's political fragmentation, which gives sense to the complex architectural collage that constitutes the city. In this student's perspective, the revisited idea of *terrain vague* (Solà-Morales, 1995) still holds substantial transformative potential within the urban landscape to respond to contemporary habitat demands (Figure 12).



**Figure 12. Surrealist role in module 2 and 5.**

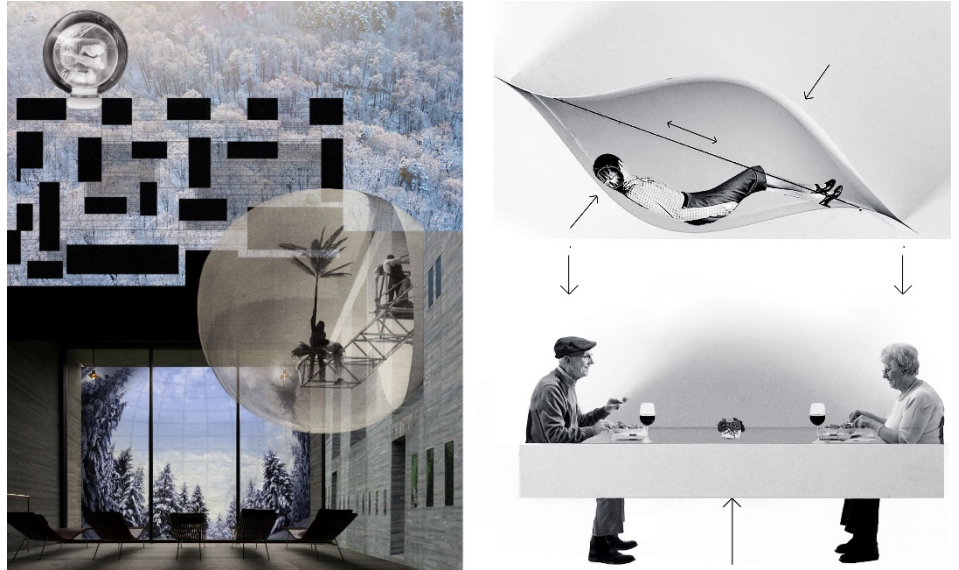
Submission by Mathias Naranjo Chrambach.

#### *The humourist*

This student adeptly employed a variety of humour-laden and inventive strategies to navigate all the design-research challenges, making use of ideas such as exaggeration of contrasts, parody, absurdity and incongruity. The resulting designs in each module exuded a deliberate physical awkwardness, igniting an investigative journey in module 5. This exploration delved into the pressing issue of contemporary habitation and grappled with the misalignment between societal and cultural space-time and biological rhythms. During this exploration, the student encountered two compelling philosophical concepts to inspire his response to module 5: 'resonance' as conceptualised by Hartmut Rosa (2019), and 'focal things', theorised by Albert Borgmann (2009). Both concepts chime with the student's commitment to analysing the noted maladjustment reflected in architectural objects and to proposing how to overcome the sense of the uncanny produced by it (Figure 13).

*The humourist’s research-seed: analysing the misalignment between societal and cultural space-time and biological rhythms reflected in architectural objects.*

**Figure 13.** Humorist role in modules 2 and 3. Submission by Manuel González Veglia.

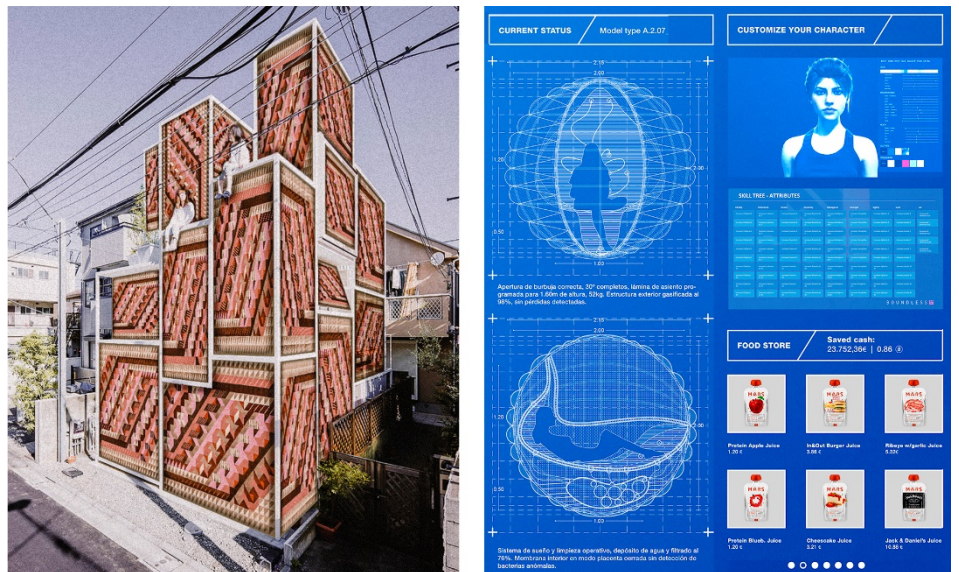


*The cynic*

The responses of this student to the dilemmas were distrustful, sceptical and even pessimistic. The student used the processes of ‘appropriation’ and production of techno-fictional narratives, memes and their imagery as the operative means of transformation. Technology as *artifice* juxtaposed with *nature*, and the understanding of both phenomena as irreconcilable opposites, constituted the thematic leitmotif for his critical speculation on the topic of the collective habitat. In this case, the synthesis tackled a rather complex meta-analysis of the discipline, which mirrored the intentionally disbelieving attitude held during the different exercises. The hypothesis that the student posed at the end of the course was that the production of images in architecture is currently dissociated from the real object and that it may be possible to create a protocol to stress this further and thus to generate impactful fictional futures for raising awareness of such contradiction and its potential pitfalls (Figure 14).

*The cynic’s research-seed: development of an image-generating protocol to underscore the current dissociation between image production in architecture and the physical object.*

**Figure 14.** Cynic role in modules 2 and 3. Submission by Alejandro Carballo Lorente.



*All the students considered all ILOs to be very relevant. However, some students expressed doubts about how they had been implemented.*

*For the students, the goal of knowing, addressing and tackling topical design issues related to the contemporary habitat was the less satisfactory in All students found pertinent the exploration of the concept of transformation in present times as it relates to a commonly accepted ethical standpoint: recycling what already exists.*

**Post-course surveys**

A survey was conducted after the course, consisting of two separate sections: one for the students, which had four respondents, and another for the teachers, which had six respondents. While authors are aware of the limitations of such a restricted sample, it is still possible to extract revealing data from it to help respond to this study’s RQs. Below are some of the most significant survey results to address such questions.

*Students’ self-assessment of performance*

The answers of the respondent students showed a misalignment between their own and the teachers’ overall evaluation of the work. One of the respondents reported that he had only reached the third level of the SOLO taxonomy, which is to say that he only achieved the ILOs with limited solvency. Two of them believed they had reached the fourth level and only one thought he had attained the fifth level.

The students’ perceptions of their performance in each exercise were uneven. Module 2 was the one with which respondents were more satisfied, followed by modules 1, 3 and 4. This might imply that students were not perceiving an evolution in their performance, although module 5 broke this rule – all the students perceived their performance in it more positively.

In relation to the achievement of specific ILOs, the goal of knowing, addressing and tackling topical design issues related to the contemporary habitat was less satisfactory in terms of achievement by students, followed by using transformation as a research-through-design strategy. Conversely, on average, students thought they were best at being able to independently identify a research topic and plan, and to create a research-seed diagram (Figure 15).



**Figure 15. Comparison between students’ and teachers’ assessment of ILOs.**

ILOs	Relevance (students’ assessment)	Achievement (students’ self-assessment)	Implementation (teachers’ self-assessment)
Understand and use of the concept of transformation as a research-through-design strategy	4,8	3,6	4,2
Learn about and put in practice the method of research-through-design	4,8	3,7	4
Think out of the box	4,6	3,8	3,2
Get to know, address and tackle a topical design issue related to the contemporary collective habitat	4,8	3,2	3,6
Formulate independently a research topic a research plan and create a research-seed diagram	5	3,8	3,8



*Students' and teachers' perceptions on the role of transformation in the course*

All students found pertinent the exploration of the concept of transformation in present times as it relates to a commonly accepted ethical standpoint: recycling what already exists. However, some students gave specific ideas for improving the implementation of this concept, e.g. assigning the specific perspective from which transformation could be applied to a specific dilemma, for instance from an ecological, gender-based, political or technological standpoint.

Similarly, all teachers agreed on the potential of transformation both as a research-by-design tool and as a pedagogical method. However, they also agreed that there was room for improvement in how to guide students in applying transformation conceptually and heuristically. Notably, it was only after the course – during the development of the present study – that teachers came to discern the distinct roles adopted by successful students and recognized the pivotal character these roles played in students' accomplishments. This newfound insight, derived from the pilot course experience, holds promise for informed integration into future iterations of the course, thereby providing deliberate support for students in transforming their mindsets.

Talking of mindsets and ways of thinking, students highly valued the combined process of working on the disorienting dilemmas and on a final capstone. They highlighted how interesting it was for them to work and act spontaneously due to the requested quick response time and then having to think more calmly after the action.

Finally, most students valued positively the transformation of the course during the course itself, from redirecting the dynamics of the critical sessions to adjusting the time dedicated to each module and creating new tasks along the way. All of these changes involved the capacity of teachers to accommodate their mindsets.

*Students' and teachers' assessments of ILOs*

Both students and teachers acknowledged the significance of the course's ILOs. Students, however, expressed reservations about their implementation, particularly in relation to the definition of disorienting dilemmas. One student noted that insufficient clarity and continuity hindered their effectiveness. For their part, teachers believed they had reasonably aligned ILOs with TLAs and AMs, but they also recognised room for improvement (Figure 15). Suggestions included clearer ILO presentation, and emphasising research-by-design methodologies and introducing their relation to AMs from the beginning to gauge student criteria comprehension.

*Students' and teachers' assessments of TLAs*

In general terms, there was consensus among students and teachers on TLAs; their alignment with ILOs and quality was valued. The primary activity – disorienting dilemmas – received varied ratings, with teachers rating it higher than students. Challenges highlighted by some students included limited time for dilemma exploration and the need for better connections between successive dilemmas. Guest lectures were perceived as somewhat disconnected from the course. A suggested improvement was to better align participatory and guest lectures with the dilemmas. Student-teacher misaligned opinions about the jury sessions and content delivery were also observed (Figure 16).

*Students' and teachers' assessment of AMs and grading criteria*

Despite some TLA and AM misalignments, students considered AMs fair, but that the clarity of assessment criteria from teachers varied. There were suggestions for refinement from the teachers' perspective, such as increasing active participation weighting in the final grade and developing rubrics for nuanced assessment. A proposed rubric would guide students during the course and standardise assessment across teachers. The importance of providing clear

*Both students and teachers acknowledged the significance of the course's ILOs. Students, however, expressed reservations about their implementation.*

*Guest lectures were perceived as somewhat disconnected from the course. A suggested improvement was to better align participatory and guest lectures with the dilemmas.*

*Module 5 was the one with which respondents were more satisfied, followed by module 2. In contrast, teachers assigned more balanced ratings across the modules.*

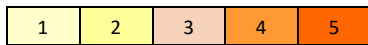
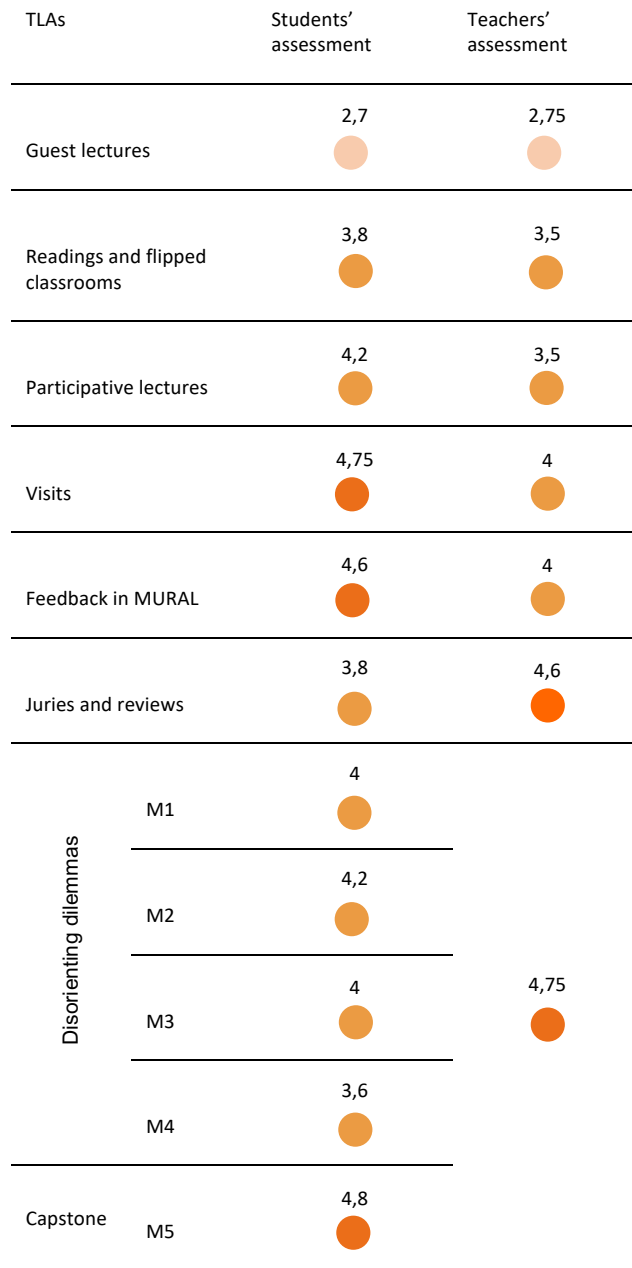


Figure 16. Comparison between students' and teachers' assessment of TLAs.

initial information about assessment methods and grading criteria was reiterated both by students and teachers. Additionally, introducing a diagnostic assessment at the start of the course to identify students' developmental zones and design-culture differences was recommended by one of the teachers.



*Students' and teachers' overall satisfaction with the course*

In terms of providing a panoramic view of students' and teachers' perceptions of the course, it is worth noting that quantitative overall satisfaction was uneven, especially in the case of students. In terms of fulfilment of expectations, one can also find a misalignment between students and teachers. However, on average, both groups considered that the course met their expectations reasonably well.

## Discussion

### RQ1

Considering all these data – the students' work and its assessment by the teachers, and the survey analysis – it could be posited that the main contribution of the course presented in this paper to research-through-design methodologies in educational contexts is the dual and simultaneous use of transformation as a design-led strategy and as a pedagogical process. This dual approach is proven to perform especially well in terms of leading students to the 'creative understanding' posited by Seggern. In fact, even when they did not produce original new knowledge, the students, at the very least, generated valuable threads of inquiry with their work. The time given to each task was too short to advance scientific results; however, it was precisely the rapidity of the exercises, along with their polemical character, that facilitated the switching between rationality and intuition, so necessary in research-through-design processes, as also discussed by Seggern.

Precisely, it is the explicit incorporation of Mezirow's concept of disorienting dilemmas in this course that contributed significantly to the research-through-design body of knowledge. This mechanism acted as a catalyst for critical thinking, interweaving design intuition with rationality. The dilemmas also placed students in a position that not only triggered personal transformations, but also encouraged them to think beyond conventional boundaries and challenge their preconceptions. Although the roles assumed by the students (the materialist, the surrealist, the humourist, the cynic) might have been exaggerations or shifts from their own personas, rather than something that gave rise to profound transformations, it is evident that this mechanism effectively prompted the students to explore unconventional avenues and reflect deeply. They intuitively established a 'plan of action to experiment with new roles', aligning with the third stage of Mezirow's (1991) transformative learning theory. However, looking at the results and the answers to the survey, it must be recognised that students were only able to fully grasp this hidden potential in the final module, when they were asked to go back and find research seeds within their previous work, in correspondence with the last stage of Mezirow's theory, that of 'reintegration'. Then, the ideas that were once just intuitive in the sequence of research-through-design brief exercises became more coherent to them. That is why the final capstone seemed so successful for all participants; specifically, the unplanned module that was added to the syllabus in the middle of the semester.

Based on this experience, it is possible to argue that transformations implemented in the middle of a course can become another key to success. In this case, the constructivist conviction assumed by teachers worked especially well in terms of designing a course that was able to change over time. This was made possible, primarily, by the clear, and at the same time flexible, nature of pre-established pedagogical elements – in other words, the system of modules and related TLAs could potentially produce different combinations of items and course lengths while retaining its coherence as a system. Additionally, success was only possible thanks to the acceptance of some degree of uncertainty by all participants, both teachers and students.

It is clear by now that the course tried to offer a twofold possibility within architectural research that students had not considered before: how design-led methods based on thought-provoking transformations of existing reality could help them, on the one hand, to question clichés and their own pre-established ideas about a given architectural topic – contemporary collective habitat, in this case – and, on the other hand, to raise their awareness of their own learning and creative processes, and help them to identify innovative research lines matching their interests. Also thought-provoking for the teachers were the challenges the students posed along the way, which triggered transformations in the way they

*The main contribution of the course to research-through-design methodologies in educational contexts is simultaneous use of transformation as a design-led strategy and as a pedagogical process. This dual approach led students to 'creative understanding'.*

*Students established a 'plan of action to experiment with new roles' aligning with the third stage of Mezirow's Transformative learning theory. The last stage of Mezirow's process, 'reintegration', was reached in module 5.*

were conducting the TLAs and in the actual curriculum. Thus, the whole community of teaching and learning was altered by the twofold transformation experiment.

#### RQ2

This architectural design course introduced as its leading theme the concept of transformation, a notion traditionally more prevalent in heritage and conservation courses. This choice was motivated by the imperative of sustainability, where the ethos of reutilisation takes precedence. By purposely narrowing scope and concentrating design strategies on transformative processes, the teachers foregrounded the practice of material and conceptual reuse. Consequently, assimilating transformation as a practice on a par with, if not more critical than, creating ex novo becomes essential. This paradigm shift extends beyond mere material application; within the architectural discipline, recontextualising past concepts in the light of the present gives the practice continuity.

Within the course framework, a multifaceted exploration of transformation unfolded. Beyond its strict design implications, the course also delved into the pedagogical realm, aligning with the ideas of architectural pedagogues advocating for an intrinsic transformation of the profession to ensure disciplinary sustainability. The course's intention lay in gazing into the past, with a determined vision towards the future.

Evident from the responses garnered through post-course surveys, students recognised the pertinence of assimilating and promoting this approach. As their work also shows, they seemed to acknowledge that restoration is not a detached element, but an integral facet of both design and research processes. By immersing students in the intricate interplay between historical context and contemporary demands, the course inherently embodied a restorative ethos. The process of reimagining, repurposing and recontextualising architectural elements not only aligns with the most evident sustainable principles, but also revives a sense of purposeful continuity within architecture as a field of knowledge.

#### RQ3

As to the main guidelines that could be followed to refine the course for future iterations or put it into effect in other contexts, it is necessary to highlight some points. To start with, and in relation to the understanding of transformation as a restorative practice from a sustainability standpoint, an important improvement would be to make clearer to students, and reinforce in the curriculum, that some of the competencies acquired in the course relate implicitly to the UN's Sustainable Development Goals, namely the collaboration, anticipatory, normative, strategic, critical and systems thinking, self-awareness, and integrated problem-solving competencies (Arene, 2022; Sterling, 2022; UNESCO, 2017). This way, students and teachers would be more aware of the course's use of transformation potential within the sustainability framework.

Considering students' general discontent with acquiring knowledge and real competences through tackling topical issues around the contemporary collective habitat, another important guideline to follow in the future would be to reinforce the critical content on the binding topic depending on how knowledgeable the students are about it. For example, it could be interesting to implement specific AMs that could enable teachers to identify the students' zone of proximal development in relation to such a topic, something that was not considered in this pilot course.

Through the teachers' assessment of students' results, it was confirmed that 'thinking outside the box' to identify and appropriate a relevant research topic was probably the most difficult goal of the course for all to achieve. At this juncture,

*For future iterations an important improvement would be to make clearer to students, and reinforce in the curriculum, that some of the competencies acquired in the course relate implicitly to the UN's Sustainable Development Goals*

*A valuable insight gleaned from the course analysis was the recognition of the emergence of student's performative roles, which teachers intend to leverage in their future teaching endeavours.*

*Other action to take for the future is to design the course to comply better with Biggs's constructive alignment theory, e.g. make sure that the disorienting dilemmas tackle with precision key issues of the binding topic.*

further teaching experience and deeper analysis would be needed to extract reliable conclusions on this issue. Nevertheless, as previously mentioned, the recognition of the emergence of student's performative roles constitutes a valuable insight gleaned from the course analysis, which teachers intend to leverage in their future teaching endeavours. Another action would be to refine the course design to better comply with Biggs' constructive alignment theory (Biggs, 1996), e.g. make sure that the disorienting dilemmas tackle with precision the key issues of the binding topic or that the lectures provide enough 'scaffolding' knowledge to bring about significant change in the students' mindsets. Apart from this, there is still plenty of room for experimentation, adaptation and improvement of this course or any further version of it. For instance, and relating to the previous argument, ILOs and AMs should be conveyed more clearly to students from the very beginning, independently of the curriculum being open to unexpected changes. It is true that the range of disorienting dilemmas – which should always be in line with the binding topic – is infinite, just as the topical issues to tackle within this framework are infinite. It is also true that through their interrelation, the binding topic and the disorienting dilemmas can open multiple ways for the course to unfold, creating a very flexible system for teachers to experiment in rather different fields. However, the role of transformation in relation to the main goals of the course should be precise and maintained throughout the course, and always transparent to students. Moreover, students should be asked – and tested – about their previous knowledge on the chosen topic at the beginning of the course, as well as about their research-through-design expertise. This could lead, among other things, to the preparation of more specialised lectures.

Additionally, the course's TLAs and AMs should be subject to reconsideration if implementing the course with a different learning community (e.g. one composed of undergraduates, or with a greater number of students, or with individual or pairing teachers) and if using different teaching modes (e.g. face to face, remote or hybrid). In the latter regard, the authors acknowledge that there is a need to further analyse and develop the pilot course in future studies so that all the pedagogical elements respond more adequately to hybrid-mode teaching and learning environments.

## Conclusions

The theoretical and empirical study of the pilot course that has been the subject of this paper has given insights into the concept of transformation as a restorative practice in the architecture field. Transformation has been used as a research-by-design strategy and at the same time as an innovative pedagogical tool to be applied in architectural education. Besides showing the relevant work of the students participating in the course, this study has also given a series of indicative guidelines on how to design, implement and teach an architectural design-research course that revolves around this concept.

The discussion has brought to light, firstly, that the main contribution of this course to the research-through-design body of knowledge came from applying a transformational pedagogy, and the use of Mezirow's transformative learning theory and his idea of 'disorienting dilemmas', into the architectural design-research studio, and, more specifically, from the translation of such a notion into a sequence of iterative, very brief and thought-provoking tasks that lay in between theory and practice.

Likewise, the discussion has made evident the urgency of orienting teaching plans towards students' and teachers' self-reflective work, so that they may understand their individual thinking processes and creative logics. Otherwise, teaching will not lead to substantial learning. Equally necessary is an active collaboration and trust between the two agents to guarantee a meaningful co-construction of knowledge at the university level. In this pilot course, building

upon this idea led to seeking a balance between regulated teaching and students' learning autonomy and engagement. Moreover, it meant being open to modifying the timings and content of the course while it was in progress, according to students' emerging needs and teachers' evolving concerns.

The transformation in the students' ways of thinking lay in the displacement of their understanding of architectural design practice from being an end in itself to being a research tool to produce critical insights and outcomes, and even a meta-analysis of the discipline. Therefore, the concept of transformative pedagogy, as presented in this paper, has the potential to contribute to the disciplinary sustainability of architecture by nurturing new generations of architects who are well equipped to address the complex and interconnected challenges of creating sustainable built environments. It empowers students to approach architecture as a dynamic and evolving field that has the potential to drive positive change on multiple fronts.

All the suggested guidelines and potential conditions that might help the course to evolve should be only seen as starting points or inspiration for other teachers who may want to build upon the findings of this study. The multifaceted nature of the course's pedagogical approach and the evident resonance it found among students indicate that the concept of transformation can indeed be considered a restorative practice. As the architectural discipline grapples with evolving demands, environmental concerns and cultural shifts, embracing transformation as a core tenet not only safeguards the essence of architectural heritage, but also fuels its adaptive growth. This approach thus propels architectural practice towards a more holistic and sustainable future, validating the premise that transformation, as explored within this course, indeed holds the potential to act as an uplifting force for architectural design research. Other researchers and teachers may take over from here and replicate or expand on what this paper has explored, so that the concept of transformation as a research-through-design strategy and as a pedagogical process can have a broader and ever-growing impact in the architecture field.

## Ethics

This paper adheres to the basic ethical principles enunciated by Tampere University. All participants answered the survey voluntarily and gave their consent to contribute to this research by accepting an invitation sent by email. The authors of the study informed participants that they could withdraw from the study at any time. Participants received a transparent and straightforward description of the content of the study, the processing of personal data, the expected period for processing and retaining research data, the research goals, and the impact and benefits of the study.

For privacy reasons, all data from the interviews have been anonymised. However, authorship of the students' work is displayed in this study for clarity of explanation, and it is acknowledged.

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All the figures included in this paper are by the authors unless stated.

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## References

- Arene. The Rectors' Conference of Finnish Universities of Applied Sciences. *Shared Competences*. 2022. [online] Available at: <https://www.arene.fi/julkaisut/raportit/suositus-ammattikorkeakoulujen-yhteisista-kompetensseista-ja-niiden-soveltamisesta-2022/>
- Allen, S. 2007. "Working Education". *Arquitectos 180: Estrategias de formación*, no. 1, pp. 57-59.
- Baddeley, A.D. 2000. "The Episodic Buffer: A New Component of Working Memory?", *Trends in Cognitive Science*, vol.4, no. 11, pp. 415-423.
- Bandura, A. 1977. *Social Learning Theory*. New York: General Learning Press.
- Barnett, R. & Kelly C. 2005. *Engaging the Curriculum in Higher Education*. Berkshire: Open University Press, 2005.
- Biggs, J. 1996, "Enhancing Teaching Through Constructive Alignment", *Higher Education*, vol. 32, no. 3, pp. 347-364.
- Biggs, J.B. & Collis, K.F. 1982. *Evaluating the Quality of Learning: The SOLO Taxonomy*. New York: Academic Press.
- Bloom, B.S. & Krathwohl, D.R. 1956. *Taxonomy of Educational Objectives: the Classification of Educational Goals, by Committee of College and University Examiners. Handbook I: Cognitive domain*. New York: Longmans.
- Borgman, A. 2009. *Technology and the Character of Contemporary Life: A Philosophical Inquiry*. Chicago: University of Chicago Press, 2009.
- Boris, S.D., Daugaard, M., Jorgensen, A.A. & Olensen, K. (Eds.). 2018. *Concepts of Transformation. Research Lab 1: Territories, Architecture and Transformation*. Aarhus: Aarhus School of Architecture.
- Brown, M. "Chimera: The Architecture of Creative Miscengenation", *Journal of Architectural Education* vol. 70, no. 1 (2016), pp. 22–27.
- Fraser, M. (ed.). 2016. *Design Research in Architecture. An Overview*. New York: Routledge.
- Fraser, M. 2017. "Preserving Openness in Design Research in Architecture". In Nilsson, F., Dunin-Woyseth, H. & Janssens, N. *Perspectives on Research*

*Assessment in Architecture, Music and the Arts. Discussing Doctorateness.* New York: Routledge, pp. 69-84.

Flusser, V. 2017. *The Shape of Things: A Philosophy of Design.* London: Reaktion books.

Gardner, H. 1983. *Frames of Mind: the Theory of Multiple Intelligences.* New York: Basic Books.

Grillner, K. 2016. "Design Research and Critical Transformations: Situation Thought, Projecting Action". In Fraser, M. (ed.). *Design Research in Architecture. An Overview.* New York: Routledge, pp. 71-94. Häggström, M. & Henriksson A. 2021. *Transformative Learning. Education for resilience and sustainability.* Erasmus learning and teaching event. Centret för livslangt lärande.

Helmersen, K. 2021. "Contemporary Studio Teaching in Europe: Towards a Theoretical Framework". In Silberberger, J. *Against and for Method. Revisiting Architectural Design as Research.* Zurich: gta Verlag-ETH Zurich, pp. 142-169.

Krathwohl, D.R. 2002. "A Revision of Bloom's Taxonomy", *Theory into practice*, vol. 41, no. 4, pp. 212-218.

Lave J. & Wenger E. 1991. *Situated Learning: Legitimate Peripheral Participation.* Cambridge: Cambridge University Press.

Lee-Camacho, J.I. 2022. *Dispositivos pedagógicos de iniciación al proyecto arquitectónico: entre el basic design y los simuladores.* PhD Diss. UPM

Kolb, D. 1984. *Experiential Learning, Experiences as the Source of Learning and Development.* Englewood Cliffs, NJ: Prentice Hall.

Martín-Blas, S. True Freedom. "Observations About Design Driven Doctoral Research". In: I. Borrego, R. Pasel and J. Weidinger eds. 2023 (forthcoming). *CA2RE+3: Frameworks of Design-driven Research*, Berlin: Technische Universität Berlin. ARENA (Architectural Research European Network Association), EAAE (European Association for Architectural Education). ELIA (European League of Institutes of the Arts).

Maslow, A. 1970. *Motivation and Personality*, 2<sup>nd</sup> ed. New York: Harper & Row.  
Mezirow, J. 1991. *Transformative Dimensions of Adult Learning.* San Francisco: Jossey-Bass.

Moloney, J., Smitheram, J. & Twose, S. 2015. *Perspectives on Architectural Design Research. What Matters. Who Cares. How.* Baunach (Germany): Spurbuchverlag.

Nilsson, F., Dunin-Woyseth, H. & Janssens, N. 2017. *Perspectives on Research Assessment in Architecture, Music and the Arts: Discussing Doctorateness.* New York: Routledge.

Pallasmaa, J. "Loneliness and Solitude in Architecture: Estrangement and Belonging in the Existential Experience". In F. Nieto & R. Rubio ed. 2021. *Loneliness and the Built Environment.* Tampere: Tampere University.

Piñón, H. 2005. *El proyecto como (re)construcción.* Barcelona: Edicions UPC.

Prada J.M. *La apropiación postmoderna.* 2001. *Arte, práctica apropiacionista y teoría de la postmodernidad.* Madrid: Editorial Fundamentos.



Rendell, J. "Between Two: Theory and Practice", in Jonathan Hill (ed.) *Opposites Attract: Research by Design*, Special Issue of Journal of Architecture (Summer) vol. 8, no. 2 (2003) pp. 221–38.

Riding, R.J. & Cheema, I. 1991. "Cognitive Styles: an Overview and Integration", *Educational Psychology*, vol. 11, pp. 193-215.

Rogers, C. 1983. *Freedom to Learn for the 80s*, Columbus, OH: CE Merrill.

Rosa, H. *Resonance: A Sociology of Our Relationship to the World*, Cambridge, UK: Polity Press.

Seggern, Hille von. 2019. "Cross Fields: Designing and Researching *Raumgeschhen*", in Martin Prominski and Hille von Seggern (eds.) *Design Research for Urban Landscapes: Theories and Methods*. New York: Routledge, pp. 8-33.

Schön, D. 1983. *The Reflective Practitioner: How Professionals Think in Action*. London: Temple Smith.

Solà-Morales Rubió, I. 1995. "Terrain Vague". In Davidson, C. (ed.).1995. *Anyplace*. Cambridge, MA: MIT Press, pp. 118-123.

Sternberg, R.J. 1996. *Successful Intelligence: How Practical and Creative Intelligence Determine Success in Life*. New York: Simon & Schuster.

Steele B. & Vidler A. 2013. "The Key Project of the Architectural School Today is the Making of Audiences, not Architects". *Log* no. 28, pp. 87-98.

Sterling, S. 2022. Re-thinking Education for a More Sustainable World. Available at: <https://www.sustainableeducation.co.uk/>

UNESCO. 2017. *Education for Sustainable Development Goals - Learning Objectives*. Accessible at: <https://unesdoc.unesco.org/ark:/48223/pf0000247444>

Verbeke, J. 2016. "This is Research by Design". In Fraser, M. (ed.). 2016. *Design Research in Architecture. An Overview*. New York: Routledge, pp. 137-159.

Vidler, A. "Anthony Vidler". In: M. Chadwick ed. 2004. *Back to School: Architectural Education, the Information and the Argument. Architectural design profile 171*. London: Wiley-Academy.

Vygotsky, L.S. 1978. *Mind in Society: Development of Higher Psychological Processes*. 2<sup>nd</sup> edition. Cambridge, MA: Harvard University Press.

Wigley, Mark. "Mark Wigley". In: M. Chadwick ed. 2004. *Back to School: Architectural Education, the Information and the Argument. Architectural design profile 171*. London: Wiley-Academy.