

## DESIGN RESEARCH ESSAY

# 'Making is Thinking': From Design Fixation to Provocative Competence

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To prepare our students for an unfamiliar future and unknown challenges, it is important that they are experienced in methods and strategies that equip them to manoeuvre in, and find solutions to, complex and unpredictable situations. However, there seems to be a tendency that many students incline towards 'safe' and well-proven paths of professional training and instrumental learning and are reluctant to explore fields of uncertainty.

The 'Making is Thinking' initiative aligns theoretical insights and development with methodologies of implementation that prepare students to pass through the barriers to their own learning. All activities revolve around hands-on experience, developed in actions where architecture cross-pollinates with other creative disciplines. We strive to achieve real impact by actively contributing to urban development by making live interventions, with actual stakeholders and engaging with the public. In this learning environment mistakes are acknowledged as a necessary and productive condition for the creative processes. A precondition for this is to establish trust.

In sum, our approaches and methodologies aim to challenge preconceptions of calculated patterns, causality and linearity in the learning process. Instead, learners are offered the affordances of uncertainty and liminality as a fertile learning space to be embraced rather than be feared. The purpose is to create and identify productive moments, and to develop a provocative competence, through moving from fixed to open ontologies. To facilitate this, we apply the methodology of 'strange-making', through working with a theatre company.

The article concludes with reflections on the pedagogical value of liminal spaces as fertile condition for creativity.

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**Keywords:** design fixation; transformative learning; threshold concepts; divergent thinking; creative methods; strange-making; provocative competence

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## Introduction

*We need to change the definition of what an architect is and what the qualification criteria is, because we need to work on an expanded definition of architecture, which is something we rarely do. We need a pedagogic shift. [1]*

In this article we will investigate into a characteristic of a contemporary university experience with regards to students' approaches to learning and their perceptions of the teaching and learning environment [2]. Many students seem reluctant and unwilling to move out of their comfort zone, and instead favour and request easier and more direct routes of learning. This reflects the differences between surface-learning and deep-learning in students [3, 4].

In contrast to this, educational researchers and developers, scientists in various fields as well as industry tell stories of future needs of skillsets, competences and mindsets that enable students and professionals to deal with challenges in and across disciplines, characterized by ill-defined and wicked problems

[5]. Required in these scenarios are the abilities and mindsets to deal with situations of uncertainty and ambiguity [6].

How do educational institutions in architecture meet these challenges? What sort of demands to be put on students and what should they have achieved when having completed their education?

This article aims to address some of the challenges in Harriet Harris' statement above, by pointing to how architectural education may lead to a broader understanding of the role of the architect. The article presents a theoretical framework for the challenges, and then through the approach of 'Making is Thinking', henceforth referred to as MT, we will suggest some possible pathways to a revision of teaching and learning environments. The methodology of MT is much influenced by Richard Sennett, who writes in the acknowledgments in his 2008 book *The Craftsman*:

*I owe a peculiar debt to the philosopher Richard Foley. At a point when I was stuck in my work, he asked me, 'What is your guiding intuition?' I replied on the spur of the moment, 'Making is thinking.'* [7]

### Theoretical framework: the TRANSark pedagogical thinking

The approach of 'Making is Thinking' has been initiated by the research group FORM and developed within TRANSark, both at the Faculty of Architecture and Design at the Norwegian University of Science and Technology (NTNU). TRANSark – is a pedagogical development centre which has the ambition of contributing to an emerging paradigm shift in higher education in general and specifically to the education of architects (**Figure 1**). In developing teaching and learning environments, TRANSark's pedagogical thinking is inspired by several pedagogical lines of thought that in sum can influence our understanding of what transformational learning might be. The intention for establishing this theoretical framework is, on the one hand, to provide a lens and a vocabulary to describe and reflect on difficulties that students face, and on the other hand, to develop a means of understanding how and why 'stuckness' occurs in design education and learning. This will in turn inform a renewed pedagogical stance and provide a basis for pedagogical development and methodologies to help students to find their way out of their 'stuckness', and thus provide a way towards transformative learning [8].



**Figure 1:** Introducing the Master's course on 'Making is Thinking. Student advertising on the ground for an exhibition on 'Harbour Happenings' in Nyhavna, Trondheim. [Courtesy of Johanna Gullberg. All rights reserved].

To frame the development of this pedagogical stance, we will be drawing upon several sources of inspiration such as design fixation, the threshold concept framework, and ideas of strange-making, that complement our understanding of transformative learning. An underlying thought in such a perspective is to deliberately take students out of their comfort zone. Drawing upon inspiration from Shkolovsky's ideas of strange-making, or de-familiarization, through to Barnett's pedagogy of strangeness and uncertainty, the MT approach intends to enhance the counter-intuitive and make exercises more troublesome [6, 9]. However, it is of the utmost importance to us to build a teaching and learning environment that balances risk with trust, confidence and belonging [10, 11, 12]. We further suggest the notion of 'provocative competence' as one possible way to orchestrate and unify these ideas [13].

To be fully able to design trajectories of teaching and learning, we need to take into consideration the mechanisms that may hinder learning trajectories. Also, many students start their higher education trajectory with a mindset full of approaches of surface-learning, and with an understanding of learning as primarily reproduction and imitation of what is taught [3, 4]. Thus to be exposed to challenging and unfamiliar methodologies, such as those in the MT projects, is uncomfortable for students because of the existing mindsets many of them have. Often, this leaves students in a position where they get stuck in terms of work progress and are not able to move on when their established strategies prove clearly inapplicable. The result is then frustration and disappointment.

In studies of learning trajectories and in design studies, this kind of 'stuckness' has become known as 'design fixation' or 'Einstellung effect' [14, 15]. If not addressed, it becomes a serious obstacle for the students and their intellectual development. The situation it implies is one where:

*... good ideas can block better ones, or when earlier transformations and shifts that have had positive effects can subsequently prevent further transformation and have a pernicious effect by inhibiting new ways of seeing and thinking. This has been shown to affect both people facing novel problems (e.g. students) and experts within their field of expertise (e.g. practitioners/professors). This effect works by influencing mechanisms that determine what information is attended to. [16]*

Note also that according to Land's observation, as stated above, change is required not only by the student but also on the part of the practitioners/professors who are involved and who need to develop an appropriate pedagogical stance.

Central to the TRANSark pedagogical thinking is the 'threshold concept framework' [17]. This framework brings focus to the troublesome stages of the learning trajectory whereby a learner realises that their previous knowledge is not sufficient or applicable, yet the new required knowledge is not yet clearly in sight or within reach. In such a situation:

*... a threshold concept can be considered as akin to a portal, opening up a new and previously inaccessible way of thinking about something. It represents a transformed way of understanding, or interpreting, or viewing something without which the learner cannot progress. As a consequence of comprehending a threshold concept there may thus be a transformed internal view of subject matter, subject landscape, or even world view. This transformation may be sudden, or it may be protracted over a considerable period of time, with the transition to understanding proving troublesome. Such a transformed view or landscape may represent how people 'think' in a particular discipline, or how they perceive, apprehend, or experience particular phenomena within that discipline (or more generally). [18]*

Passing through these kinds of portals are most likely troublesome and are potentially irreversible once passed. They become integrative, in that the learner perceives something about the inner relationships of the subject. In sum, passing through such a portal is transformative, in that it represents a fundamental ontological shift. The process itself can be described as a transitional liminal space, much like a rite of passage [19, 20]. Design fixation describes the period of resistance prior to the learner's realization, be that on their own or by intervention, that something needs to change. A key characteristic of the period when the learner feels challenged is their perspective on risk and uncertainty. What is needed is to challenge the learner to accept risk and the 'value of uncertainty' [21]. This however represents a challenging journey into the unknown that students can find scary yet also somewhat intriguing and enticing once they leave their comfort zone. To initiate this transition, a paradoxical process or 'unlearning' must take place, with the learners now needing to know what to leave behind [11, 22]. Before this new knowledge and skillset is developed, learners may cer-

tainly feel some sense of loss. This situation, of course, is the realm of the educator. Unlearning is a necessary yet painful trajectory for the learner. But the rewards are many. To Dunne, unlearning is about

... learning *incomes*. It's into the *incoming* of the unforeseen, the truly monstrous, the advent of all those wholly others turning up at our doorsteps unexpectedly and demanding our hospitality. Unlearning is *into* the risk of intrusion and insemination, the insolent overcoming of the known knowns in favour of the *incoming* of the unknown knowns. [22]

In such moments a 'learning vulnerability' is provoked, these being 'moments of disquiet and excitement in which people are exploring the unfamiliar' [13].

### The 'Making is Thinking' approach

We have in the above section described the starting point, and the characteristics of the journey. But the question is where to, and what is the intended outcome? We propose that the MT approach aims at developing what may be termed a 'provocative competence'. In addition to challenging students' pre-conceptions about what and how to learn, it becomes a methodology for developing skills to understand and facilitate innovation, with the aim of developing the capacity 'to create the discrepancies and dissonances that trigger people to move away from habitual positions and repetitive patterns' [13].

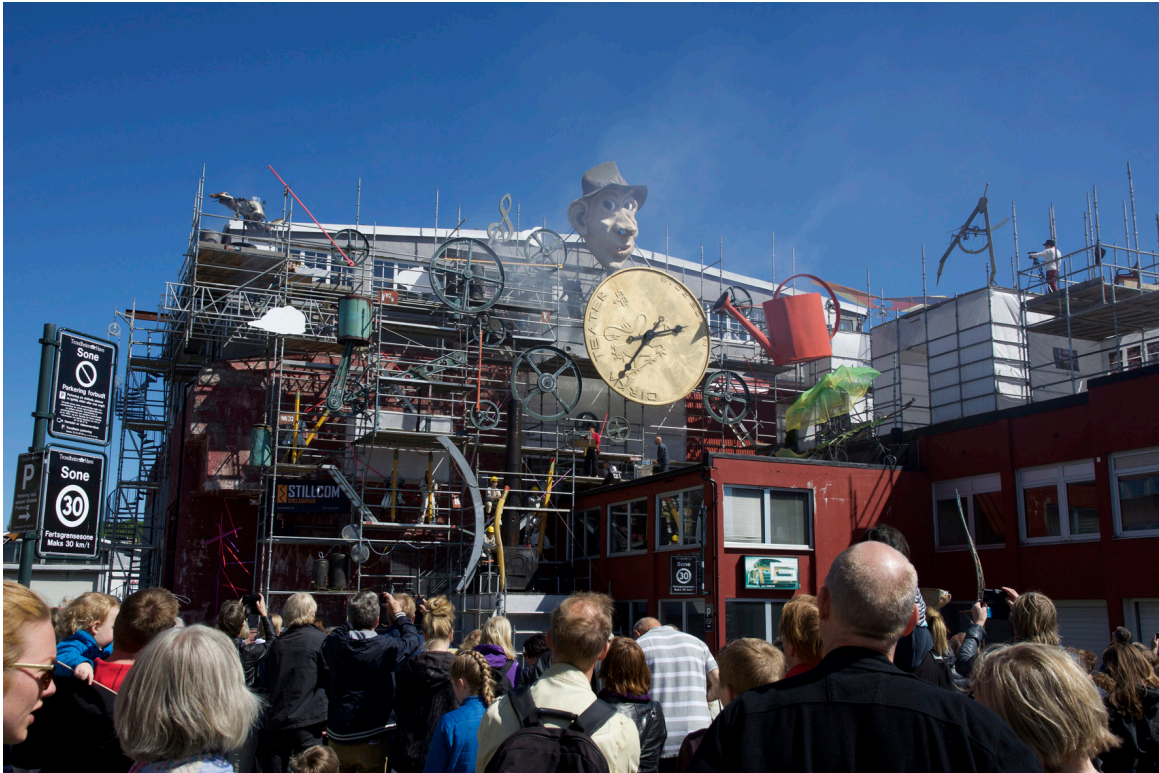
To arrive at this position, a 'commitment to a mindset, a culture, practices and structures' is required. As a jazz musician and organizational developer, Frank Barrett draws interesting parallels with how jazz ensembles set the stage to foster and nourish the interplay between the individual and collective development of competences. Barrett outlines seven principles that resonates well with our MT approach:

- *'All that jazz'*: mastering the art of unlearning.
- *'Yes to the mess'*: developing affirmative competences, and a mindset of seeing affordances and possibilities of appropriation.
- Performing and experimenting simultaneously: embracing 'happy accidents' and errors as sources of learning.
- Minimal structure/maximal autonomy as a useful way to balance freedom and constraints.
- Jamming and hanging out: learning by doing and talking, and an emphasis on informality and unstructured settings.
- Taking turns in soloing and supporting.
- Leadership as a provocative competence to help people to break out of 'competency traps'.

The MT approach at the Department of Architecture and Design at NTNU is, of course, a continuation of tendencies seen in education in general and in the education of architects [23]. Acknowledging that tradition, we draw upon the notion of the architect as a maker who has knowledge of craftsmanship, a stance that has been revitalized in the work by, among others, Richard Sennett, Juhani Pallasmaa and Tim Ingold [7, 11, 24]. We are also, as mentioned, influenced by recent discussions and findings in educational research.

A major facilitating tool in developing the MT methodology has been the collaboration with the theatre company, Cirka teater, who are 'one of the most experienced theatre companies on the Norwegian performing art scene. Their repertoire ranges from small, intimate performances to stunning outdoor spectacles and main stage productions – usually recognized by a rich visual theatrical language.' [25]. This collaboration is founded on two shared ideas: one being the interest in sharing knowledge and experiences in similar methods, like bricolage approaches [26]; the other involves the tension between the search within architecture for stability in terms of time and place, and the striving for intensity and a focus upon the now and the temporality of theatre. The resulting estrangement techniques intentionally shifts the students out of their comfort zone, again as a strategy for transformation.

The MT methodology is not dependent on being practiced in a studio setting. Indeed, it is suited for different scales and contexts, and thus we practice our methods in various places, in studio as well as non-studio settings, from small-scale exercises in a sandbox to big urban interventions that involve real stakeholders and are open to the public. One example is Hendelser på Nyhavna ('Harbour Happenings'), which will be described later in the article [27]. At the heart of this methodology is the desire to train and develop students' mindsets to enable them to move away from ideas of reaching a 'perfect' solution or a 'correct' answer, in favour of tools, devices and methodologies that minimize the fear of making mistakes and make it easier to overcome design fixation (**Figure 2**).



**Figure 2:** 'Hendelser på Nyhavna' ('Harbour Happenings'). Cirka teater and the 'Making is Thinking' course turned Cirka's production studio inside out, staging instead this giant intervention at Nyhavna in 2016. [Courtesy of Johanna Gullberg. All rights reserved].

The 'Making is Thinking' approach has been implemented in several formats and contexts. Currently it constitutes a Master's Course at NTNU as well as an essential learning perspective gained in the first year of students' architectural education, plus an ongoing yet budding field of research work within the school. Prior to this it had been part of another Master's degree course titled 'Experts in Teamwork', in which students learned to develop interdisciplinary teamworking skills. At the time it was compulsory for all Master's students at NTNU, and we initiated the experimental learning lab called FormLab [28], which was named a NTNU 'Top Teaching' project in 2015. It has also arranged workshops and events for students and professionals, whether in Norway or abroad.

The overall objectives of the MT approach can be summarised as such:

- to investigate the field where architecture cross-pollinates with other creative disciplines.
- to work in the timespan from overall ideas to site-specific interventions, which are visualized conceptually and enacted physically.
- to achieve real impact by actively contributing to urban development by making 'live' interventions with real stakeholders that engage the general public.
- to offer embodied hands-on learning experience.

The MT approach is practiced in various settings and places, as well as at several scales. An overall perspective on its methodology is formulated through five pieces of advice for reaching creativity, as follows:

- **Start by doing:** Alternate between doing – input – doing – reflections – doing; and so forth.
- **Work in teams:** Preferably heterogeneous ones.
- **Cooperate with other professions:** This can trigger the process and/or provide the necessary obstacles.
- **Pay attention:** To the site, to people, and to available materials.
- **Take creative risks:** Let go of your preconceptions and practice open-ended explorations instead.

So far, we have organized the 'Making is Thinking' course into three different initiatives (**Figure 3**).

1: FORMLAB	2: THE SANDBOX	3: HARBOUR HAPPENINGS
<i>Exploratory methods</i>	<i>Tool for speedy idea generation</i>	<i>Urban interventions</i>
<b>Addresses:</b> Open ended processes <b>Keywords:</b> Teamwork, bricolage, experimentations, workshops, exhibitions <b>Scale:</b> Different scales <b>Duration:</b> From one day to a week	<b>Addresses:</b> The fear of making mistakes <b>Keywords:</b> Teamwork, bricolage, idea generation, representations <b>Scale:</b> No scale or small-scale <b>Duration:</b> From one minute to one day	<b>Addresses:</b> Societal engagement <b>Keywords:</b> Strategy for urban development, teamwork, culture, art, real stakeholders, involving the public <b>Scale:</b> Full-scale <b>Duration:</b> From one week to one month

**Figure 3:** Table explaining the ideas behind the 'Making is Thinking' course [Diagram by the authors].

### Initiative 1: FormLab – appreciating the strange or unexpected and embracing risk

FormLab was established at NTNU as an accessible learning lab, available to all staff, students and courses. It is an initiative to address the previously mentioned challenges and to enable pedagogical methods to be explored. While the lab is physically located at the Faculty of Architecture and Design, its methodology is also tested out in different locations, workshops and 'real-world' situations (**Figure 4**).



**Figure 4:** FormLab: some first-year students working in the lab, while Master's students work on site at Nyhavna, 2018 [Courtesy of Nina Haarsaker. All rights reserved].

It is important to emphasize that all the methods and exercises in the following examples address challenges in the initial phase of an architectural design process. Hence they are methods and exercises that aim to trigger and enhance open-ended processes that will challenge the students to explore and to embrace risk. In these initial phases, divergent thinking is important, whereas convergent thinking is what would be required when it is time to wrap up and make decisions. FormLab thus introduces a series of exercises and methodological approaches which we have found to be paramount for successful entry into this way of thinking and practicing, since they share common goals in creating a basis for preparing and introducing this way of thinking, as well as for practicing it within the discipline of architecture. These exercises gravitate around ideas of creative play, and thus about initiating liberating laughter [29], so as to develop a sense of collective pride and benefit from 'doing much breeds more' (i.e. the aim is create a surplus of ideas and not discriminate or be selective too early in the process). And perhaps most important of all, the intention is to build trust among the students, and between students and teachers.

We usually start the semester or a workshop by mapping ourselves and the resources within the group through these playful games. The very first exercises that we do, whether it is for a Masters course or a workshop for undergraduate students or for professionals, are all about getting to know each other, to loosen up, to dare to step out of one's comfort zone, to be bold, not to take oneself too seriously, and not being too self-critical. Having a laugh together, and at the same time doing exercises where you must focus outside yourself, the exercises treat each person with respect and curiosity. These ways of trying to encourage play and trigger liberating laughter among participants can also challenge and surprise them. One of the participating students explained it thus:

*The first exercises we did surprised me a lot, because I thought that they were useless, but the reality was that I enjoyed them, and they made me feel relaxed. [30]*

A major goal is to make things together, to connect different perspectives, and to build up a group commitment. This feeling of collective ownership is important, in terms of belonging and trusting, and having the confidence to be able to challenge things. One example we use is a collective-drawing exercise. Producing a big common assignment implies the possibility of working on and developing each other's ideas. It then becomes hard to hold on to a design fixation. Suddenly the sense of ownership starts to fade, and it truly becomes a common work. 'Who' did 'what' become uninteresting.

*The lesson I learned from this is to kill your own 'darlings' in order to achieve greater things, when working together as a group. Of course, I have heard this phrase before, but it was only when other people were painting over my painting or reorganising the sand installation, I noticed the strength of it.*

*All the time I had to interpret and re-interpret, react and re-react to my own work, and to the work from somebody else. [30]*

By planning, making, and reflecting simultaneously, the work will grow around the participants and will reflect the process, as was seen in the Antwerp workshop. When one starts by making, there is already on the first day of a workshop something visual and physical that immediately fills the space. It is significantly stimulating for the process when tangible results are developing around you, as one needs to sum up and make the work presentable for each other. Thus the participants always have physical material to reflect upon (**Figure 5**).



**Figure 5:** Re-ACT by Design: International Design Workshop Week at the University of Antwerp, 2017. Here the 'Making is Thinking' workshop was titled: 'DISPLACE\_PLACE\_DISPLAY\_PLAY' [Courtesy of Gro Rødne and Nina Haarsaker. All rights reserved].

Each day's work is usually exhibited, and a short discussion held with the whole group, finding words to define what has happened and been produced. Questions like 'what did I get out of this?', or 'how can I use this later?' brings in a meta-reflection about learning. Feedback from other people is also important, especially when other students are popping in and commenting upon what you have achieved:

*The idea of 'making is thinking' actually works for me. Normally we first think (through research and reading) and after we make models or start to make other things. But why see these two things as different? Making is actually thinking, or making makes you think. I really liked the fact that we immediately started working and producing. Because we worked fast, we had no time to overthink our work, but had the possibility to change and adapt it afterwards. Because of the production speed and the limited budget, we had to be creative and open-minded. [30]*

Rather than first planning out and then finding the optimal material to fulfil our ideas, we instead go out to find the materials and then let the materials and our imaginations and efforts decide where to go, in the traditional sense of bricolage (**Figure 6**). To develop creative muscles, so to speak. This helps to see possibilities and find solutions, to improvise by taking something and combining it in a new way. We regard these as important skills for designers to have.



**Figure 6:** Re-ACT by Design: International Design Workshop Week, 2017. Students out 'hunting and gathering' on St Anna's Beach and then working with that material back in the studio [Courtesy of Gro Rødne].

In this way, we base the FormLab's culture on an attitude which positions students as the providers of knowledge, rather than it simply coming from the teacher. They can bring many outside experiences and interests to the table. One example of this is that we ask students to bring a prop with them on the first day – an object that means something special for them or is interesting or even perhaps weird. It is a simple start to raising interest in each other. We later then use these props as catalysts in each student's creative development exercises.

In addition, all of us need to endure being in a state of uncertainty, not knowing the outcome. We do have some rules, but our main target is to activate an awareness of the resources in the student group, and to use them accordingly. We find that creating a friendly atmosphere of trust is crucial for the participants to perform in the best way.

In sum, the approaches and methodologies we have developed aim to challenge preconceptions of calculated patterns, causality and linearity in the learning process. Instead, students are offered the affordances of uncertainty and liminality as a fertile learning space which is to be embraced rather than feared. The purpose is to create and identify productive moments, and to develop a 'provocative competence' [13]. In other words, to become open to that which is other.

## **Initiative 2: The Sandbox – Experimenting with a safety-net**

To address students' hesitations about open-ended explorations, and to implicitly address the productive possibilities of making mistakes, we have developed an interactive digital and analogue sandbox as 'a safety-net for architecturally audacious acrobatics'. The safety-net analogy implies that you will be rescued whenever errors or mishaps occur. Analogue three-dimensional tools and digital processes are again combined using bricolage techniques. Students often claim that they don't have time to test and experiment in order to meet deadlines, and can consequently be quite reluctant to make changes. However, the time issue and the fear of losing something if you make changes are not valid when using this sandbox tool.

The easily malleable sand (i.e. kinetic sand) is readily combined with various objects and digital projections for the rapid generation of three-dimensional ideas. In interaction with others, one can work almost as fast as one can think, merging ideas with people with other perspectives. This is speedier and more adaptable than when working with conventional analogue architectural models. In this context we refer to the architectural model as a tool purely for investigation and development, not for presentation purposes. One can thus quickly establish a landscape or a city by projecting images (photos, maps, satellite images or drawings), and by using plenty of tools and elements that make different shapes easily available, students can build concepts and spaces in response to each other and in dialogue with their representation of the landscape.

Since less time will have been invested in the various proposals, it does not feel so painful to make changes as opposed to a model that one has invested a lot of time in making. During the work session a fixed camera takes time-lapse photographs from above, documenting the whole process, so one does not have to worry about losing any of the outcomes. It accommodates the students' demand for efficiency too: one can literally wipe out the sand and start again. The students can thus be triggered by what is



happening, and, from that, new opportunities can be rapidly discovered. While the students are working analogously in the sandbox it is also possible to capture the changes through a 3D-camera and -projector, and hence project contour lines, water, cityscapes etc. All of this is controlled from a computer with 'augmented reality sandbox software' and a tablet, and there is plenty of space for six participants to work around the sandbox (**Figure 7**).



**Figure 7:** Some first-year students along with Master's students working together in the sandbox [Courtesy of Gro Rødne].

After the work session, all participants have a common pool of various possible solutions, which forms a more diverse set of opportunities as opposed to what they could achieve individually. This thus helps to kick-start the design process even though the material still needs of course to be processed afterwards. Participants must, whether alone or in small groups, analyse and decide which ideas from the common pool are worth developing further, thus switching from an open mode/intuitive phase to a closed mode/analytical phase. As one student noted:

*It made me feel free and loose to experiment and make things without thinking too much ... which often blocks my creativity. The work we did ... as a group made me feel comfortable and more creative than when I would work on my own. I alone would never find methods like these to work with. [30]*

The rules to be conducted when working in the sandbox are simple, and they are borrowed from improvisation theatre in which most of what is performed is created spontaneously. It is not allowed for students to say 'no', only 'yes'; they must always 'bring something new to the table'. Saying 'no' in the open-mode phase otherwise only blocks new ideas or else it blocks the possibility for other ideas to emerge from previously suggested ideas. We choose to use free associations, and we play. There is no such thing as a 'bad' idea in this phase, in line with what Edward de Bono has termed 'the intermediate impossible' [31].

### Initiative 3: 'Harbour Happenings' – Experimenting without a safety net

As mentioned, the methods we use are not dependent on working in a studio context. On the contrary, the learning outcomes have added value when working in a 'real-world' setting with actual stakeholders. According to the International Academy of Education, learners are most creative when involved in meaningful, challenging, and authentic activities; these are more likely to generate interest and engagement [32]. One of the 'Making is Thinking' students in 2016 described it as seeing 'that something that you have created actually led to something, that it meant something to someone else. I think that's the most rewarding thing in architecture'. [33]

In 2016 we initiated an annual event, as a sort of an urban development festival, called 'Harbour Happenings' at Nyhavna in Trondheim (**Figure 8**). This was done together with a local theatre company, Cirka teater, Trondheim Municipality, Trondheim Harbour Authority and approximately 50 actors within the cultural field. Nyhavna is a harbour area which is about to undergo a major urban development. Through this event we turned the area 'inside out' to reveal all the exciting things that were already happening there, and not least to suggest scenarios for what could happen in the future. We asked: 'could cultural power be catalyst for the urban development?'



**Figure 8:** Cirka teater and the 'Making is Thinking' course, 'Harbour Happenings', 2016. Students exhibited their proposals inside the scaffolding construction mounted on the external walls and rooftop [Courtesy of Johanna Gullberg. All rights reserved].

The Cirka teater company was both our client and partner, and together we turned their production studio inside out to rediscover elements from their 30 years of stage productions, placing these into a giant scaffolding construction around the walls and roof of the Second World War heritage bunker where they have their studio. Within this construction the students exhibited their proposals for redeveloping the area, with an important aspect of their projects being to involve the public. In addition, the students transformed the studio into a performing space for a 'laboratory of thoughts' [34] which could include characters like 'The Stick Man', 'The Oyster Lady' and 'The Rust Man' (**Figure 9**). They also created another exhibition inside Dora 2, another war-time heritage bunker.



**Figure 9:** Cirka theater performers: Anne Marit Sæther in *Tankelaboriet* (*The Laboratory of Thought*); *Pinnemann* (*The Stick Man*), and *Østersdamen* (*The Oyster Lady*). On the right, students from the 'Making is Thinking' course help to build the scaffolding construction [Courtesy of Gilles Berger, William Lee Wright and Johanna Gullberg. All rights reserved].

To learn from other professions and to not close in on your own profession is important for architects. Methodologies that encourage defamiliarization and strange-making have the potential to take students away from that which is too established. The act of stepping out of the familiar provides ways of seeing things from different angles, entering new spaces, while leaving the constraints of the already-known behind. Cirka teater's way of doing and thinking thus provided us with new perspectives, and strange things happened that caught us by surprise and ultimately prevented our work from being too vacuous. It is rather hard to hold on to habitual positions when one's 'client' is 'The Stick Man' or 'The Oyster Lady', or if the site happens to be on an external wall or on the rooftop of a bunker. Moreover, entering another field can feel liberating; expectations for us were lowered because we were not expected to have any expertise in the theatrical world, but could feel free to experiment without the restraints of our own profession. Our colleague, Johanna Gullberg, has elaborated on this choice of collaborator:

*The Cirka teater company played a significant role by encouraging the students to experiment with spatial scenarios. Simply put, the theatre company is used to working with instantaneous spatial interventions, while most architects are used to designing long-lasting buildings. By seeing how the theatre company built strange scenarios by combining found objects, colours, sounds and light – and by hearing a sonography telling them to be 'more crazy' and to work harder – the 'Making is Thinking' students could dare to experiment in incremental process of making. [35]*

Since 2016 we have continued this collaboration with Cirka teater, and in addition we have also involved local architects, professionals and students from the Art Academy and Music Technology, both at NTNU. We always involve the Cultural Heritage Management Office as well as other stakeholders at Nyhavna, as drawn across the cultural field as well as from small-scale industries and businesses. Our interventions have activated different parts of the area to make people aware of the qualities of the different places and what their potential could be in the future. Interventions have their own value when they happen, but they might also stay in the minds of people who have experienced them and hence continue to influence how that place is perceived.

Temporary interventions and public events can thus point out important aspects which could easily be lost within the process of urban development, like for example issues of gentrification. A crucial learning outcome in this kind of work is also about hardcore 'real-world' experiences, such as when the Harbour Authority in 2018 turned down our suggestion on a giant staircase together with Cirka teater. In 2019 we needed to constantly change our design to fit the changing parameters caused by our decision to create a floating platform, which we termed 'Micro-Cosmos', as the base for our new temporary urban space (**Figure 10**). Although the students expressed their frustration about this continual uncertainty, they also, at the end of the semester, emphasised the positive learning outcomes due to such obstacles. One of them said:

*I had a very fixed and traditional understanding of the evolution of a student's design. But here, although we were dealing a lot with the abstract side of architecture and development, there were very real conditions we were faced with from external forces – the municipality. (The tutors) constantly reminded us that this is a fair reflection on how projects can be stalled and interrupted in the 'real-world', so that was educational. [36]*



**Figure 10:** Work for the 'Making is Thinking' course in 'Harbour Happenings', 2019. Here the floating 'Micro-Cosmos' creates a public exhibition space, while students work on a common model for a parallel design assignment about the urban spaces in Nyhavna [Courtesy of William Lee and Paul Ratel. All rights reserved].

And reflecting on how this helped to come to terms with thinking like an architect:

*We felt we had a lot of freedom in the end of the semester but felt a little bit more restraint in the first part. This might be because it takes some time to understand and adapt to this new type of learning arrangement. [37]*

The last quote is interesting since the first part of the semester was the 'open-mode' period, when we were challenging the students to ask the questions and to experiment. They had in fact less restraints but somehow felt the opposite. In the last part of the project, we were more constrained by the fact it needed to be built, and we had a public exhibition to mount, participating in a parallel national assignment together with four other teams. In other words, there were a lot of restrictions. To us this simply shows that the most difficult thing to do is to work without restrictions.

### **Students' responses and reflections**

As indicated above, students go through a span of reactions and responses to the 'Making is Thinking' projects. Their narratives are full of descriptions of liminality and transition, and of their struggle to move from a position of seeking stability and certainty into a landscape in which uncertainty is threatening yet increasingly rewarding – and is eventually perceived as a positive affordance. Thus, in the early stages of their studies, questions like: 'is this relevant for my exam?' are quite common, and indeed at the beginning of each workshop we receive feedback and comments like that from the very first day. We get a sense of the students being a bit puzzled; both wondering and, so it seems, curious about what will happen next.

A series of 'Making is Thinking' students have commented on how the approach was unexpected and broke away from their previous educational experiences, and yet how they slowly came to terms with the methodology and finally embraced this way of doing things. The student survey at the international workshop at Antwerp in 2017 led to similar responses. For instance, there were feelings of initial surprise, bewilderment and inaction being expressed by students: 'it surprised me a lot'; 'it didn't all make sense'; 'I didn't know exactly what to do'; 'it was quite a mystery'; 'I was a bit reserved'; 'it was a bit strange to me'; and such like. The lack of reference to their understandings from previous learning processes was summed up in these words: 'I didn't know what to expect'; 'unknown targets'; 'trying to find logic and connections'; 'I did not know what I could expect'; 'at first none of it made sense to me'; 'On the first day I was wondering; what are we going to do? And why do we have to make a huge painting, to destroy it later? Then, the slowly emerging sense of purpose and direction was also expressed: 'At first none of it made sense to me, but in the middle all the pieces started to fall together, and the end result is amazing.' [30]

This complex relationship and interplay between theory and practice is part of the experience and of the ontological shift involved, in that it changes how things are perceived. The transformative aspect of the troublesome learning trajectory towards an integrative understanding of what it means to think like an architect, was well described by one 'Making is Thinking' student in 2018:

*These two subjects have given me the opportunity to know the artistic and theoretical parts of architecture. And now I cannot figure out how I could do architecture without this before. The combination*

*of art, theory and technique in a design will be essential for me from now on. I have enriched myself a lot through both of them, by studying and working on them together. It has been an opportunity that I would never have had in my home university. Simply, thanks for teaching me so much. [37]*

The MT approach quite deliberately positions students in difficult situations, somewhere in the intersection between confusion, despair and slowly emerging understanding. In the traditional understanding of the liminal process of development, i.e. the rites of passage, the learner is taken into a new and eventually comfortable place where a new sense of belonging is established. The 'Making is Thinking' methodology, on the other hand, establishes this liminal space as a place to seek and to revisit as a part of the learning process – as a space to experience and explore, a space to dare in. All the elements of the methodology listed in this article – for example, trust, play, liberating laughter, collective pride, 'doing much breeds more', improvising, awareness, bricolage – are all elements that connects us with the way that a creative company like Cirka teater works. Taken together, they mean being open to the strange and unpredictable, allowing for intuition and for entering the zone of risk (**Figure 11**). In sum, they are means to counter the problem of 'stuckness'.



**Figure 11:** 'Harbour Happenings: The importance of being a stranger', 2016. Students work on the scaffolding construction as part of the staging of their projects, while musicians play in the background [Photograph: Johanna Gullberg. All rights reserved].

The estrangement methodologies involve a high degree of risk, for teachers and learners alike, but can be made to work by devoting a lot of time to building mutual trust through dialogue and co-creation. Many educationalists warn against making education too safe, amongst them Gert Biesta:

*... the stronger education becomes – more secure, more predictable, risk free, standardised – the more we lose sight of what it actually is: a practise that is slow, difficult, insecure, unpredictable, and full of risks and uncertainties. [38]*

This perspective on liminality in learning and creative processes may be seen as productive. Perceiving liminality as an affordance in creative processes means that the liminal experience can be seen as iterative: 'a threshold between established roles from which one can linger and depart and to which one can return' [39]. This movement back and forth challenges the student in regard to their tolerance of uncertainty, while at the same time contributing to the development of confidence in face of challenges. From this perspective a mistake or failure 'is an 'integral' part of the creative process and creative people often have many failed ideas or products before finding their successful ones. The creative process is inherently risky, and risk-taking is among the key characteristics of a creative personality [32: p. 20]. When successful, the participants in this co-creative process may achieve a 'groove' – a jazz expression for the ambiguous nature of the liminal space, one of risk and possibilities, where the artist needs to be simultaneously prepared but also ready for anything.

### **Concluding comments, and future work: Towards a pedagogy of provocative competence**

In this essay we have presented the 'Making is Thinking' initiative at the Faculty of Architecture and Design at the Norwegian University of Science and Technology. The initiative can be seen as a continuation of certain tendencies within education in general, and especially in the education of architects. In this work, for instance, we acknowledge the tradition and draw upon the notion of the architect as maker. This specifically addresses a common challenge that many students experience in the early stages of their studies, what we have identified as design fixation, or the 'Einstellung effect' [14, 15]. In learning processes this potentially leads to students becoming stuck in terms of progress. We thus introduced the threshold concepts framework as a lens to observe and describe the nature of students' 'stuckness', and suggest provocative competence as a unifying term for our pedagogic framework.

We have shown how the MT methodology is scalable and expandable, through its realization through the FormLab, the sandbox and urban interventions such as the 'Harbour Happenings', as well as being realized in student group projects and in international workshops. Furthermore, we have described the reasoning why these methodologies are implemented, aligning theoretical insights with implementation. In our attempt to 'practice what we preach' and to move beyond the known, these kinds of insight are sought from outside the confines of architecture and architectural education. Instead it has been established by collaborating with a theatre company, along with educational developers from the Faculty of Architecture and Design – thereby linking teaching, research and practice.

We are thus suggesting the kind of competences that will be needed for an unknown future, something that relates not only to architecture but to higher education in general. The aim of our learning experience is to make students feel comfortable in avoiding the obvious and seeking that which is not known, and that which is not immediately visible. In describing a pedagogy like this that emphasizes uncertainty, Land suggests that:

*Bringing 'strangers to the tribe', to challenge, extend and render existing perspectives 'strange' would be another strategy. These approaches may well merit further exploration as we seek effective pedagogies and curriculum designs to enhance our students' understanding of threshold concepts and their transformation as knowers. [16]*

Strange-making as an overarching metaphor for methodologies where the learner is deliberately positioned on the edge, clearly requires a high degree of trust. However, an integral – although frequently overlooked – aspect of transformative learning is to develop a readiness of teachers to initiate their own transformation, which includes moving from instruction towards dialogue and co-creation. It is a vast field, of course, yet it is sufficient here simply to say that it implies the development of a new pedagogical stance. This requires an awareness of the necessary changes between our roles and identities as professionals, that is as architects, and

as teachers and educators. Our own stance is 'not just a matter of attitude, it encompasses our unconscious beliefs and prejudices, our prior learning experiences, our perceptions of tutors, peers and learning situations, and our past, present and future selves.' [39]

### Coda: '*sapere aude*'

To live up to this difficult challenge and all its promises, one can perhaps remember the urging words from Horace, when he writes '*sapere aude*' ('to dare to know'). It seems appropriate to end with these lines from Robert Frost's poem, 'The Road Not Taken':

*I shall be telling this with a sigh  
Somewhere ages and ages hence:  
Two roads diverged in a wood, and I –  
I took the one less travelled by,  
And that has made all the difference.* [40]

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The authors have no competing interests to declare.

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