

# 7

## RESPONDING TO EMBODIED INJUSTICES

### Introducing critical thinking and empathy in architectural education

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#### **Climate emergency and radical rethinking**

Architecture has been complicit in the climate and biodiversity crises, forcing architects to finally examine their extractive and exploitative design and decision-making processes. The impacts of architects' actions extend far beyond these dual crises, creating and sustaining other social and environmental consequences, which can all be referred to as the “embodied injustices” of architecture (Tucker, 2021).

For decades, architects' design decisions and material specifications have justified the exploitation and destruction of ecosystems and the extraction of natural resources, reinforcing the separation of humans and nature. There has been a profound lack of empathy and consideration towards e.g., the health and wellbeing of disadvantaged and vulnerable communities affected at the sites of production as well as the projects' impacts on increasing climate injustices, child-labour use or other human rights abuses. By ignoring societal challenges and denying the impact of projects' embodied injustices, architects allow themselves to comfortably continue to design to their intersubjective “architect” values. These values and canonical references, material cultures and stubborn aesthetical values are what got us in this situation to begin with, through “the spatialisation of an out-of-control capitalism” (Till, 2021).

We cannot build our way out of these embodied injustices and emergencies, because building is what has caused them in the first place. The climate emergency reframes our value systems: from what we build, for whom, to how we build it, and if we should be building at all. It requires us to bring empathy, critical thinking and a sense of broader responsibility into the design process, our values and our roles as architects.

The foundation for this change must be laid in architecture education, where (professional) values, cultures and norms are established that one later builds on in practice. To engage students in the active promotion of sustainability both in their work and communities, students need to be taught with an immersive focus on their values and behaviour, not solely delivering sustainability knowledge and positive attitudes (Pappas et al., 2012; Wodika & Middleton, 2020). However, architectural education typically

does not respond well to such a vast, seemingly unsolvable net of problems that extend beyond the physical environment to social and societal structures. Finding a frame or an approach for holistic sustainable architecture<sup>1</sup> has become increasingly difficult as often in design curricula sustainability is still treated as a distinct topic separate from the design process or even its desired outcome. Treating sustainability as a phenomenon instead of a way of thinking has resulted in many students gaining a narrow understanding of sustainability aspects and their interdependence (Donovan & Pelsmakers, 2019, p. 220). Clearly, teaching sustainability knowledge is not enough: a radical reimagining of how we work and what we do has to be borne out of completely different internal values and new design cultures, implying a new architecture (Hill, 2021; Atekpe, 2025). Previous attempts have shown that we cannot achieve a complete rethink of what architecture is about by using the same methods, attitudes and values that we have instilled over many decades: architects should be trained to be flexible and holistic thinkers rather than linear spatial problem solvers (Deutsch, 2020; Nisonen, 2022).

This chapter investigates how these challenges might be met in architecture education and therefore by extension in practice. First, the status quo is explored through *Problem-based Learning* as a typical existing architecture education pedagogy, delving further into the setting of *Design Problems*, the *Design Studio* and typically associated problems with this. Next, *Design Thinking* theory is unfolded and analysed as a potential new approach for architecture education. It must be noted that while there are exceptions to the general ways of teaching architecture, and that avoid the pitfalls and risks with it, this chapter focuses on the prevailing ways of teaching in most schools around the world.

## Exploring the status quo

### *Problem-based learning*

Problem-Based Learning (PBL) is one of the most prominent pedagogies in architecture education. Literature describing PBL as a theoretical approach exists, but there is very limited literature available on the actual relevancy and effectiveness of its *implementation* in architecture education (Bridges, 2006). This section gives an overview of the theory of PBL and its typical application in architecture.

PBL was developed to tackle the established top-down power positions in education: teachers were acting as gatekeepers for “justified knowledge”, serving it to the students. This practice ignored the student as an individual and rather saw them as a passive subject absorbing information (Margetson, 1991, pp. 47–48). In contrast, PBL was based on the idea that the starting point of education is the curiosity of the learner (Drinan, 1991). In the 1990s PBL further evolved through its actual implementation, e.g. PBL was developed to allow for students to become active learners who can internalise a desired, complex body of knowledge through creatively studying “a real-world problem” in different scales and contexts, together with others. Students would no longer solely learn to acquire knowledge but to also gain capability and agency (Drinan, 1991; Boud & Feletti, 1991).

In 1991 Drinan explored the limits of problem-based learning by listing the desired outcomes of PBL (Table 7.1) from its original purposes (1–5) to ones that emerged later through its development (6–9). A less successful PBL curriculum often encompasses the points 1–5, where the goal is for students to gain relevant information and organise it to

TABLE 7.1 Synthesising the original and developed purposes of PBL (after Drinan, 1991)

Original purpose of PBL: students to gain relevant information and organise it to make decisions and to independently learn more	<ol style="list-style-type: none"> <li>1. developing the ability to make decisions (solve problems)</li> <li>2. raising awareness of the complexity of real-world issues</li> <li>3. acquisition of, or exposure to, a body of knowledge</li> <li>4. motivation for learning through use of professionally relevant material</li> <li>5. developing the capacity for self-directed learning</li> </ol>
Developed purpose of PBL: the necessity of reflection and conceptualisation	<ol style="list-style-type: none"> <li>6. developing the ability to extend learning beyond the presented situations (problems) into new ones</li> <li>7. generating the desire and ability to think deeply and holistically</li> <li>8. generating an enthusiasm for learning from and utilising all life's experiences in personal, professional and community development</li> <li>9. encouraging a search beyond one's own preconceptions, so becoming ultimately innovative and critical with respect to self and one's profession</li> </ol>

make decisions and to independently learn more. This typically excludes the necessity of reflection and conceptualisation (points 6–9), leading to a lack of comprehension of the depth and breadth of the “problem” and does not motivate to challenge or reframe it (Drinan, 1991; Engel, 1991).

### ***Design problems***

From early on, many authors have recognised the limits of the term “problem” in PBL, which can mislead one into thinking that there is something negative to solve, something to react to, rather than an opportunity to explore (Drinan, 1991; Bridges, 2006). A “problem” should not refer to *a single difficulty*, but rather to *what is problematic about a situation*, and represent a broader phenomenon with a complex context (Margetson, 1991).

When evaluating the applicability of PBL in architecture education, it is important to note that design problems are often described as “wicked” (e.g. Buchanan, 1992; Earle & Leyva-de la Hiz, 2020), meaning that they cannot be comprehensively described, nor do they have a beginning or an end. They have multiple possible solutions, and the success of these alternatives usually cannot be objectively evaluated. Often these different solutions prompt new questions and new problems to solve, making each design problem unique (Lawson 2019).

Attempts to formulate a PBL curriculum in architecture often tend to tackle either the problem itself (reshaping the design problems into cases), or the integration of the curriculum to better support the problem-solving process (e.g., establishing a shared theme as an umbrella encompassing all individual courses in a year) (Maitland, 1991; Bridges, 2006). When PBL is used to reformulate design problems, the risk is to diminish architectural thinking into a diagnostic process of cause and result, which overlooks the complexity of design problems. When the attention is on the integration of content and the creation of a desired body of knowledge, the threat is that the design approaches are steered into a pre-defined, uncritically derived solution. It has also been noted that designers tend to approach problem-solving by growing a better understanding of problems

through trying and retrying different solutions to them (Dorst, 2011; Lawson, 2019). This contrasts the original purpose behind PBL, where problems were solved primarily through theoretical research (Boud & Feletti, 1991).

### *The design studio*

In architecture, *the design studio* is typically used to assist a student to solve a brief for a building or urban plan (i.e. the problem). The creative studio work is usually underpinned by individual design tutorials and passive learning (supporting lectures). At the end of the design process, the solution is presented by the student and critiqued by a jury of tutors and practitioners. This culture often contributes to creating a mastery syndrome, where the teacher acts as the master in a public critique with little room for collaborative and empathetic dialogue with the students (El-Latif et al., 2020).

Moreover, the way problems are typically presented in the design studio is by already describing a solution (the design brief), which is hardly ever the right answer to the initial problem (what is the *brief itself* reacting to?) (Lawson, 2019). This culture of problem-posing mimics the dominant situation in practice, where the briefing process is usually one-sided; the designer often becomes a part of the briefing process in late stages, or after its completion (Paton & Dorst, 2011). Design should, however, consist equally as much of *discovering* problems as exploring them; solely solving the problem is often far less essential than reframing and questioning it (Drinan, 1991; Lawson, 2019; Deutsch, 2020; Nisonen, 2022).

If the brief is solely created by the teachers, mimicking real life, and if students are unable to question the starting point of their designs, they are pushed to follow a fairly linear process towards a certain type of desired solution (Melles, et al., 2015). A pre-defined design brief generally prevents students from forming a deep understanding of the problem context and prohibits them from getting personally motivated in the design process (Paton & Dorst, 2011). While Maitland (1991) refers to the architectural studio as a “problem-based learning feature”, the commonly used master–apprentice-based model in architecture education actually promotes a culture of learning that PBL initially tried to tackle.

While the design studio and master–apprentice culture provide a long-established method of transmitting tacit knowledge (i.e., intangible professional know-how) to new generations (Nonaka & Takeuchi, 1995), embodied injustices sit at the heart of the culture and the educational methods we use. The system contains several fragilities even though the design studio’s benefit is in creating a community of learners and peer support (Deamer, 2020; Pelsmakers et al., 2020).

Firstly, the current system is based on the idea (or ideal) that the teachers are distinguished designers, masters who know it all, i.e., the very “gatekeepers” PBL originally aimed to address. The tacit knowledge base of the practitioner-teachers is simultaneously highly valuable, but a threat if the teachers as individuals are not “flexible and holistic thinkers” (Drinan, 1991; Deutsch, 2020) who actively upskill themselves and reflect on values, norms, content and teaching methods, and adapt their thinking to meet the challenges of the climate emergency.

Secondly, teachers’ tacit knowledge base renews slowly, solely based on their own interests, rendering both teachers and students prisoners of their own (unnoticed) inflexibilities and biases (Salama, 2021; Nisonen et al., 2024). Furthermore, teachers coming from practice rarely have pedagogical training, and often teach as they were taught

without critically reflecting on their practices (Hill, 2017; Donovan & Pelsmakers, 2019; Nisonen, 2022).

Thirdly, if the design studio is based on the guidance of an individual teacher, the students miss the contamination of different ideas and approaches, which are the incentives for critical reflection that is derived from the input of several teachers (Pelsmakers et al., 2021; Nisonen, 2022; Nisonen et al., 2024).

Finally, the field of architecture typically promotes individualistic designer capabilities, a star architect syndrome that the studio culture tends to emphasise. This misleads one to think that complex design problems could be solved by one individual alone. It also fails to mimic reality, where complex design issues require not only research and development but are also tackled in multi-disciplinary teams (McDonnell, 2018). Together, all the points unfolded above may lead to pedagogically unsound situations.

However, the design studio as an educational environment does not *have* to be the problem. This, in turn, requires a deliberate reset of our values and praxis (e.g. Donovan et al., 2021, Nawratek, 2021; Nisonen, 2022; O'Dwyer et al., 2023).

In summary, PBL was originally a solution to a problem. Teachers were gatekeepers of knowledge, and students were not encouraged to discover. In allowing the discovery of solutions, a new issue emerged: teachers often became gatekeepers of problems, and students were typically prohibited from seeing their origins. At present, the key problems stem from the typical top-down problem-posing (of the design tasks) and the lack of integrated and holistic sustainable architecture knowledge. Given how architecture education has focused on design as an individual effort, it lacks empathy with others and common goals to strive for. In the climate emergency, conventional architecture education needs a new paradigm where we reposition ourselves as teachers and architects from authorities to facilitators.

### **Towards a new paradigm**

Sustainability is an archetype of a wicked problem: unformulated, confusing and complex, with no “right” way to solve it (Earle & Leyva-de la Hiz, 2020). Wicked problems are best addressed if the design process shows empathy for the social and physical context of the problem (Gasparini, 2015, p. 6). Most importantly, it is difficult to tackle wicked problems with rational-analytic, linear problem-solving methods of PBL.

To help students become holistic and transformative thinkers in the era of the climate emergency, the iterative problem-solving approaches of Design Thinking might provide tools for both, creating a framework for creating knowledge, as well as evaluating and transforming one's own values and approaches (Earle & Leyva-de la Hiz, 2020). In education, rather than restraining students into absorbing information and repeating predetermined practices, the goal of Design Thinking is to engage the student in a process of ‘*active experimentation, concrete experience, reflective observation and abstract conceptualization*’ (Earle & Leyva-de la Hiz, 2020; Beckman 2020) and to develop a deep, empathic understanding of user needs and the problem context (Beckman, 2020). Contrary to PBL, Design Thinking suggests that students actively participate in the *problem posing*, not solely in the search of a “solution”. For learning about embodied injustices, the holistic nature of sustainability and its integration into design, this empathic positioning and evaluation of one's own approaches, values and attitudes, is crucial.

A designer needs to understand their design process in order to change it (Deutch, 2020; Lawson, 2019). In architecture education more specifically, the understanding

of design processes is passed on primarily as tacit knowledge through design activities (likely originating from the idea of “design can only be learned through designing”), rather than being explicitly taught or analysed (Lawson, 2019; Maitland 1991; Schön 1987 in Donovan & Pelsmakers, 2020; Deutsch, 2020; Nisonen, 2022). The way Design Thinking has unveiled the recurring stages and activities of a design process has helped demystify the creative problem-solving process, “name” issues and allow the use of “targeted” activities to help release tensions in specific parts of the design process. This is further explored in this section.

### Background: characteristics of Design Thinking

Literature reviews analysing the nature of Design Thinking (Hassi & Laakso, 2011; Micheli, et al., 2019) identified key systematically repeated characteristics in its implementations and research. For this research, the characteristics were formulated under two (overlapping and interacting) categories: “empathy, collaboration and communication” and “critical thinking” (Table 7.2). These categories are used to explore the applicability of Design Thinking in architecture education.

The following section further unfolds the two categories and their connection to learning and teaching architecture. The role and meaning of “divergent and convergent approaches” and their connection with blended learning strategies will also be explored.

**TABLE 7.2** Summarising the connection of Design Thinking characteristics and the defined categories (Based on: Hassi & Laakso 2011; Micheli et al. 2019; Beckman, 2020).

<i>Category</i>	<i>Aim</i>	<i>related Design Thinking characteristics</i>
Empathy, collaboration and communication	<ul style="list-style-type: none"> <li>– empowerment/sense of collective/community through connecting narratives and logics</li> <li>– setting aims and value base of a design project and positioning oneself as a designer</li> <li>– using (visual) communication to encourage dialogue and inspire to design against the status quo</li> <li>– representing and transforming knowledge through visuals and prototypes</li> <li>– seeking validation</li> </ul>	<ul style="list-style-type: none"> <li>– user centeredness &amp; involvement</li> <li>– collaborative (interdisciplinary) work style</li> <li>– creativity and innovation</li> <li>– thinking by doing</li> <li>– iteration and experimentation</li> <li>– visualising</li> </ul>
Critical thinking	<ul style="list-style-type: none"> <li>– putting aside personal prejudices and biases</li> <li>– forming appreciation of diversity of perspectives</li> <li>– forming deep understanding of problem context</li> <li>– generating ways to address or “solve” the problem in chosen frame (= concepts)</li> <li>– refining, combining and sorting concepts</li> <li>– self-reflection on own practises and solutions</li> </ul>	<ul style="list-style-type: none"> <li>– experimental and explorative mindset</li> <li>– future-orientation and optimistic mindset</li> <li>– blended analysis and intuition</li> <li>– tolerance of uncertainty and failure</li> <li>– holistic view</li> <li>– abductive reasoning</li> <li>– iteration</li> </ul>

### Empathy, collaboration and communication

The way we establish and nurture our interpersonal skills – human relations and our ability to work cooperatively – determines our actions towards the environment. (Pappas et al., 2012; Kondrad et al., 2021). Learning from others, building and maintaining trust and being able to tackle conflicting interests are paramount skills for sustainability.

In Design Thinking, a *collaborative work style* promotes a culture of utilising interpersonal and interdisciplinary knowledge and its diverse perspectives for tackling wicked problems (Hassi & Laakso, 2011; Micheli et al., 2019). Merging these perspectives “in a meaningful and novel way” is achieved through *interaction*, rather than working alone (Hassi & Laakso, 2011). Collaboration and interaction also strengthen designers’ ability to be truly empathetic: when based on individual “low-level mindreading”, what one thinks is empathy can just in fact reflect one’s own beliefs, motivations and judgements (Heylighen & Dong, 2019, p. 116).

In Design Thinking, the iterative problem-solving process is formed around user-centeredness and *user involvement* to empathise with the physical and emotional expectations, needs and behaviours of users, human and non-human alike (Hassi & Laakso, 2011; Micheli et al., 2019). Design Thinking uses tools like personas and journey mapping to form a deep understanding of users’ interactions with design; the use of these tools is based on analyses of user data.

Design Thinking’s approach to creativity distinguishes it from the traditionally more individualistic architectural design process. Contrary to seeing creativity as a characteristic or skill of the designer, Design Thinking considers *creativity and innovation as shared experiences* that motivate engagement in the problem-posing and problem-solving processes. The ability to visualise is considered to be a tool for communicating intangible concepts and ideas. The informality of e.g. sketching and mind-mapping is considered to lower the threshold for sharing ideas (Hassi & Laakso, 2011; Micheli, et al., 2019).

In Design Thinking, establishing a “shared language” as well as shared aims and values is considered to happen through communication and is seen to enable validation, empowerment and a sense of community (Beckman, 2020). The creation of this shared language is also paramount for the process of transforming tacit knowledge into explicit knowledge (Nonaka & Takeuchi, 1995). To achieve this, the design process should involve stages explicitly dedicated to shared experiences and collective knowledge creation, like brainstorming sessions, peer discussions and workshops. In architecture education, introducing a culture of teacher-facilitated, active peer-learning might help tackle the existing top-down power structures enforced by the master–apprentice model. (Drew & Mackie, 2011; Sgambi et al., 2019; Mahmoud et al., 2020; Nisonen, 2022).

### Approaches to critical thinking

A holistic approach to sustainability helps to unveil the complex interdependence of social and societal structures and allows students to critically position themselves within them (Argento et al., 2020). In design, this translates to adopting a profound understanding of the interdependence of the problem’s aspects and a deep understanding of its context, i.e. gaining a holistic view of the problem (Micheli et al., 2019, p. 135). This understanding should expand from functional needs to emotional, social and cultural needs (Deutsch, 2020).

Design Thinking aims for one to form an appreciation of diversity, and to provide means for self-reflection and withstanding uncertainty. Putting aside personal prejudices and being able to celebrate this multitude of different, often contradictory, alternatives is also a crucial skill in approaching wicked problems (Hassi & Laakso, 2011; Leifer & Steinert, 2011; Micheli et al., 2019; Earle & Leyva-de la Hiz, 2020).

A culture of being guided and positively challenged by constraints and obstacles, as well as having a desire to improve an existing situation, requires *future orientation*, *optimism* and an *experimental and explorative mindset* (Hassi & Laakso, 2011). In a learning environment, transformative behaviour and tolerance of uncertainty can be fostered by providing students a safe (physical and mental) environment that allows for experimentation (Leifer & Steiner, 2011; Elsbach & Stigliani, 2018).

### Problem-posing (and solving)

A “problem space” refers to the mental representation of a problem and all the possible paths to solving it. In Design Thinking, the problem space is considered to exist parallel with the solution space (see Figure 7.1). Design problems and design solutions evolve separately in these two spaces but affect and interact with each other constantly. Cycles of iteration happen both within the spaces and between the spaces, and this process eventually narrows down the solution space, resulting in a holistic understanding of the problem and its context and allowing for “final” design approaches to emerge (Du et al., 2012; Nisonen, 2022).

Thinking by doing refers to this process of knowledge creation through a movement between the problem space and solution space. This movement encompasses experience, conceptualisation, observation and experimentation (Figure 7.1). It originates

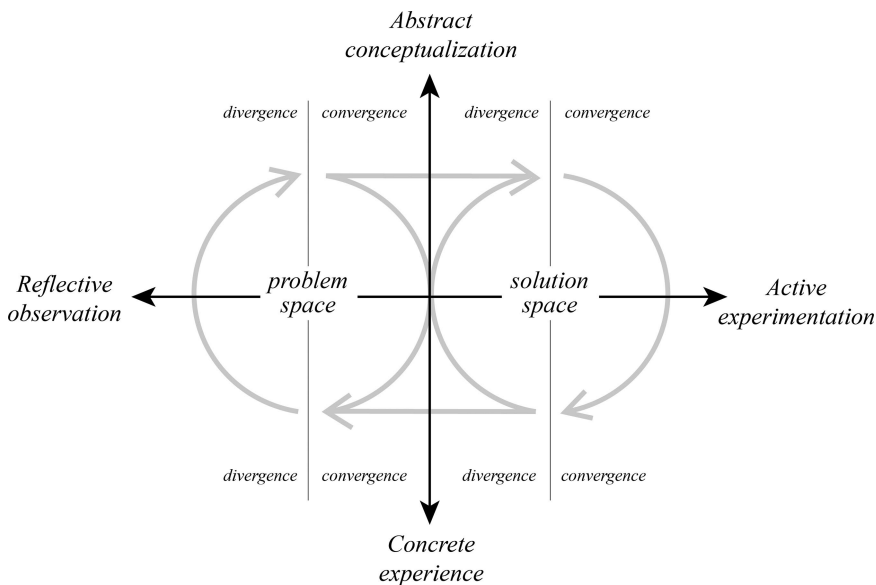


FIGURE 7.1 The Design Thinking process, adapted from Beckman, 2020.

from the logic of experiential learning, where two approaches for “grasping” experience and “transforming” experience are juxtaposed (Kolb, 2014; Beckman, 2020). In DT, the evolution of design problems and solutions happens through a combination of divergent and convergent approaches. Divergence and convergence have a dual meaning; moving further out and zooming closer into a problem, but also moving between personal perceptions and a shared understanding (Leifer & Steinert, 2011; Dorst, 2011).

Diverging, or distancing oneself from the problem, generates and acknowledges alternative approaches to a problem (Hassi & Laakso, 2011). Diverging helps the designer to choose a viewpoint from which the issue is explored, i.e. how they initially frame the problem. During framing the designer empathises and positions themselves in relation to the problem (not when they solve it) (Dorst, 2011). To establish a frame, questions like “what are the facts?”, “what do they imply?”, “what is taken for granted?” and “is there something that prevents us from seeing other options?” should be addressed through research and observation (Beckman, 2020). Answering these questions is the basis of critical thinking; the designer should recognise patterns and relationships that may be conflicting and paradoxical and through this, also become aware of their own prejudices and biases (Hassi & Laakso, 2011).

Converging brings the various problem approaches together through establishing a dialogue: different viewpoints are evaluated against each other (and integrated) to create a (new) common understanding, i.e. reframing the problem. (Dorst & Cross, 2001; Dorst, 2011). A cycle of divergence and convergence typically results in the emergence of a design approach. Through the analysis and critical evaluation of the design approach in the solution space, new perspectives to the initial problem emerge, and a new cycle of divergence (research for additional information) and convergence (synthesising the information and creating a new possible design approach) begins, often moving back to the problem space (revisiting and refining the “problem” the design approach is trying to solve) (Du et al., 2012; Lawson, 2019).

It is recognised that generating out-of-the-box ideas during the diverging process is easy, but people have a tendency to revert back to more average ideas during the converging process due to fear of mistakes (Beckman 2020; Mahmoud et al., 2020). One possible mechanism leading to this could be in the oversimplification of complicated matters both in the problem space (oversimplifying insights that emerge from research) and solution space (over-exaggerating the effects of design approaches) (Beckman, 2020), and the realisation that ideas might have been too far-fetched, prompting some to lose motivation in their ideas, thinking they have to start over (Melles et al., 2015; Lawson, 2019). This kind of thinking is especially common for students early in their studies or less-experienced designers (Mahmoud et al., 2020). Familiarising students early on with the iterative logic and collaborative nature of the design process might help overcome these failures or moments of despair and help students stay engaged in the problem-solving process (Leifer & Steinert, 2011; Du et al., 2012), which is also paramount for the development of critical thinking skills (Deutsch, 2020; Rodríguez Aboytes & Barth, 2020).

In learning and teaching, explicit iterative movement between the problem space and solution space would create a different culture for establishing a desired body of

knowledge; problem posing is based on shared experiences and co-creation, rather than being posed top-down (Dorst & Cross, 2001; McDonnell, 2018). Successfully supporting this iterative process of holistic knowledge creation calls for a matching pedagogical approach.

Blended learning (BL) could be considered a suitable option, as its logic is based on optimising the use of different teaching strategies to best support different learning modes (i.e. experience, conceptualisation, observation and experimentation), typically combining face-to-face learning events with online-learning (see e.g. Nisonen, 2022). To help with diverging from the problem, and to individually perceive and process information, students should be provided with general background knowledge through lectures, reading and discussions. In BL, this is often done through flipped classroom methods, i.e. pre-recorded lectures and other online resources (Donovan & Pelsmakers, 2019; Perbandt et al., 2021). To help converge and create a new understanding of the problem and its context, active learning methods (Drew & Mackie, 2011; Sgambi et al., 2019; Nisonen, 2022) embedded in DT practices, e.g., discussions, workshops and brainstorming sessions (McDonnell, 2018), should be organised along individual guidance sessions. Discussions and shared experiences help with the application of theoretical knowledge, i.e. transforming the abstract ideas formed in the problem space to concrete design approaches in the solution space (Donovan & Pelsmakers, 2019; Nisonen, 2022). The core of this process is what DT refers to as integrative thinking; the possibility to face several opposing ideas simultaneously, and instead of choosing between them, produce a creative resolution which releases the “tension” and uses the strengths of the several ideas (Hassi & Laakso, 2011; Micheli et al., 2019).

Instead of the linear status quo practises in the design studio, we argue that establishing connections between the iterative movement between the problem space and the solution space and different blended learning strategies can provide fruitful insights for the future of architecture education: finding a balance between co-creation, dialogue and individual reflection is key for supporting students’ process of becoming holistic and transformative thinkers understanding both themselves and the surrounding society.

## Conclusion

Architects need to achieve a transformative change in their values and design processes to support society’s urgent transformation. This requires discovering and integrating new approaches for holistic sustainable architecture and implementing an explorative and experimental mindset that helps us unveil, critically evaluate and radically rethink architecture.

Problem-based learning was originally adopted to allow for students to become active learners who can grasp complex issues through creatively studying a “real world” problem in different scales and contexts, together with others. Architecture education often claims to be following PBL, but we argue that the predominant master-apprentice model and problem-posing culture opposes the initial goal of PBL, which was to tackle the established top-down power positions in education.

With decreasing resources and increasing knowledge demands the traditional design studio needs a rethink (Hill, 2017; Donovan & Pelsmakers, 2019). We suggest that

Design Thinking could be used for rooting a deeper appreciation for iteration and reflection to the design studio: together with blended learning strategies, design thinking can help integrate optimal learning methods and mindsets into the architecture curricula. *Establishing a culture of participatory, holistic problem-posing* will help students to critically position themselves in the design process and get motivated in transformational thinking against the status quo. To support the development of students' interpersonal skills, low-hierarchy learning environments encouraging co-creation and dialogue should be established and nurtured. *Empathy, collaboration and communication* can be enforced through active, (face-to-face) learning events where students come together with teachers acting as facilitators, not authors of the collective knowledge creation. These dialogic learning events could also potentially be used for updating the tacit knowledge base of teaching staff.

Students cannot be encouraged to be innovative and transformative without the teaching staff promoting the same behaviour. It is vital to encourage teachers to try new approaches; often the idea of thinking outside the box can feel intimidating or futile at first, prohibiting new approaches from being tested, but when implemented, new approaches are mostly greeted with excitement and engagement by students (Beckman, 2020).

An understanding of design as a process-forward, collective and holistic activity should encompass the whole curriculum, both in the attitudes of educators and the structure and goal of the design studio. Architects should 'redefine' themselves from problem solvers to holistic thinkers and facilitators of transformation.

#### KEY TAKEAWAYS FROM CHAPTER 7

- The role of practitioner-teachers (and by extension, architects) needs to transform *from authorities to facilitators*: design problems are wicked and do not have one right answer or a right, linear path towards it. Instead, learners create knowledge and define (design) problems and their solutions from unique viewpoints. This needs to be acknowledged through the teaching and learning cultures of the design studio.
- Empathy, collaboration and communication need to lie at the heart of the design studio culture. *Iterative processes cannot be controlled* through top-down cultures or power structures between teachers and learners but should instead be *facilitated* through low-hierarchy and dialogic teaching practices and peer-to-peer cultures that acknowledge the diversity of learners and the complexity of (solving) wicked problems.
- Design should consist equally as much of *discovering* problems as exploring and solving them. Learners need to be given the possibility to question the starting points of their designs. Allowing the learners to form an in-depth understanding of the design problem and its context is vital for holistic sustainable architecture and develops learners' critical and reflective thinking skills.
- Different phases of the problem-posing and problem-solving processes require different teaching and learning activities to best support them. Blended learning strategies can support the iterative design process by balancing online-learning with face-to-face activities (see e.g., Nisonen, 2022).

## Note

- 1 Holistic sustainable architecture comprehensively considers high standards in all aspects related to sustainability in architecture, and includes “the quadruple climate change challenges (i.e., climate change mitigation, adaptation, restorative design and climate justice)” (Pelsmakers et al., 2022).

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