Designing learning environments

typologies for school interiors of 2035



Master Thesis
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Msc. Design for Interaction

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Preface

Education is constantly evolving, shaped by societal changes, technological advancements, and new insights into how people learn best. As we look toward 2035, the question arises: how can we design learning environments that remain relevant, adaptable, and inspiring? This project explores that question by developing both typologies as design guidelines and a tangible design tool that help envision and create future-proof educational spaces.

This project has been developed for Triomf Design. The project aims to equip designers with the tools they need to create flexible and engaging learning spaces for the future.

I am grateful to everyone who contributed to this project. First of all, thank you to the designers, teachers, and students who generously shared their perspectives and allowed me to observe their environments, it was invaluable to gain insights from real-world contexts.

I am especially thankful to my supervisors, Stephanie Gieles and Pieter Jan Stappers, for their guidance, critical feedback, and encouragement throughout the process. Matthijs van Dijk, my ViP mentor, deserves my appreciation for his invaluable advice, enthusiasm and positivity.

Finally, I want to thank my friends, family, and roommates for their support, countless conversations, and willingness to think along with me. Their encouragement and fresh perspectives made all the difference.

I hope this work serves as a valuable resource for those designing the next generation of learning environments and inspires new ways of thinking about education and space.

Abstract

The project investigates the needs for learning environments in 2035 and how you can design that learning environment future-proof. The project has 2 results, theoretical design guidelines and a design tool. The theoretical guidelines are based on a multitude of factors that have been collected through literature research, interviews and observation. These factors may or may not have a connection with each other. By investigating these relations, 11 clusters have emerged. By linking these clusters to each other, looking for connections, fitting and measuring, trial and error, I created a framework. The framework is filled with patterns that influence behavior, interaction and engagement in educational situations, which led to types of spaces, so called typologies. Naming and grouping these patterns provides designers with guidelines that enable them to shape future learning environments through an organised yet flexible approach.

At the core of the typologies are 12 types that represent relevant actions in the learning environment of 2035. For example: exploring or sharing perspectives. To make these actions spatial and demonstrate how every action can be executed in different ways, for each action, 5 to 6 archetypes are connected to it. An archetype embodies a space or object that everyone has an idea or experience with, but at the same time everyone has their own interpretation of it, for example a cafe. The archetypes capture qualities and the actions of users. The archetypes serve as adaptable design references, offering insights into how different spatial arrangements can foster diverse educational experiences.

Building on this research, the second part of the project translates the framework into a tangible design tool: a card set that facilitates ideation, discussion, and creative exploration. This project is executed for Triomf Design, their designers are the main stakeholder for the design of the card set. Triomf approaches projects dynamically and intuitively. The tool encourages designers to experiment with spatial concepts and interactions. An interaction vision, inspired by children collaboratively building with Lego blocks, was used to define six key interaction qualities, ensuring that the tool fosters engagement and adaptability.

The card set comprises 18 archetypes and the corresponding actions, presented in a visually engaging format. To encourage playful exploration, each card has a unique shape, color-coded action labels, and visualisations that balance guidance with interpretive freedom. The imperfect fit of the shapes emphasise that there is no single “right” solution. This design invites users to interact physically with the cards, experimenting with arrangements and combinations to spark creativity. By incorporating both product and interaction qualities, the tool helps users think beyond literal representations, encouraging more intentional and innovative spatial designs.

Together, the framework and design tool offer a structured yet adaptable approach to shaping future learning environments. The framework provides a theoretical lens for understanding the typologies, while the card set translates these insights into a tool that supports designers throughout different stages of the design process. This dual approach ensures that educational spaces remain flexible, engaging, and responsive to future learning needs.

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Introduction

With an average of about 5 hours of school per day, 5 days a week, and 40 weeks a year, the average secondary school student spends around 1000 hours in a classrooms per year. We can conclude that a significant amount of time of the life of a teenager is spent in a school, where currently the buildings are filled with rigid classrooms with tables and chairs placed in a grid. Research shows that the quality and elements of the learning environment play a crucial role in students' performance (Chan & Richardson, 2005). Interior elements influence not only student achievement, but also teacher retention and student attendance (Tanner & Langford, 2003). Despite these findings, many schools today offer classrooms that are creating learning barriers. The spaces, in which classes are given, fail to offer the appropriate environment for students to engage in a meaningful and enriching learning experience, and for teachers to facilitate this (Kaup et al., 2013).

In recent years, there has been a growing focus on how learning spaces affect the emotional and psychological states of students. Students face all kinds of challenges in their teenage years that impact the state of their well-being and therefore their ability to learn. They face challenges like increasing academic demands, the pressure of meeting expectations, the challenge of navigating social relationships, a growing desire for autonomy and independence, and the confusing process of self-discovery and forming identity (Magolda, 2008). Learning environments should go beyond serving as spaces for learning, where the physical learning environment contributes to the teachers' and students' health, well-being and educational outcomes (Cargon, 2022).

Despite changes in society including rapid development of technology, evolving educational theories and teacher shortages the design of learning environments has seen relatively little change over the past decades. Many secondary schools still rely on traditional classroom layouts that were suited for a different era of education. These environments often fail to support the diverse needs of students and teachers, who face new challenges, from addressing mental health to adapting to a technology-driven world. In a research classroom-needs in higher education were addressed, findings revealed that general-purpose classrooms fall short of meeting the diverse needs of both teachers and students (Scott-Webber et al., 2000). While the statement addresses higher education, its core insight is equally applicable to secondary schools. While teachers find themselves navigating through crowded classrooms, constrained by spaces that limit their ability to implement more innovative, student-centred teaching methods, students are disengaged due to static and uninspiring learning environments. Schools are asked to foster not just academic achievement but also social, emotional, and cognitive development, many learning environments remain focussed on efficiency. This lack of connection between educational needs and physical environments underscores the urgency of rethinking how we design schools.

This project's goal is to respond to these challenges by developing a series of typologies (definition discussed on the following page) desirable for secondary school design in 2035 that are used as guidelines for designing learning environments. The typologies are based on situations that are desired to take place in educative spaces. These situations consist of interactions that better support both students and teachers, creating

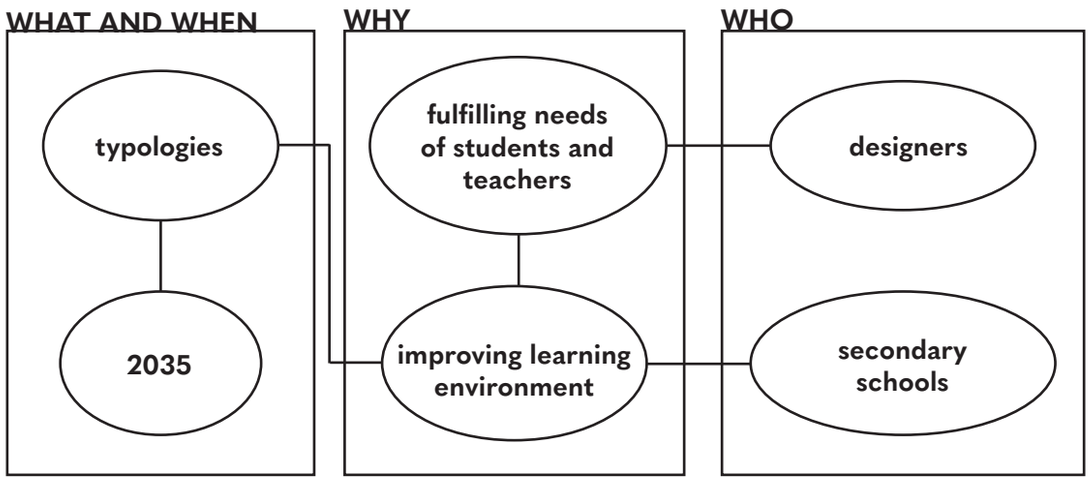


Figure 1: WWWW

environments that enhance learning, foster working together, and promote well-being. By envisioning schools that are equipped for the future, this project seeks to contribute to a shift in the way we approach design the environment for education, ensuring it meets the evolving needs of all its stakeholders.

These typologies have formed the basis for a tool that helps designers design with the situations in mind. The tool is relevant for designers but can be useful for architects, teachers, and policymakers as well. It is aiming to design schools that are student- and teacher-centred, and future-ready. Key factors such as the integration of technology, individual focus and community engagement are considered. Ultimately, this design aims to redefine what it means to learn and teach in secondary schools by aligning physical spaces with the evolving pedagogical goals of the 21st century.

Typologies, archetypes and situations

The terms typology, archetype, and situation are important to this project and appear frequently throughout. Given the multiple interpretations and definitions these terms can have, I will clarify how they are specifically understood and applied in the context of this work.

Typologies

There are many opinions on what can be named a typology. For this project, typologies are systems or frameworks used to classify things into distinct types or categories based on shared characteristics. What the types or categories are based on, can differ. Typologies focus on classifying a broad range of subjects into discrete, mutually exclusive types based on specific features or criteria. For example, when making typologies for groceries in the supermarket, these can be taste-based, like savoury, sweet, spicy, bitter. However, the typologies can also be ingredient-based, like vegetables, beverages, dairy and grains.

Typologies are a way of dealing with multiplicity. When there is a multiplicity of ingredients and all sorts of alternatives, typologies help work with all of that at the same time. They convey the coherence of the content, in this project, the interactions and the spaces that support them.

Archetypes

Archetypes can take on many forms. They are universal, symbolic patterns or models that emerge in human culture, psychology, and storytelling. They are often innate, unconscious, and deeply rooted in the human experience. Archetypes represent timeless, fundamental ideas or roles (Heckmann, 2025). An example of archetypes could be different types of people when working in a group, there could be ‘the leader’, ‘the planner’, ‘the presenter’, ‘the researcher’ and so on.

Archetypes are useful for representing a holistic coherence, making the multiplicity of ingredients that typologies capture, understandable.

Situations

The term situation may not seem as interpretable as the other two, but the choice to use situation was intentional. While scenario is a term that could also be used, it typically refers to a sequence of moments, whereas a situation is defined as a single, specific moment. This project is space-oriented, where the emphasis is on capturing specific interactions that occur within a space. The term situation aligns better with this focus, as it highlights the relationship between a particular moment and the spatial context in which it unfolds.

Report structure

The project consists of two parts, see Figure 2. The first part, concerns one of the stakeholders: secondary schools. It contains research and analysis of educational spaces, resulting in a proposal for 12 situation-based typologies that can be used as guidelines in the designing of educational spaces. Part II incorporates the perspective of designers of schools and results in a concept for a tool with which designers can design educational spaces.

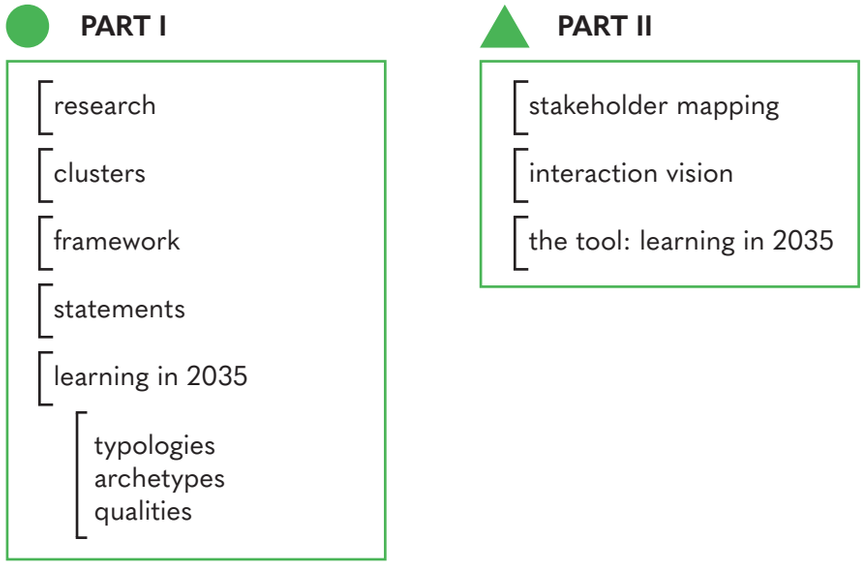


Figure 2: report structure

When mentioning design, this can refer to two things: in part I it will refer to the situation-based typologies for learning environments and in part II it refers to the tool for designing.

The designers at Triomf

This project is executed for Triomf Design, usually called Triomf, a company that has a broad portfolio and is specialised in spatial design. The designers at Triomf will be main stakeholder of part II of the project. While Triomf has proven expertise in creating well-received spatial environments, the company is eager to deepen its understanding of the specific needs of students and teachers and create more meaningful school designs in the future. Triomf will be further discussed later in the report. They are included as the main user of the tool for designing and are kept informed throughout the process.

Vision in Product Design

Part I of the project follows the Vision in Product Design (ViP) method, a future-oriented approach that helps face complex systems, like learning environments. This method is created by Paul Hekkert and Matthijs van Dijk, to shift design from solving immediate problems to proactively shaping the future (Hekkert & Van Dijk, 2016). They aimed to focus on the broader context, meaning, and societal impact of products. It suits the project well, since it focusses on innovative solutions not necessarily applicable in the here and now. Attractive of this approach, is the wide variety of research that is required.

ViP is divided into two main phases, deconstruction and design, that both operate on three levels: product, interaction, and context. The deconstruction phase focuses on analysing the current situation, while the design phase explores possibilities the future.

Before beginning the process, it's essential to define a specific domain where the designer aims to make a contribution. Deconstruction takes place mainly in the context, through interviews and observation. The goal of deconstruction is to get familiar in the context and gain insights that can't be found in literature. Insights that are relevant for the future are brought to the next phase. This phase is collecting relevant context factors both through field research and literature research. The collection of context factors are then structured into clusters, these tell stories of what drives the possible future. The clusters form the base of the framework. This framework will reveal the probable future situations this domain is to move towards. Followed by the framework, is writing statements about the desired future situations. These statements describe how the designer responds to the probable future situations and what the change is they would like to compose.

These steps of ViP are followed by the book, however the next phases asked for some adjustments. See Figure 3 for the ViP process. The statements on desired future situations form the base for the typologies that are meant as guidelines for designing. The next step in ViP, determining the desired product interaction of the user with the product is interpreted more freely. Every future situation can be facilitated in different ways, with preferences for every individual in the learning environment. Therefore, they are in the shape of archetypes that fit the desired situations. For every situation, there are several archetypes.

The product level of the design phase is up to Triomf when designing schools. Therefore, the ViP process is carried out up to and including the interaction level.

Following the steps of the method keeps a certain amount of structure in the process. With each step of the process it is questioned whether it is still useful or whether a different approach or adjustments to the method is better suited. Throughout the report, a small icon will indicate the position in the ViP process.

In addition to coaching from the supervisors, to ensure effective application of the ViP method, regular guidance and feedback are provided by Prof.ir. M.B. van Dijk. With every phase of the ViP process meetings were held to discuss the progress, what every phase entails and what the

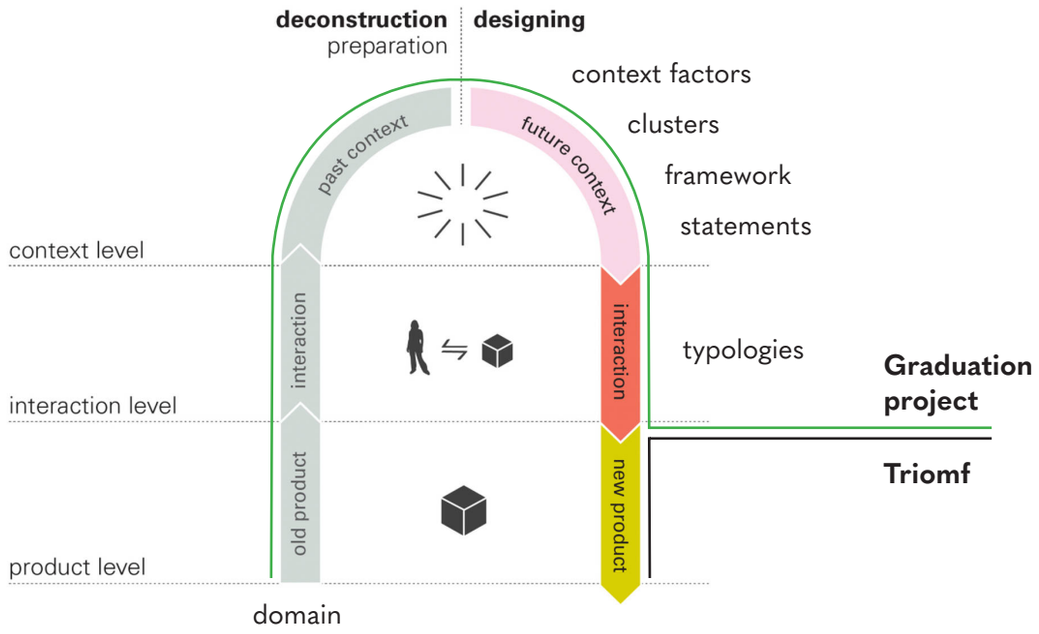


Figure 3: Vision in Product Design (Hekkert & Van Dijk, 2016)

Double Diamond

In parallel with the ViP approach, a more conventional design process was followed, structured around the Double Diamond framework (Design Council, 2005). See Figure 4. This method is divided into four phases, starting with diverging in the discover stage. For this project, this phase focused on analysing the primary stakeholders of this stage: the designers at Triomf Design. Key questions explored included: Who is Triomf Design? How do they approach projects? What values and priorities drive their work?

The second phase, define, involves converging insights to identify what is most relevant for the design process. At this stage, an interaction vision was established to guide the relationship between the designers and the tool. The envisioned interaction provided a foundation for the subsequent phases and ensured the final product aligned with the designers' needs and expectations.

The second diamond begins with another round of diverging, focusing on generating ideas for the tool's potential forms. This phase was all about exploring creative possibilities before converging once again to narrow down ideas and finalise the concept: the card set. Throughout this process, an iterative approach was used, refining ideas based on feedback and insights. Throughout the report, a small icon will indicate the position in the ViP process.

A challenge in this phase was designing for designers. In this case, the designers are the users of the tool, a role reversal that required consideration. Designers are accustomed to creating for others, this can result in them not seeing themselves as users. Designing a product that meets their unique needs and sparks their creativity demanded an empathetic approach.

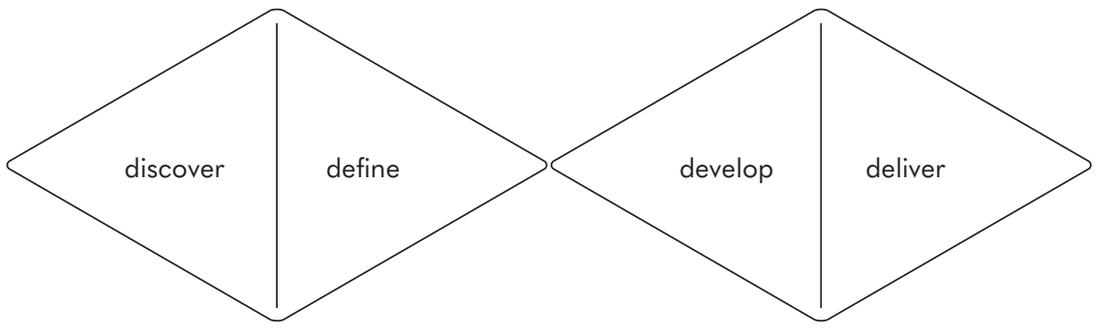


Figure 4: double diamond (Design Council, 2005)

Including stakeholders

To understand current learning environments, on product, interaction, and context level, insights are mainly gathered through interviews and observations. This field research, research in the context, is meant to be the guide for additional literature research. Experts from educational environments, a school principle and teachers, have provided valuable insights through their perspective (discussed in the deconstruction chapter). Open exploration in educational environments reveal insights that aren't available in literature and can only be discovered through observation and engagement in the environment.

I gathered insights by visiting five schools, attending four classes, and interviewing nine teachers from various courses and school systems. (See tables in Appendix [A] for details.) The students did not respond in depth to direct questions, so the reserach method was adapted to observations and fly on the wall. For this I listened to their conversations and watched their interactions. Conversations amongst students have contributed additional insights that are included in the deconstruction.

In the deconstruction phase insights collected through interviews and observations are referred to as follows: (Interview; participant no.) and (Observation). All observations are made by me and discussed with the teacher present at that time.

The main research questions during interviews and observations were:
"What is happening in the school environment?"
"How do people feel about the learning environment?"
See Appendix [B] for the list of questions used during interviews.

My own experiences in learning environment also impact my perspective. While it's important to acknowledge this, insights gained through stakeholders remain central to the design process.

To include Triomf's perspective collaboration is part of the process through gathering their input by organising two sessions: one about structuring findings and one for brainstorming ideas. This gave insight into their design methods and values that influence the final design of part II. Further description about these sessions can be found in Appendix [D,G,O].

The typologies are validated by presenting them to both teachers and students in situation-based tests to ensure they feel represented and that it meets their needs. The design of the tool is reviewed by the designers of Triomf, to confirm it enhances their understanding of how the new learning environment should support interaction between teachers, students, and the space itself, but also to ensure the tool contributes to their design process.

PART I

Part I is focusses on secondary schools. Here, the research revolves around the students and teachers, first discussing the current state of learning environments on product level, interaction level and context level.
All data is collected and formatted as context factors. These context factors are then gathered into clusters that form the driving forces of the domain. By analysing the clusters a framework is made, the cells of the matrix each represent a probable future situation. From there is decided what is desirable and how this translates to future learning environment design guidelines.

This chapter lays the foundation for the development of the framework by delving into the research that underpins the project. It explores the complexities of the design domain on product, interaction and context level. Additional research into relevant context factors for learning environments at secondary schools then add to the understanding of the design challenge.

The domain description provides an overview of the scope of this project. Next, the deconstruction phase is discussed. This step creates a picture of the current situation.
Finally, this chapter delves into context factors, which outline the environmental, social, and functional considerations that shape the design process. These factors provide insight into the real-world conditions that influence the success of the framework, ensuring that the proposed solutions are practical, relevant, and adaptable to different situations.
Together, these elements form a comprehensive exploration of the research underpinning the framework. They not only clarify the theoretical basis but also ensure that the outcomes of this project are deeply rooted in context and designed to address the realities of educational environments.

Domain

Determining the domain of the project depends on the area in which the designer aims to make a contribution (Hekkert & Van Dijk, 2016).

In short, the domain can be described as

'The learning environment of Dutch secondary schools'.

In the Netherlands, secondary education is divided into levels, each supporting different learning trajectories and preparing students for various future study plans. This project focuses on general education for students in the VMBO-T, HAVO, and VWO levels. This project does not extend to vocational education, as vocational courses often require specialised tools and spaces tailored to specific professional skills. The aim of this project is to investigate the general aspects of learning environments rather than modifying the specific content or structure of core subjects such as Dutch, Mathematics, English, Geography, History, Science, and Biology. The focus is on the broader learning experience rather than the delivery of individual courses.

Furthermore, this project does not differentiate between educational philosophies (e.g., Montessori, Dalton, or traditional), instead adopting a universal approach to secondary education environments for students aged 12 to 18. The goal is to understand and improve the qualities of learning spaces that can support a diverse range of learning needs, styles, and activities, creating environments that benefit students across all school types and theoretical levels within Dutch secondary education. See Figure 5.

Here the domain is the place where the typologies provide insights for the design. What also could be seen as the domain is the design space at Triomf, however this will be addressed later in part II.

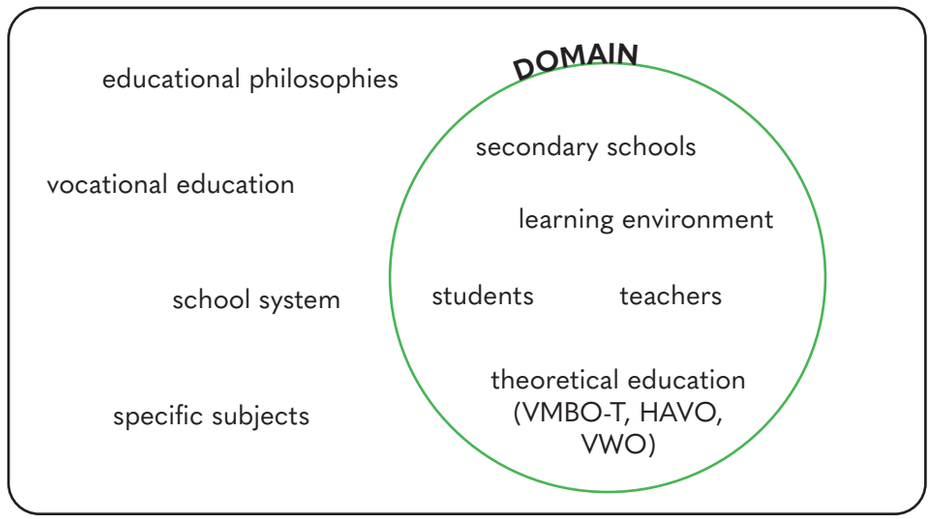


Figure 5: domain pool

Deconstruction

Product level

Physical setup
The physical setup of traditional classrooms reflects a standardised approach to learning that has remained mostly unchanged for decades. See Figure 6. Most classrooms today still follow the classic “bus” setup: rows of tables and chairs arranged in a grid, each facing a designated “front” of the classroom where the teacher’s desk and a board are placed. This setup establishes a clear directionality in the room, focusing all attention on the teacher, who is positioned as the primary source of knowledge. The arrangement emphasises individual workspaces over collaborative opportunities, stimulating a teacher-centred, lecture-based model of learning. In addition to the setup, classrooms often have minimal decorative elements, such as subject-relevant posters or educational displays that personalise the space without altering its structure or function. (Observation)

Some schools have started experimenting with movable furniture on wheels to allow for greater flexibility, facilitating different seating arrangements to suit group work or discussion-based activities. However, teachers usually don’t bother to change the setup. The traditional classroom layout generally prioritises consistency so every class can be held in that room, as well as predictability, and ease of management (Interview, Participant 3 & 7).

Technological advancements
Despite the technological advancements in education, the physical structure of traditional classrooms has changed little over time (Observation). The primary technological shift has been the transition from chalkboards to whiteboards and, more recently, to smart boards. This development shows how new tools are added whilst keeping the basic setup of the room the same. Although technology, like smart boards and tablets, provides new opportunities for interactive learning, it often integrates into the existing structure rather than transforming it (Observation; Interview, Participant 1 & 5).

Specialised classrooms
In contrast, specialised classrooms for more practical courses such as science, technical studies, or creative arts show different physical characteristics tailored to hands-on activities. Science labs, for instance, often include specialised equipment, lab benches, and safety features that support experimentation and group collaboration. Technical studies or creative programs are typically held in workshop-style spaces with ample room for physical materials. These specialised rooms deviate from the traditional grid format to meet the practical needs of specific subjects, allowing students to apply concepts more actively (Observation; Interview, Participant 3).

Innovative school designs
An innovative approach in educational spaces can be seen in models like those implemented at Wings Agora School in Roermond. Agora moves away from the traditional layout by creating a personalised learning environment where students are free to design their own workspaces. Instead of desks in rows, Agora provides students with spaces that facilitate to diverse activities, from quiet, solitary study areas to interactive stations for



Figure 6: current classroom setup



Figure 7: current classroom setup of research and design course

practical work like 3D printing, painting, or carpentry. Students who prefer movement have options to engage in active tasks, while those who require focus can find quieter areas suited to individual work (Agora Wings, n.d.)(Interview, Participant 1). This approach is inspirational for designing guidelines for learning environment design.

Conclusion and product qualities

The current physical setup of learning environments reflects a tradition of standard classroom layouts, with rows of desks facing the teacher to support a lecture-based model. While some schools have incorporated technological advancements like smart boards and tablets, these innovations are often layered onto the existing structure rather than reshaping it. Specialised classrooms, such as science labs and workshops, offer tailored spaces that meet the unique requirements of practical, hands-on learning. Innovative designs, like those at Wings Agora School, represent a departure from tradition, providing personalised and flexible spaces that accommodate diverse learning styles. Comparing traditional and innovative approaches reveals a fundamental difference in how physical space influences the learning experience. I concluded that traditional classroom setup prioritises efficiency and control, with an emphasis on teacher-centred instruction and passive learning. In contrast, innovative spaces emphasise a more active, student-centred model that encourages collaboration, creativity, and exploration. See figure 8 for the product qualities of the traditional classroom.

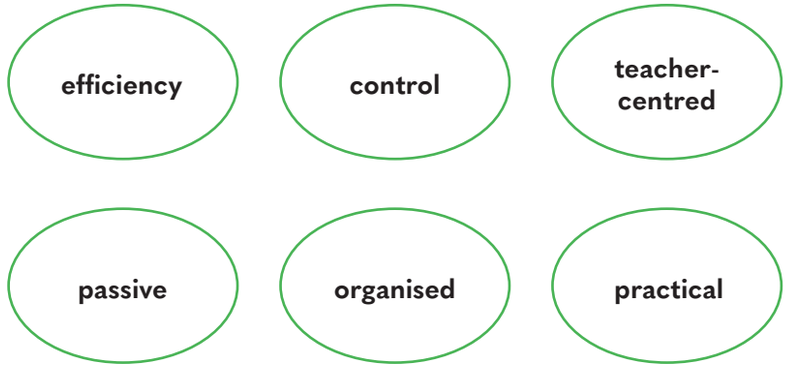


Figure 8: product qualities of current product

Interaction level

Building connection
Establishing a meaningful connection with students is essential in any learning environment, it helps develop emotional intelligence (Lee & Qiufan, 2021). Trust emerges as a foundational element in fostering effective teacher-student relationships, as students tend to learn better when they perceive their teacher as someone invested in their success and willing to be open (Interview, Participant 4; Observation). This trust stimulates a willingness to engage in class activities, and teachers report a strong social component as key to the learning process (Interview, Participant 3). However, in classrooms with large numbers of students, the challenge lies in ensuring that each student feels "seen", which some students actively seek through frequent requests for attention or affirmation (Interview, Participant 4; Observation).

Motivation and engagement
Students often light up when given opportunities to show what they have learned. This sense of achievement fuels motivation and encourages active participation (Whiteley & Dintersmith, 2015). Teachers play an important role in maintaining this motivation, particularly by prioritising curiosity over strictly following the lesson objectives (Interview, Participant 3). Unfortunately, a lack of enthusiasm among students towards learning is a common observation, with some students simply attending school for social interactions rather than for academic engagement (Interview, Participant 2; Observation). Therefore, an important focus is on involving students actively in the learning process, whether through interactive assignments, visual learning tools, or more practical activities (Interview, Participant 2; Participant 3).

"The primary goal is for students to enjoy learning, regardless of the specific subject." - teacher

Teachers are constantly challenged to find a balance between socially interacting with students and putting the focus on teaching the learning contents, see Figure 9.



Figure 9: finding balance between teaching content and connecting



Figure 10: students engaging in class
From Kids Sitting at the Table [Photograph], by Pavil Danilyuk, Pexels



Figure 10: friends determining where to be and how to move [2]
From Students in the School Hallway [Photograph], by RDNA Stock project, Pexels

"I am where my friends are." - student

Student interaction and social dynamics
For many students, social connections within the classroom environment significantly influence their engagement. Friend groups are integral, being the motivation for where students choose to sit, how they participate in activities and how they move through the school as visible in Figure [fix] (Interview, Student). While interaction with each other can create distractions, it also holds potential as a motivator for active engagement when guided in a constructive way (Observation), underscoring the importance of balancing social and academic elements in lesson design. The social dynamics at schools are largely influenced by group dynamics. Students like to test their teachers, finding ways to interrupt the class or getting less homework assigned. This disrupts class and lays focus on certain students (Interview, Student). Classes are filled with these types of interactions. Everyone has roles, for example the entertainers, the mediators, the deciders and so on. Every class has a different composition of individuals, making every class unique (Observation).

Adapting to changes
Resistance to change among teachers is common when changes are implemented from the school board without meaningful involvement from the teachers themselves (Interview, Participant 1). School boards that come up with new educational visions sometimes forget to include teachers, leading to a disconnection between policy and practice, where the learning environment is left behind. Familiarity and consistency in routines are valuable to teachers, especially during times of transition, as these help in maintaining a stable learning environment (Interview, Participant 8; Participant 5).

Physical engagement and movement
Movement within the classroom and physical interaction with learning materials is essential for understanding abstract concepts (Manches & O'Malley, 2012; Interview, Participant 3). However, objects within the classroom are often viewed as "play material," reflecting a potential distraction (Observation). During school hours the students get little movement, only to move from one class to another. Also, moving around is "being seen", which is a reason for some students to move around and for other students a reason to remain seated. (Observation). Patterns were uncovered in how students interacted with the space, particularly their body language and movement. Some students appeared to move intentionally into visible areas, often engaging with peers or seeking attention, while others remained seated, avoiding drawing attention to themselves.

Learning methods and techniques
A variety of teaching methods is seen as essential in listening to the diverse needs of students. Although traditional study methods, such as studying for tests, are common, they often lack long-term effectiveness in knowledge retention (Interview, Participant 1). Teachers try to adjust their techniques to foster curiosity and deeper understanding, with sometimes using tangible objects (like models or posters) to help concepts stick in students' minds more effectively than digital tools, as can be seen in Figure 12 (Interview, Participant 3). Flexibility in learning pace also proves beneficial for preventing student disengagement, allowing students to process information at a rate that feels comfortable for them (Interview, Participant 4).

Conclusion and interaction qualities
The current learning environment emphasizes building meaningful connections between teachers and students, with trust being essential for effective relationships. Teachers actively work to engage students through a mix of methods, fostering motivation by celebrating achievements and encouraging curiosity. Social interactions within the classroom play a significant role, as students' relationships with peers often shape their engagement and participation. Teachers adapt their approaches to accommodate diverse needs, integrating physical materials and flexible pacing to support learning. While change can be challenging, teachers value consistency and stability in maintaining a productive classroom atmosphere. Overall, the classroom is a dynamic space where connections, motivation, and adaptability come together to support student growth and learning. This translates to the following interaction qualities:

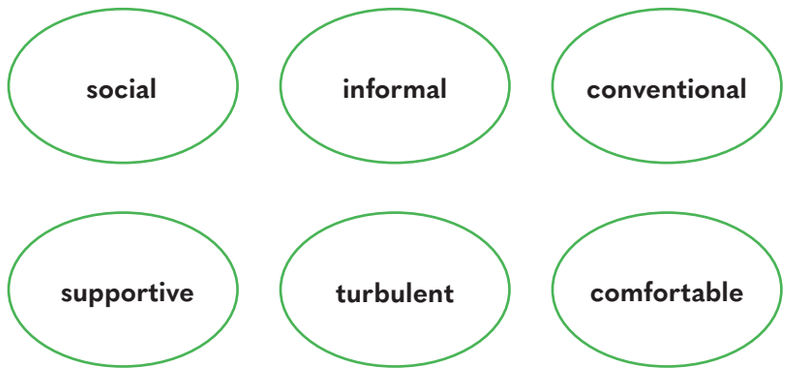


Figure 11: interaction qualities of current interactions



Figure 12: using objects in class [3]
From Man Standing beside a Human Skeleton [Photograph], by Tima Miroshnichenko, Pexels

Context level

Learning environment and classroom design
The physical learning environment plays a significant role in shaping student focus and engagement. While dynamic, visually engaging classrooms may enhance the learning experience, they can also inadvertently become sources of distraction (Interview, Participant 3). Teachers express a desire for reliable, distraction-free spaces that facilitate teaching without compromising their efforts (Interview, Participant 3). Flexible classroom designs are increasingly becoming a topic as evolving educational philosophies often require adaptable spaces that align with new teaching practices and collaborative activities (Interview, Participant 5). Additionally, furniture placement can be perceived as "distance", which can either hinder or enhance teacher-student interactions, further underlining the need for thoughtful design (Interview, Participant 8).

Student motivation and teacher influence
Motivation remains a complex yet critical factor within education. Teachers' enthusiasm and dedication directly influence students' attitudes towards learning (Whiteley & Dintersmith, 2015). While future-oriented motivation, such as the potential career impact of education, is often lost on younger students, they are highly motivated by immediate achievements like high grades (Interview, Participant 1; Participant 4). Teachers find fulfilment in seeing students make progress and gain understanding, which in turn reinforces their intrinsic motivation to continue teaching (Interview, Participant 4).

Teacher workload
The demands on teachers remain substantial, with many struggling to manage continuous teaching schedules within the traditional school system (Interview, Participant 4). Concerns about remaining teacher shortages, highlight the need for new support structures to attract and retain teachers (Interview, Participant 4). In practice-oriented programs, teachers often shift from direct instruction to a coaching role, guiding students through experiential learning tasks and offering support rather than solely delivering content (Observation).

Curriculum and government influence
Standardised curricula and government regulations place considerable pressure on schools to meet assessment requirements, often limiting opportunities for innovative or experimental teaching methods (Interview, Participant 4; Participant 1). The emphasis on knowledge absorption and testing may overshadow broader educational goals, such as fostering creativity, critical thinking, and hands-on skill development (Observation). Limited classroom space and inadequate facilities also pose challenges, as educational institutions struggle to provide sufficient resources and learning spaces to support everyone (Interview, Participant 5).

"The curriculum focuses on knowledge absorption and the need to meet testing requirements." - teacher

Technological developments
Advances in technology give rise to questions about which skills are essential for students' futures, Teachers are encouraged to set clear rules for digital resource use, balancing technology's advantages with the potential for distraction (Interview, Participant 2). In organisational meetings, a topic that is being talked about more is the shift from purely knowledge-based learning to skill-based education, where technology can support this transition by highlighting skills relevant to students' future needs (Interview, Participant 1).

"There is a need for a broader teaching method that promotes not only knowledge but also skills and creativity." - teacher

Developing practical and personal skills
A holistic approach to education increasingly emphasises practical life skills, creativity, and collaborative abilities. As the job market evolves, schools recognise the need to prepare students for future challenges by integrating these skills into the curriculum (Interview, Participant 2). Collaboration, critical thinking, and adaptability are essential, and group work helps cultivate these qualities, along with a sense of responsibility and teamwork (Interview, Participant 2).

Education visions
There are quite some visions for education, see Figure 13. For every vision the focus is on another learning aspect. There is not one type of school or way of learning that is best for everyone. The future of education may see schools transitioning into community learning centres that serve students, parents, and local residents. Some teachers envision institutions that remain open beyond regular hours, fostering greater involvement from parents and offering additional learning opportunities for the broader community (Interview, Participant 1). Teachers dare to dream about what the learning environment could be. Sustainability also emerges as a growing priority, with schools encouraged to model environmentally conscious practices (Interview, Participant 2). Furthermore, inclusive classrooms with students of mixed levels, particularly in early education, are seen as beneficial for social and academic development

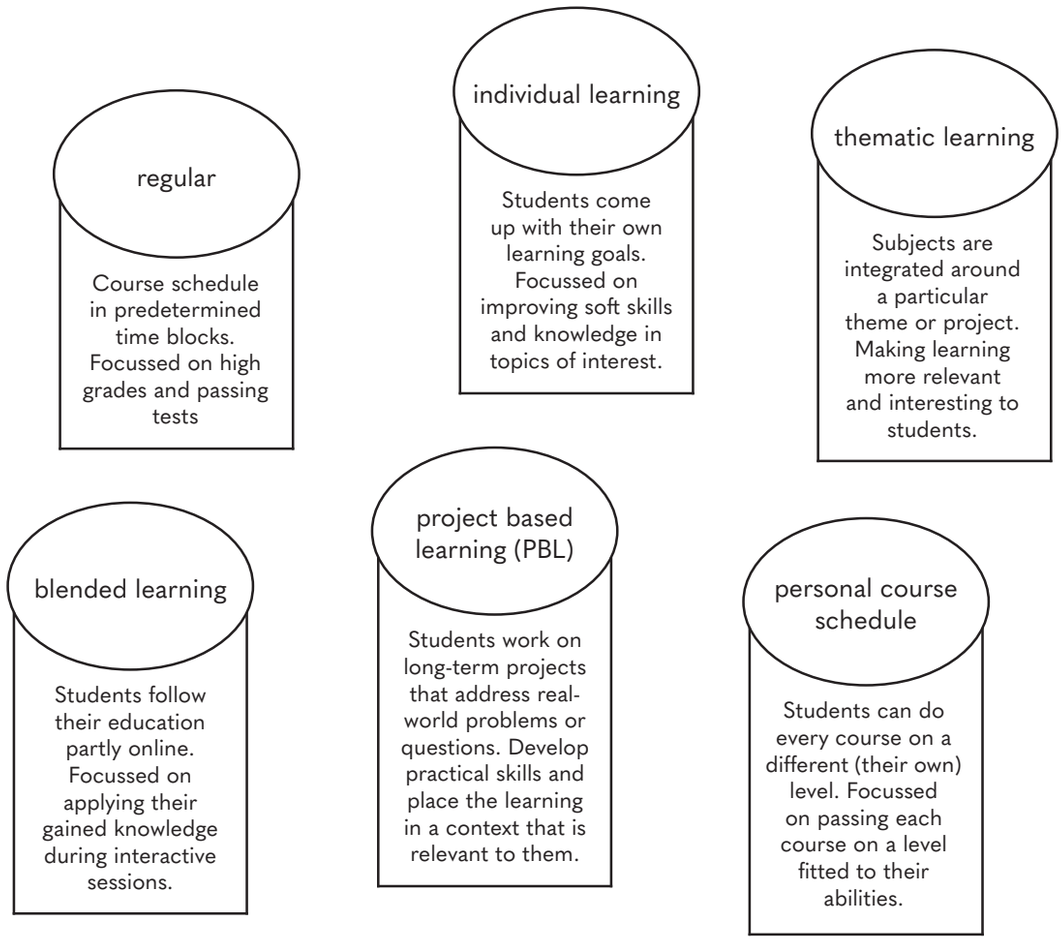


Figure 13: visions for education

(Interview, Participant 1). Not only mixed levels and ages, also inclusive when it comes to disabilities, schools have to work on reducing the gap between special education and regular education (Interview, Participant 2).

Conclusion

The current learning environment reflects a complex interplay of physical, social, and systemic factors that shape both teaching and learning experiences. Classrooms are designed to balance engagement and focus. Student motivation is influenced by immediate achievements and the enthusiasm of dedicated teachers, who have to find a balance between heavy workloads and structured curricula. While standardised education frameworks emphasise testing and knowledge acquisition, teachers increasingly advocate for skill-based learning that prepares students for real-world challenges. Technology continues to play a crucial role, with schools navigating its potential. The integration of practical skills, collaborative learning, and inclusive practices reflects a holistic approach to education, as schools strive to meet diverse student needs. Emerging visions for education see schools as community hubs and inclusive spaces, bridging gaps between traditional and special education.

Context factors

Capturing the future context is done by gathering factors that give insight about conditions of the future. These factors are statements about the future within the project's time span, which extends to around 2035. The ten-year window is close enough to make reasonably confident predictions yet far enough to ensure that the solution remains both relevant and innovative.

A total of 159 factors were gathered through field research and literature research. Insights from field research were used to formulate statements that are still relevant in 2035. It is essential to recognise the role of interpretation and estimation in this process. Each factor stands independently, with no pre-determined connections, providing a broad, unbiased as possible view of the future context. All factors can be found in Appendix [C], while the following pages provide an overview in Figure 15.

To support the ViP process, it is important to include a broad variety of factors. Although it's impossible to achieve a complete picture of the future, capturing diverse perspectives helps outline more realistic scenarios. All factors are in a way relevant to the domain. Some factors are obvious, others are a bit further away from what you would initially think is relevant. Each factor is categorised into one of four types and assigned to a specific field, as shown in the table in Figure 14. This diversity framework is not intended to produce a perfectly uniform distribution across categories; rather, it aims to minimise bias and enhance wide representation across the possible future.

	Cultural	Psychological	Demographical	Sociological	Economical	Biological	Evolutionary	Technological
Trends	15	3	1	6	4	x	4	14
Developments	2	x	3	x	5	x	1	1
States	7	7	1	5	6	5	4	3
Principles	7	12	x	22	x	17	3	1

Figure 14: diversity table

Variable Factors

1. **Trends:** These involve changes in human behaviour. Trends capture shifts in how people act, interact, or perceive, often influenced by cultural, social, or technological developments.
   An example of a trend is that learning becomes more individual with AI (Lee & Quifan, 2021).

2. **Developments:** This category includes measurable shifts, often supported by statistics or numbers. Developments reflect quantitative changes in society that affect the domain. Unlike trends, developments are less about behaviour and more about changes in the distribution or state of certain characteristics within a population.
   An example of a developments is that household expenses on tutoring, homework assistance and exam training rose from 320 million euros in 2017 to 472 million euros in 2022 (CBS, 2024).

Non-Variable Factors

3. **States:** These factors are currently true and are expected to remain stable over the project's time span, 10 years. While they are not universally constant, they exhibit stability for the period being analysed. States may vary across cultures, but they remain largely unchanged within the defined timeframe.
   An example of a state is that most people spend more than half of their waking hours sitting (Harvard Health, 2020).

4. **Principles:** Principles are universal and always true, applying across all contexts and cultures. These are fundamental regularities or universally applicable knowledge that hold true regardless of time or place.
   An example of a principle is that people have a desire for feedback and validation (Gere & MacDonald, 2010).

Trends
T1: The concept of well-being is broadening. The income-centred view of individual well-being is expanding. (Rekola & Solovjew-Wartiovaara, 2023)

T2: Jobs aren't for life anymore. It is not one course and forever a job. It becomes constant learning and improving, jobs disappearing, changing and creating. Society changes, jobs change with it. (Lee & Qiufan, 2021)

T3: The continuous skills development is being highlighted. Changing work life and society require lifelong learning and the continuous skill development. (Rekola & Solovjew-Wartiovaara, 2023)

T4: Far-reaching flexibilisation and personalisation of education. (Last et al., 2023)

T5: Labour and skills needs are changing. Jobs are disappearing and jobs are being created. (Rekola & Solovjew-Wartiovaara, 2023)

T6: Changing role of the teacher and their skills. (Last et al., 2023)

T7: Increasing cross-sectoral and/or interdisciplinary collaboration. (Last et al., 2023)

T8: Mental health problems are increasing, particularly among young people. (Rekola & Solovjew-Wartiovaara, 2023)

T9: The importance of perceived well-being related to quality of life is growing along side. (Rekola & Solovjew-Wartiovaara, 2023)

T10: Increasing internationalisation and globalisation. (Last et al., 2023)

T11: Growing commitment to lifelong learning. (Last et al., 2023)

T12: Growing importance of socialisation and inclusivity. (Last et al., 2023)

T13: More focus on encouraging students to regulate their own emotions and learning, providing formative feedback, and giving them control over how they demonstrate their understanding. (Osika et al., 2022)

T14: Trust is being put to the test. High quality information provided by social institutions is seen as an important factor in building trust. (Rekola & Solovjew-Wartiovaara, 2023)

T15: Flattening population growth, increasing diversity and ageing. (Last et al., 2023)

T16: Preparing young people to live in an ethnically mixed society is an increasing topic in schools. (Leeman, 2008)

T17: Government money distribution is not proportional to inflation. (Hasekamp, 2022)

T18: Growing importance of and commitment to sustainability and green campus initiatives. (Last et al., 2023)

T19: Number of children in special education keeps growing. (Ministerie van Onderwijs, Cultuur en Wetenschap, 2024)

T20: Field research: school buildings must meet higher standards and stricter requirements. (interview participant 1)

T21: AI lowered basic costs of education and AI teachers can be trained that have near-zero marginal costs to teach in a symbiotic and flexible education model. (Lee & Qiufan, 2021)

T22: Growing importance of well-being. (Last et al., 2023)

T23: Sustainability is a growing topic in decision making.

T24: The teacher's focus is more on being an empathic mentor who teaches learning by doing, supervises group projects that develop emotional intelligence and provides personalised coaching. (Lee & Qiufan, 2021)

T25: Growing importance of ethical awareness and safeguarding public values around technology use in education. (Lee & Qiufan, 2021)

T26: Socially vulnerable students are more impacted by teacher shortage. (Onderwijsraad, 2023)

T27: People struggling with their gender comes more to light and is becoming a topic.

T28: Field research: freedom in learning is being stimulated more. (interview participant 5 & 6)

T29: Low change capability of educational organisations. (Last et al., 2023)

T30: An increasing focus on individualisation.

T31: The focus is more on standing by one's own truth instead of finding a compromise.

T32: AI applications enter society. AI applications are becoming more usual. (Rekola & Solovjew-Wartiovaara, 2023)

T33: Rise of blended, hybrid and online education. (Last et al., 2023)

T34: More questions raising about technological developments: data collection, transparency and accountability. (Rekola & Solovjew-Wartiovaara, 2023)

T35: Low-cost virtual reality (VR) technologies. (Cipresso et al., 2018)

T36: Growing body of research exploring the impact of VR on various aspects of human life, including psychology, education, and healthcare. (Cipresso et al., 2018)

T37: AI can make learning very individual. (Lee & Qiufan, 2021)

T38: Field research: changing education requires more flexibility in space. (interview participant 5)

T39: A lack of a sense of community can lead to social fragmentation and a sense of isolation among individuals. (Brandt et al., 2022)

T40: Remote and hybrid work are changing the labor market. Enabling new approaches to the organisation and decentralisation of work. (Rekola & Solovjew-Wartiovaara, 2023)

T41: Far-reaching digitalisation and datafication of education and the learning and working environment. (Last et al., 2023)

T42: Increasingly smarter buildings and better infrastructure. (Last et al., 2023)

T43: More schools integrate digital learning resources such as laptops into their curriculum. (Stichting Leergeld, 2024)

T44: Greater emphasis on understanding technology. The significance of technology skills will increase as well as the need for understanding technology. (Rekola & Solovjew-Wartiovaara, 2023)

T45: AI can enable teachers to focus on mentoring and connecting, practicing the soft skills like, empathy, critical thinking, teamwork and creativity. (Lee & Qiufan, 2021)

T46: AI can create a digital twin of people, which can be used to test whether something works for a specific person. "The AI has the blueprint of our children." (Lee & Qiufan, 2021)

T47: Improving accessibility of education with AI. (Lee & Qiufan, 2021)

Developments
D1: The Netherlands is 10.370 teachers short in 2028. (Algemene Onderwijsbond, 2019)

D2: There is a teacher shortage of 5.8% of reported employment.

D3: Household expenses on tutoring, homework assistance and exam training rose from 320 million euros in 2017 to 472 million euros in 2022. (CBS, 2024)

D4: There will be around 2,444 self-employed people in front of the class (flex teachers) in 2023, double the number from 5 years ago. (Gallmann, 2024)

D5: Field research: teachers' wage is increasing.

D6: 2017 counted almost 3,400 study guidance companies. In 2022, this number will be over 5,400. A growth of 61% in 5 years. (KVK Regiodata, 2022)

D7: 42% of teachers in secondary education believe that they often have to work extra hard. (Algemene Onderwijsbond, 2019)

D8: AI can do chores like correcting students errors, answering questions, assign homework, tests and grading etc. (Lee & Qiufan, 2021)

D9: Field research: Per student more space is needed for the ideal learning environment than currently advised by government. (Interview)

D10: Field research: teacher shortage will not reduce but increase further after 2035.

D11: Field research: schools are facilitating more. Extra care, help, personal needs. As a response to the governments vision on inclusive education (interview participant 2)

D12: "Real education should be as much about personal growth as knowledge and skills." (Lee & Qiufan, 2021)

States
S1: Field research: If you are allowed to decide for yourself, you get the feeling of ownership. Creating a different sense of responsibility when you feel you are the owner of your own learning path. (interview participant 1)

S2: Future focussed motivation is not effective for most students. Motivation that is relevant 'now' is more effective. (Whiteley & Dintersmith, 2015)

S3: "Work isn't just a steady pay check, it is dignity, self-worth." (Lee & Qiufan, 2021)

S4: The square meter counted for per student is between 5,7 and 8,1. (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2022)

S5: Field research: It motivates teachers to see students learning: "that they gradually improve, that they start to understand things, I think that is really nice to see." (interview participant 3 & 4)

S6: Establishing a sense of belonging, through cooperative learning, open dialogue, and informal conversations, helps create a more engaging and effective learning environment. (Brandt et al., 2022)

S7: Initiating the steps of change, facilitating employee participation, and managing communication carefully early in the process can prevent negative reactions from escalating. (Khaw et al., 2023)

S8: It is difficult for ethnic minorities to establish a philosophical and religious existence in schools. (Leeman, 2008)

S9: Field research: students perceive a threshold to ask their questions. (interview participant 6)

S10: Teachers lack professional expertise in discussing cultural and religious issues. They have neither the language for discussion nor sufficient alternative strategies. (Leeman, 2008)

S11: Field research: The focus is often on someone's diagnosis rather than someone's capabilities. (interview participant 2)

S12: We live in a growth driven society.

S13: Productivity is acknowledged as the "key mechanism by which average income and welfare are improved". (Bleischwitz, 2001)(Englander & Gurney, 1994)

S14: People need certainty from their job, to pay the bills and care for their family. (Lee & Qiufan, 2021)

S15: Teachers perceive tensions when discussing cultural and religious issues in a mixed class. (Leeman, 2008)

S16: Field research: there is high pressure on teachers. (all interviews with teachers)

S17: We have to deal with inequality of opportunity in society.

S18: People who are paid by the hour apply mental accounting rules to time, similar to how these rules are typically applied to money. (Devoe, 2007)

S19: Field research: in the current education system, teaching an entire day takes a lot of energy. (interview participant 3 & 4)

S20: Field research: people have individual needs that need to be heard. (interview all participants)

S21: Physical activity increases blood flow to the brain which can enhance concentration, memory and creativity. (Braybrook, 2022)

S22: Movement helps reduce stress and anxiety. (Braybrook, 2022)

S23: Active learning strategies can make learning more engaging and enjoyable for students. (Braybrook, 2022)

S24: Replacing 30 minutes of sitting with light activity each day reduces the risk of death by 17%. (Harvard Health, 2020)

S25: Most people spend more than half of their waking hours sitting. (Harvard Health, 2020)

S26: Field research: teachers are trained to rise above the subject matter. (interview participant 6)

S27: Field research: studying for tests is often not effective on the long term. Once the test has passed, new knowledge comes in the short-term memory. (interview participant 1)

S28: The school level determination of students is influenced by their background (and of their parents). (Sylbing et al., 2024)

S29: Field research: In the Netherlands, the teacher has little authority compared to other countries. (interview participant 8)

S30 Field research: the workplace is seen as separate from school policy. (interview participant 8)

S31: Field research: there is a lot of knowledge, data and information available in schools, but it remains unused. (interview participant 8)

S32: Sexism is deeply rooted in our society and is relevant in our daily lives.

S33: Field research: furniture can create distance between students and teacher. (interview participant 8)

S34: Field research: it is easier for teachers to follow the curriculum. (interview participant 8)

S35: Capabilities AI is falling short are: creativity, empathy and dexterity. (Lee & Qiufan, 2021)

S36: "Artificial Intelligence can perform many tasks better than people can." (Lee & Qiufan, 2021)

S37: There is a lack of connection, feeling like you belong a in group.

S38: Technology takes over current jobs. Jobs change, evolve and arise with the technology developing. (conclusion from AI 2041 book)

Principles
P1: When feeling a sense of ownership over their work, people are more likely to engage in behaviours that benefit both the organisation and themselves. (Avey et al., 2009)

P2: A positive, enjoyable, and supportive learning culture, where students feel valued and have a voice, results in emotional engagement and learning success. (Osika et al., 2022)

P3: Field research: Trust plays an important role in a learning environment. Students learn better once they have connected with the teacher and have established the teacher wants what's best for them. (interview participant 4)

P4: Sharing and demonstrating what people have learned fosters motivation and provides an opportunity to express feelings of pride. (Whiteley & Dintersmith, 2015)

P5: Field research: Learning environment has to change alongside a changing education vision. (interview participant 1)

P6: "Children need to raise self-awareness through inward exploration, cultivating empathy, communication, and other soft skills that would nurture deeper connections with one another and increase emotional intelligence." (Lee & Qiufan, 2021)

P7: Engaging physically with objects helps externalise and manipulate abstract concepts, deepening cognitive understanding. (Manches & O'Malley, 2012)

P8: People will take better care of, and strive to maintain and nurture the possessions they own. (Avey et al., 2009)

P9: Field research: Certain learning topics and goals require different learning environments. (interview participant 3)

P10: The combination of physical and cognitive engagement through tangible interfaces supports intuitive learning of abstract ideas. (Manches & O'Malley, 2012)

P11: Emotions play a crucial role in learning, either enhancing or impeding it depending on the emotional state. (Osika et al., 2022)

P12: Emotions like curiosity and interest support learning. (Osika et al., 2022)

P13: The emotional states of both students and teachers influence each other, impacting the overall learning environment, whether in face-to-face or online settings. (Osika et al., 2022)

P14: Positive emotions can foster motivation through mastery goals (intrinsic motivation) or performance goals (external rewards). (Osika et al., 2022)

P15: A teacher's motivation reflects on students, playing a crucial role in the quality of teaching and student engagement. (Whiteley & Dintersmith, 2015)(field research)

P16: Students learn about each others differences and how to respect those by meeting at school. (Ministerie van Algemene Zaken, 2024)

P17: The energy of a teacher has direct influence on the students mentality. (Whiteley & Dintersmith, 2015)

P18: Leaders who motivate and inspire, encourage people to take greater responsibility and ownership over their tasks. (Avey et al., 2009)

P19: Tangible interfaces promote joint problem-solving and knowledge construction by providing shared, interactive objects for group work. (Manches & O'Malley, 2012)

P20: Field research: teachers value fostering curiosity and engagement over strictly adhering to lesson objectives. (interview participant 3 & 4)

P21: Awareness of the emotional states of learners is becoming more important. Integrate activities that engage emotions, and foster dialogue and reflection. Encouraging curiosity, creative risk-taking, and learning from mistakes is key. (Osika et al., 2022)

P22: Positive reactions to change include emotional commitment, self-respect, and optimism, often driven by strong leadership, clear communication, and opportunities for participation. (Khaw et al., 2023)

P23: Fears lead to resistance and internal conflict. (Khaw et al., 2023)

P24: Stress and anxiety can undermine learning. (Osika et al., 2022)

P25: Students from minority backgrounds, often encounter environments that either ignore their differences or promote identities that clash with their own, making it hard for them to fully participate or feel included. (Leeman, 2008)

P26: People have a desire for feedback and validation. (Gere & MacDonald, 2010)

P27: Field research: Everyone strives by a different amount of attention given by the teacher (or anyone). (interview participant 3 & 4)

P28: Negative reactions to change are frequently driven by fears. (Khaw et al., 2023)

P29: People seek social acceptance and reassurance. (Gere & MacDonald, 2010)

P30: Field research: People want to be seen by others. (interview participant 3 & 4)

P31: Field research: With many students in one class, it can be difficult to give everyone the right amount of attention. (interview participant 3 & 4)

P32: Emotions like anxiety and disengagement can hinder learning. (Osika et al., 2022)

P33: Positive emotions such as joy, curiosity, and engagement activate the brain's reward system, helping students focus, persevere, and respond better to challenges and feedback. (Osika et al., 2022)

P34: Emotions are linked to essential cognitive skills like attention, memory, critical thinking, and problem-solving, all of which are vital for learning. (Osika et al., 2022)

P35: Being creative improves mental health by reducing stress, enhancing mood and providing a sense of accomplishment. (D'Silva, 2021)

P36: Physical activity improves learning and memory. (van Praag, 2009)

P37: Insecurity is part of the teenage years.

P38: When people are stressed, using cognitive skills becomes significantly more difficult. Stress affects the neural ensemble for integrating new information and prior knowledge. (Vogel et al., 2018)

P39: It is important for students to learn solution-oriented thinking skills and to become resilient so they can deal with difficulties both during their education life and after graduation. (Avci & Ataç-Öksüz, 2023)

P40: Field research: making connections has a positive effect on motivation. (observation school)

P41: Students who engage in regular physical activity tend to perform better academically. (Braybrook, 2022)

P42: Confusion can sometimes be a productive tool for fostering deeper understanding. (Osika et al., 2022)

P43: Everyone has the potential to be creative. (D'Silva, 2021)

P44: Eating well has a positive influence on brain activity. Concentration etc.

P45: Everyone has their own truth.

P46: Conflicts have a bad influence on concentration.

P47: A mastery-oriented mindset leads to more productive and sustained learning. (Osika et al., 2022)

P48: Field research: You need to make mistakes to learn. (interview participant 1)

P49: People have a drive to form and maintain lasting, positive, and significant interpersonal relationships. (Baumeister & Leary, 1995)

P50: People feel the urge to be part of a group. (Baumeister & Leary, 1995)

P51: When people are challenged, they are more motivated to work.

P52: When students are interested in what they are learning, they pay closer attention, process information more efficiently and employ more effective learning strategies. (Paul, 2013)

P53: Taking greater responsibility and ownership over tasks, boosts engagement. (Avey et al., 2009)

P54: Student's home situation affects their learning at home and at school. (Sylbing et al., 2024)

P55: Diversity can enhance creativity and innovation by bringing together different perspectives and ideas. (HRMID, 2021)

P56: Field research: In a scene where you're seated, the seat is 'home-base'. Walking is being seen. (observation school)

P57: Varying student's learning strategies increases attention.

P58: "Students' social adjustment is worse in ethnically diverse and low socioeconomic status classrooms, and an open classroom climate for discussion does not solve this." (Munniksma et al., 2022)

P59: Tutoring widens education gap.

P60: Learning environments are social environments. Interaction with each other is important opposed to solely interacting with an AI. (Lee & Qiufan, 2021)

P61: Social encounters in shared environments can enhance empathy through shared emotions and social identities. (Szanto & Krueger, 2019)

P62: Inclusive environments foster better communication and collaboration among team members. (HRMID, 2021)

Figure 15: impression of collected context factors

Clusters

Next in the ViP process is forming clusters of the context factors. This is the first time in the ViP process the designer is making considered design actions. Where the factors "must be turned into a unified whole, a coherent structure that explains how the separate elements are connected" (Hekkert & Van Dijk, 2016).

Clustering is done by taking one factor and then taking another and finding a connection between them. If there is, this forms the first cluster, if there is not, then a new cluster arises. Picking up new factors goes on till all factors are in a cluster, deciding for every factor whether it connects to an existing cluster or creates a new one. Every time a new factor enters a cluster, the cluster story is reevaluated. By following these steps, all 158 factors are put into 11 clusters, each of which is telling a story. See the clusters in figure 16A/B.

A pitfall in clustering is categorising, therefore it is important to emphasise the difference between clustering and categorising. When categorising, factors are combined based on their subject, while clustering is regarding factors as independent building blocks and asking yourself how you can compose stories from them. Those stories then form the clusters. Every cluster has a matching label and a statement, then for every cluster there is also a story.

On the following pages, the storylines are written for each cluster.

1

GLOBAL ACCESS,
LOCAL OVERLOAD

Globalisation raises the question about the balance between broad knowledge and in-depth knowledge.



[Photograph], Sérgio Souza, Pexels

2

NO SORRY, IM
BUSY TEACHING

Teachers are essential to the process of learning, but they experience high workload.

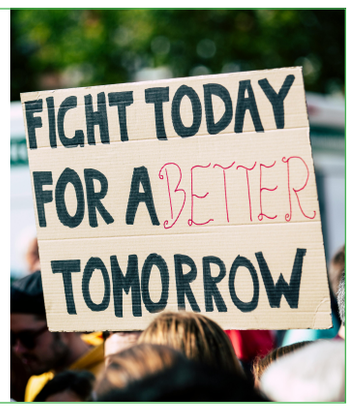


[Photograph], Max Fischer, Pexels

3

TO CHANGE OR
NOT TO CHANGE

Having trouble with change clashes with the demands of the growth driven society.



[Photograph], Marcus Spiske, Pexels

Figure 16A: clusters

4

SCREENS VS SCENES

Digitalisation reduces physical aspects in environments.



[Photograph], Cottonbro Studio, Pexels

5

WHEN FEELING GOOD GETS STRESSFUL

An increasing focus on well-being and society's drive for personal growth, has created an unrealistic expectation of always being well



[Photograph], Andrew Neel, Pexels

6

RELEVANCE IS RELEVANT

Understanding the relevance of learning content is essential for motivation.

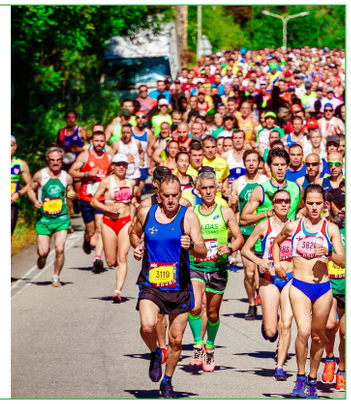


[Photograph], Kampur Production, Pexels

7

ME MYSELF AND I... WANT TO BE PART OF A GROUP

Finding a balance between individuality and group belonging is essential.



[Photograph], RUN 4 FFWPU, Pexels

8

LEARN TO WORK AND WORK TO LEARN

Rapid technological developments stimulate lifelong learning.

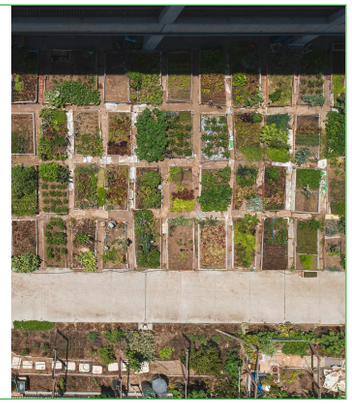


[Photograph], Kampus Production, Pexels

9

BEYOND THE BOX

Embracing diversity is important for fostering inclusion.



[Photograph], RDNE Stock project, Pexels

10

ENGAGE TO EXCEL

Responsibility and a sense of ownership boost productivity and motivation.



[Photograph], Olha Ruskykh, Pexels

11

MIND THE GAP

Diverse environments enable people to reach their full potential.



[Photograph], İbrahim Hakkı Uçman, Pexels

Figure 16B: clusters

1
Global access, local overload

Factors: T7, T10, T23, T33, T40

Globalisation raises the question about the balance between broad knowledge and in-depth knowledge. It has made great amounts of knowledge easily accessible, adding complexity as information flows freely. While this abundance allows for a more comprehensive understanding, the overload often leads people to seek simplification, sometimes at the expense of depth.

Connection to learning environment
Education's increased accessibility reduces opportunity gaps and promotes a more international, interdisciplinary approach. This global access encourages collaboration across diverse fields, enhancing collective knowledge. The shift to remote and hybrid learning models also reshapes the physical environment, requiring adaptable spaces that support both virtual connections and in-person engagement.

2
No sorry, I'm busy teaching

Factors: T6, T15, T21, T24, T41, T45, D1, D2, D7, D8, D10, S16, S19, P17, P20, P31

Teachers are essential to the process of learning, but they experience high workload due to ongoing shortages and a social image that does little to attract new teachers. With limited time for their own growth, it is challenging for teachers to adapt to developments and set an example for students. As AI takes over routine tasks, some relief can ease the burden, allowing teachers to focus on meaningful engagement.

Connection to learning environment
Teachers transition from knowledge transferor to learning facilitators, thus the physical learning environment must adapt to support more collaborative, interactive spaces that foster dynamic student-teacher exchanges. Spaces should also provide room for teachers to learn and grow professionally, allowing them to continuously enhance their teaching and inspire students through example.

3
To change or not to change

Factors: T18, T20, T25, T29, T36, T44, D4, D5, D6, D9, S7, S4, S12, S13, S26, P5, P22, P28

Having trouble with change clashes with the demands of the growth driven society. While change can feel unsettling and push people out of their comfort zones, it remains inevitable as the world progresses. Many face an internal struggle between adapting to new circumstances and holding onto the familiarity of the past. While involving everyone in a change process is essential, the internal resistance many feel towards change can hinder progress.

Connection to learning environment
Education is built on a rigid structure and change within this system moves slowly. Changing the physical spaces is often a major intervention that takes a long time to get everyone on board, which means it lags behind needs.

4
Screens vs scenes

Factors: T35, T42, T43, S9, S21, S23, S24, S25, P7, P10, P19, P36, P41, P56

Digitalisation reduces physical movement by prioritising efficiency and productivity. However, movement promotes interaction, and increased interaction enhances cognitive engagement, which is essential for effective learning.

Connection to learning environment
The physical aspects of learning, movement and objects, should be represented in the learning environment. Digital developments diminish the physical aspects of learning, while physical aspects make students' learning more effective, supporting deeper, more effective learning experiences. Physical aspects refer to movement and objects, where movement fosters interaction and objects help gain understanding of abstract concepts.

5
When feeling good gets stressful

Factors: T1, T8, T13, T22, D12, S22, P11, P23, P24, P32, P33, P34, P35, P37, P38, P44, P46

There is an increasing focus on well-being, with greater acceptance of discussing emotions. Society's drive for personal growth, has created an unrealistic expectation of always being well. This pursuit can backfire, as stress, fear, and anxiety impair cognitive function. As productivity takes precedence, well-being often declines. Shifting the focus from constant wellness to building resilience may offer a more balanced approach.

Connection to learning environment
The physical environment should support spaces for both well-being and struggle, recognising that resilience is essential for effective learning. Learning from mistakes strengthens resilience, though accepting errors can be challenging. By creating spaces that accommodate both positive and difficult emotions, the environment can better support authentic, resilient learning.

6
Relevance is relevant

Factors: S2, S27, P9

Understanding the relevance of learning content is essential. Both extrinsic and intrinsic motivations play a role, but students engage best when learning feels relevant to their current needs and interests. While learning ultimately prepares students for the future, maintaining a clear connection to present-day relevance enhances engagement and deepens learning effectiveness.

Connection to learning environment
The learning space should reflect and support student motivation, offering a sense of personal relevance. When spaces feel connected to students' immediate needs, it encourages greater engagement, making the learning environment more effective and meaningful.

7
Me myself and I... really want to be part of a group

Factors: T4, T12, T14, T28, T30, T31, T37, T39, T46, S20, S37, P3, P6, P27, P30, P40, P45, P49, P50, P59, P60

Finding a balance between individuality and group belonging is essential. Individualisation and personalisation are highlighted, striving to be the best individually. However, people seek connection, a sense of belonging and safety of being part of group. This paradox often causes collective experiences to be overshadowed by individual goals.

Connection to learning environment
The physical space should support both individual learning and collaborative, supportive interactions, fostering a balanced environment where personal growth and community both flourish. Learning should be personalised, allowing each person to progress at their own pace and learning should align with their interests and motivation. However, with limited resources, achieving this is challenging. Additionally, a learning environment is inherently social, where connection and community are crucial.

8
Learn to work and work to learn

Factors: T2, T3, T5, T11, T32, S10, S35, S36, S38, P4, P21, P39, P47, P52

Rapid technological developments impact what useful teaching contents are. Schools prepare students for the future, however current jobs change or disappear and new jobs arise. While traditional knowledge remains important, lifelong learning is a must to adjust to these continuous and fast changes. New learning contents emphasising soft skills such as empathy, creativity and adaptability have become increasingly relevant.

Connection to learning environment
The learning space has to be continuously flexible to accommodate the changes in what is to learn and how that can be done. This adaptability allows for a dynamic approach to education, enabling teachers and students to respond to changing needs and methods of learning. This requires the people in the school to also be flexible.

9
Beyond the box

Factors: T15, T16, T19, T26, T27, T47, S8, S11, S17, S28, S32, P2, P13, P16, P25, P54

Embracing diversity is important for fostering inclusion. However, instead of celebrating differences, we often confine individuals to rigid boxes that limit their potential. These boxes can create a false sense of permanence, focusing more on predefined categories than on individual needs. As circumstances change, it is challenging to break free from these constraints. People desire to be recognised as individuals and to feel a genuine sense of belonging.

Connection to learning environment
Spaces should be designed to reflect and celebrate individual differences, allowing for flexibility and adaptability. By creating areas that accommodate varied learning styles and cultural backgrounds, we can cultivate a sense of belonging that encourages all students to engage, collaborate, and thrive together.

10
Engage to excel

Factors: T9, D3, S1, S3, S14, S18, P1, P8, P18, P53

Responsibility and a sense of ownership boost productivity and motivation. When empowered to make decisions, individuals engage more deeply, enhancing both productivity and personal satisfaction. Our self-worth and ones status comes from what we do. What is fulfilling and motivating is different for everyone and is attached to personal values.

Connection to learning environment
Students don't feel responsible for the learning space as it is. Teachers and students can benefit when they are able to exert influence on the learning space or make changes to it, thus resulting in a more inspiring space they want to be in.

11
Mind the gap

Factors: T17, D11, S5, S6, S15, P6, P12, P14, P15, P26, P29, P42, P43, P48, P51, P55, P61, P62

Diverse environments enable people to reach their full potential. In diverse settings, everyone has more to learn, as collaboration fosters creativity, new ideas, and valuable teamwork skills. Those who remain open to others' perspectives gain the most from these experiences. Feeling socially accepted and valued helps people to be engaged and motivated.

Connection to learning environment
Diverse environments offer rich learning opportunities. The diversity of the people should be mirrored in the diversity of the space. Learning needs and approaches vary widely, and the environment should reflect this by supporting multiple ways of learning. Recognising that one's own experience is just one among many encourages a more inclusive and enriching learning space.

Framework

The transition from clusters to a framework marks an important step in the design process. Clusters contain organised patterns and insights derived from the context factors. A framework builds on these clusters, translating the findings into a structured base that guides design decisions in the following phase. This chapter delves into the process of constructing a framework. Starting with specifying the dimensions, after which the future situations of the cells are written. The result is a clear structure filled with what the designer expects the future of the domain to look like.

A framework can take on different forms. For example, the framework can be based on certainties or uncertainties, resulting in either four or more situations. Also, it can be based on a different number of dimensions, creating an even bigger grid. In this project's case a two-dimensional framework based on uncertainties is made. The vertical dimension is divided in three elements and the horizontal dimension in four elements. When crossing each element, a grid of 12 cells appears. Every cell in the grid is a different situation of the future that all exist amongst each other. This framework works well because the situations of educational spaces in 2035 is not necessarily 'one' or 'the other' future situation but rather about both 'this' and 'this' future situation. Also, the framework helps to understand what code of conduct, diversity of attitude or diversity of expectations students will have in the future learning context.

Dimensions describe the major themes in the domain's future and every dimension consists of several elements that are based on one or more clusters. The dimension can also be based on one or more clusters and can be described as the connection between the elements of the dimension. The squares that form when crossing the elements, are called cells. The cells are the situations that describe the future. Clusters can also be part of a cell, providing additional depth and relevance to the framework.

The size of the framework is unknown when starting to create it. It is a time-consuming process with numerous versions, requiring iteration and experimentation. Designers often try out different combinations of dimensions and elements until they find the structure that feels right and makes everything fall into place.
Throughout this iterative process, thinking over the context insights repeatedly not only helps refine the framework but also deepens the designer's understanding of the context itself.

[Dimension]

A	**D**	**G**	**J**
B	**E**	**H**	**K**
C	**F**	**I**	**L**

[Dimension]

Figure 17: two dimensional 3x4 framework

Dimensions

Change in relation to...

The vertical axis of the framework, "Change in relation to...", relates to cluster 3, discussing the difficulties with adjusting to change and continuous changes in society and personal life that are inevitable.

This axis is then divided into three rows, The three aspects on the dimension are all a view of which someone can change to in relation.

Learning (evolved from clusters 2 & 8):
This aspect explores the influence of change on learning. It considers questions such as: What happens to teaching, learning, curricula, and educational systems in the face of change?

Others (evolved from cluster 11):
This aspect examines the effects of change on one's environment, particularly on relationships with and between people. It highlights the interpersonal dynamics shaped by change.

Yourself (evolved from cluster 10):
This aspect focuses on how individuals experience change on a personal level, including internal dilemmas, challenges, and personal development.

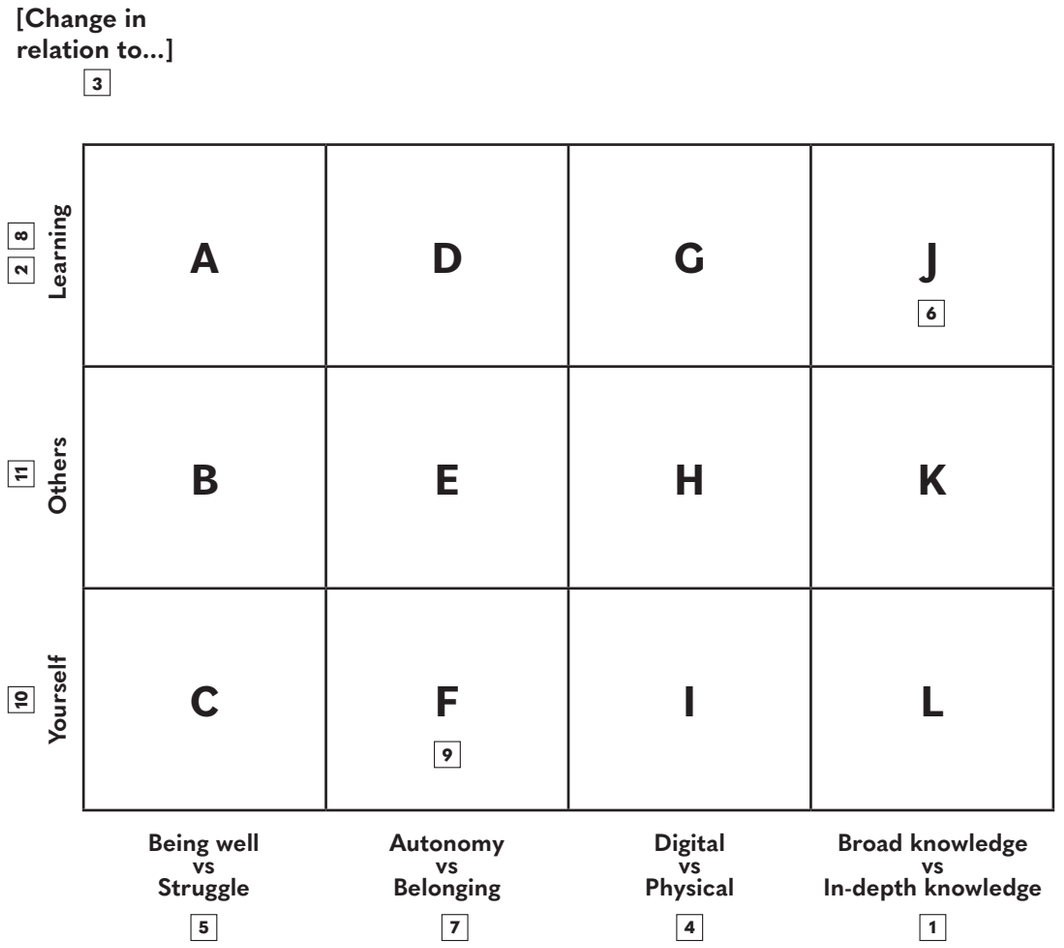


Figure 18: dimensions of framework

Balancing pedagogical dilemmas

The horizontal axis of the framework, "Balancing pedagogical dilemmas," is a relation between the clusters 1, 4, 5, and 7. It reflects the tensions in designing educational approaches, where balance must be sought between opposing values or needs. The four aspects of this axis are contradictions that are not about choosing one side over the other but about finding harmony between them.

Being Well vs Struggle (evolved from cluster 5):
This aspect focuses on balancing the importance of feeling well, both physically and emotionally, with the necessity of facing challenges and navigating periods of struggle. It highlights the need for resilience while valuing well-being.

Autonomy vs Belonging (evolved from cluster 7):
This aspect examines the tension between independence and individuality on the one hand, and connection and interdependence on the other. It involves listening to individual needs while fostering empathy and a sense of belonging within a group or community.

Digital vs Physical (evolved from cluster 4):
This aspect explores the balance between embracing technological advancements and appreciating the value of physical experiences. It's about integrating digital tools effectively without losing sight of the human, tangible, and sensory aspects of education.

Broad Knowledge vs In-Depth Knowledge (evolved from cluster 1):
This aspect considers the balance between acquiring a wide breadth of knowledge and diving deeply into specific subjects. It encourages following interests and relevance while challenging oneself to explore topics beyond initial comfort zones.

Probable future situations

Each cell provides a description of the probable future, focusing on behavioral expressions. These expressions reflect 12 distinct types of attitudes, expectations, and behaviors related to learning. These different types exist side by side, emphasizing that they are not separate or alternative worlds. While the differences between them are significant, they coexist within the same overarching reality.



A
Learning x Being well vs Struggle

Struggling with well-being directly impacts learning. Teachers being under pressure affects their well-being and with that their teaching abilities. Lifelong learning brings new challenges for both students and teachers: adapting to new skills as a student and focusing on teaching a divers set of skills as a teacher.
Schools will dedicate more time to supporting the well-being of both students and teachers by having extra care team in the school. Also, in the student-teacher interaction there will be more attention to the well-being of students.



B
Others x Being well vs Struggle

Others being well or not being well has direct effect on the surroundings. It can evoke all sorts of emotions like, frustration, sadness, demotivation. Students and teachers are both influenced by emotions of people present.
Well-being is an increasing talking topic and people get a sense of fulfilment when helping others. In a divers environment, different emotions and experiences are present simultaneously that can contribute to others well-being. Finding solutions together or having a place to your liking to deal with it can help people overcome their struggles.



C
Yourself x Being well vs Struggle

With the growing focus on well-being, people are spending more time reflecting on whether they feel “well”. How people deal with this is very different:
For some this leads to overthinking in isolation and for others this lead to sharing with others. It can feel scary to open up during times of struggles, as people often want to project a certain image to others.



D
Learning x Autonomy vs Belonging

There is more emphasis on balancing working in groups of different sizes in different roles and working individually to have a divers skill set and find personal interests and talents. Teachers are balancing their time as the centre of knowledge transferor and the student’s time in the centre. Teachers and students determine together what is to learn and how that is to be done.



E
Others x Autonomy vs Belonging

Working together is implemented more in learning, which leads to gaining understanding of others and finding solutions together. Troubles around working together arise and are a learning topic as much as the learning activity. Diversity in group work and dealing with differences can lead to finding a way where all team members are valued individually. Individual strengths will be highlighted and appreciated by learning from each other. Focus on everyone’s individual learning process, results in students lacking relation to others that are not so similar to them.



F
Yourself x Autonomy vs Belonging

How people like to spend their time, whether being and/or working alone or together is very different. Every person wants a different balance between both and likes different places to fulfil those needs. Students want to be like the rest and part of a group but still unique and not mainstream. Finding their own path, talents and interests to become their own person is playing a bigger role.



G
Learning x Digital vs Physical

Schools become digital environments. Teaching adjusts to technological developments. Technologically advanced methods find their way into the learning environment, teachers rely more on digital devices to lighten the pressure.
To accommodate the changes in what is to learn and how that can be done, the learning space has to be continuously flexible, meaning minimal in this case. This adaptability allows for a dynamic approach to education. Gaining understanding of technological developments is an important learning topic.



H
Others x Digital vs Physical

Surroundings and others are becoming a bigger definition. Digitally it is possible to connect with a broader audience. Connecting less in the physical world. People can find whomever whenever, and learn whatever whenever.
Spending time on digital devices makes the world so big as at the same time really small. With people spending most their time in digital environments, moving less, physical interactions are becoming less.



I
Yourself x Digital vs Physical

School days look like working with digital devices most of the time, with an occasional walk throughout the day to get some movement. With digital aspects increasing in learning environments, opinions differ. Some enjoy a digital environment, feeling connected with a broader group and having endless possibilities within reach, it is efficient. At the same time the digital world can be found limiting and isolating from what is ‘real’. Also resulting in being stuck in the same physical place.



J
Learning x Broad knowledge vs In-depth knowledge

In an era of rapid information flow, teachers and students may feel pressured to cover a vast range of topics. Yet, focusing on too many topics risks superficial understanding. This raises continuous questioning the degree to which deepening and broadening needs to happen. Being critical in what is useful in every situation is essential.



K
Others x Broad knowledge vs In-depth knowledge

In divers environments, different people and different means can broaden and deepen students knowledge and skills with different perspectives of different people. Broad exposure to multiple perspectives enriches learning but can make depth harder to achieve. When learning about a topic, some will like to go deep and some will like to go broad. Combining perspectives creates better results.



L
Yourself x Broad knowledge vs In-depth knowledge

How a learning topic and what about a topic is relevant is personal. People choose their own priorities for what is important. Taking in information that is interesting and relevant to them. What is considered relevant is not the same for everyone and how this is explored can be done in many ways. Some enjoy going deep into a certain topic whilst others rather cover a vast amount of topics on a more surface level. When learning about a topic finding a point of view that is motivating. Balance between reduce pressure or increase motivation.

Statements

This chapter describes the desirable future situations for the physical learning environment of secondary schools. With all the probable future situations sketched, it is time for the designer to make decisions. What transformations are foreseen to be meaningful in the future and what are situations to avoid? How to respond to the expected changes? Although many opportunities to make changes in this future world have come across, this urge is suppressed until now.

The goal of this phase is to define the desired future situations of the learning environment. To achieve this, statements are created for each cell of the framework. Each statement begins with "We want..." and describes what is desirable for that specific situation. A statement defines what it is you want to offer people (Hekkert & Van Dijk, 2016). In this case, what you want teachers' and students' learning environment to be like. They outline the essence of desirable interactions within each context.

I have made two statements per cell, one aimed at students and one aimed at teachers. While some statements are similar for students and teachers, where the teacher takes on a facilitating role for the interactions wanted for students, others are tailored specifically to the needs of teachers. These statements serve as the foundation for developing typologies of learning environments. These typologies act as guidelines for designing spaces that align with the envisioned goals and interactions.

The statements have been discussed, altered and agreed upon by the designers at Triomf to evaluate whether these statements are what we want in the future.

From these discussions, noticeable are some aspects that were big topics in the cluster phase but aren't explicitly mentioned in the statements, but are deliberate decisions.

Every individual has a preferred and personally best way of doing something. For example, some people like to talk face to face, and others rather look around while talking. There is not one cell that focusses on this in particular but this will be useful in a later phase where the typologies take form.

Also a largely discussed topic in the research phase is technology, It develops quickly and becomes apparent everywhere, it can be facilitated for all the different situations, but adjusting spaces to a specific technology brings the risk of it soon being outdated. For example, creating a VR dedicated space might not be relevant for long. Therefore there is not a situation solely dedicated to technology.

[Change in relation to...]

		3		
7 2 Learning	we want students to receive information through 'experts'	we want students to work together	we want students to experiment and create	we want students to reflect on their work 6
11 Others	we want students to have conversations about well-being	we want students to empathise with eachother	we want students to interact more	we want students to combine perspectives
10 Yourself	we want students to have time for themselves and be resilient	we want students to be unique and show their work 9	we want students to move around	we want students to find inspiration and motivation
	Being well vs Struggle 5	Autonomy vs Belonging 8	Digital vs Physical 4	Broad knowledge vs In depth knowledge 1

[Balancing pedagogical dilemmas]

Figure 19: student statements

Although every cell is equally sized, it doesn't mean they are equally important in every future situation. In every situation the relevance for every situation should be questioned and used accordingly.

From here on, a deviation from the typical ViP process is made, if such a standard ViP process can be said to exist. Normally, formulating a statement is the first step of creating a design vision, which involves selecting a single future situation for which to design a concept that facilitates the desired change. In this case, however, no selection is made between statements. Instead, each statement is translated into a corresponding type of space within the learning environment. All these situational spaces are intended to coexist, collectively shaping the overall environment.

[Change in relation to...]

3

	Being well vs Struggle (5)	Autonomy vs Belonging (8)	Digital vs Physical (4)	Broad knowledge vs In depth knowledge (1)
2 7 Learning	we want teachers to share knowledge	we want teachers to coach students	we want teachers to motivate experimenting and creating	we want teachers to reflect on their teaching (6)
11 Others	we want teachers to have conversations about well-being	we want teachers to empathise with every student individually	we want teachers to foster divers interactions between students	we want teachers to stimulate gathering perspectives
10 Yourself	we want teachers to support time for oneself	we want teachers to look at students' work individually (9)	we want teachers to move around	we want teachers to facilitate exploring

[Balancing pedagogical dilemmas]

Figure 20: teacher statements

Conclusion

This chapter has established the foundation for envisioning future secondary school learning environments by defining desirable future situations. Through a framework, statements were crafted to articulate interactions and conditions for both students and teachers. These statements serve as the basis for developing spatial typologies that form design guidelines.

Discussions with Triomf designers ensured that these statements align with a shared vision for the future. Moving forward, these statements will directly inform the spatial typologies, shaping the actions relevant in future learning environments, followed by spatial interpretation of these actions.

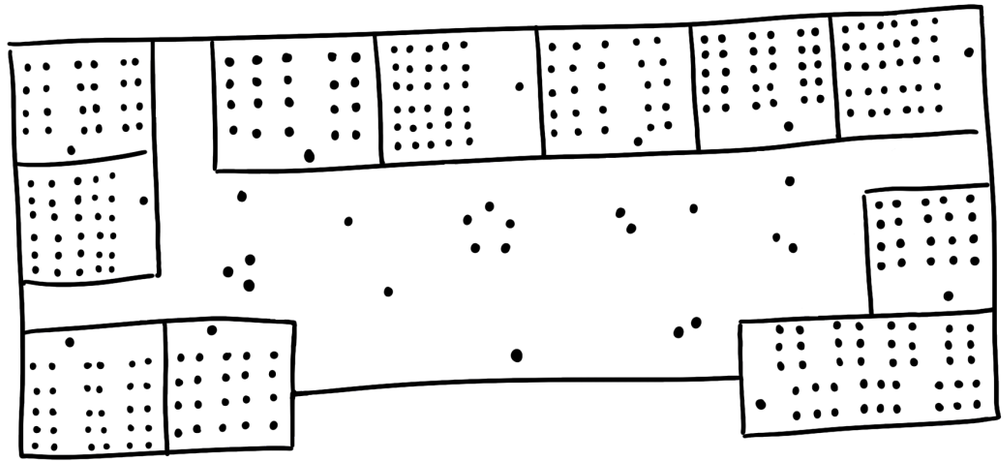
Theory:
Learning in 2035

There is no one-size-fits-all learning environment solution. Schools are shaped by their unique contexts, needs, and goals, making it impossible to create a universal design that suits every action. For this reason, the ViP process is not caried out till the product level. The outcome of this phase is not a product but a set of typologies for designing learning environments in 2035. To use the typologies as guidelines, designers are required to actively question what is relevant and meaningful for the specific learning environment they are working on.

How you could see these typologies incorporated in a school compared to the current image, you see in figure 21. With the typologies designers can think beyond the rigid class room structure of schools and look at the school environment as a space that can be divided in infinite ways. There is overlap, size difference, diversity, flexibility. It is a new perspective in which to look at a learning environment.

These guidelines aim to provide a vision for what future learning environments could be, offering direction and inspiration while leaving the design process itself in the hands of designers.

This chapter discusses the guidelines that consist of 12 typologies that each have 5 or 6 archetypes in which the typologies are relevant. The archetypes are then dissected into product- and interaction qualities.



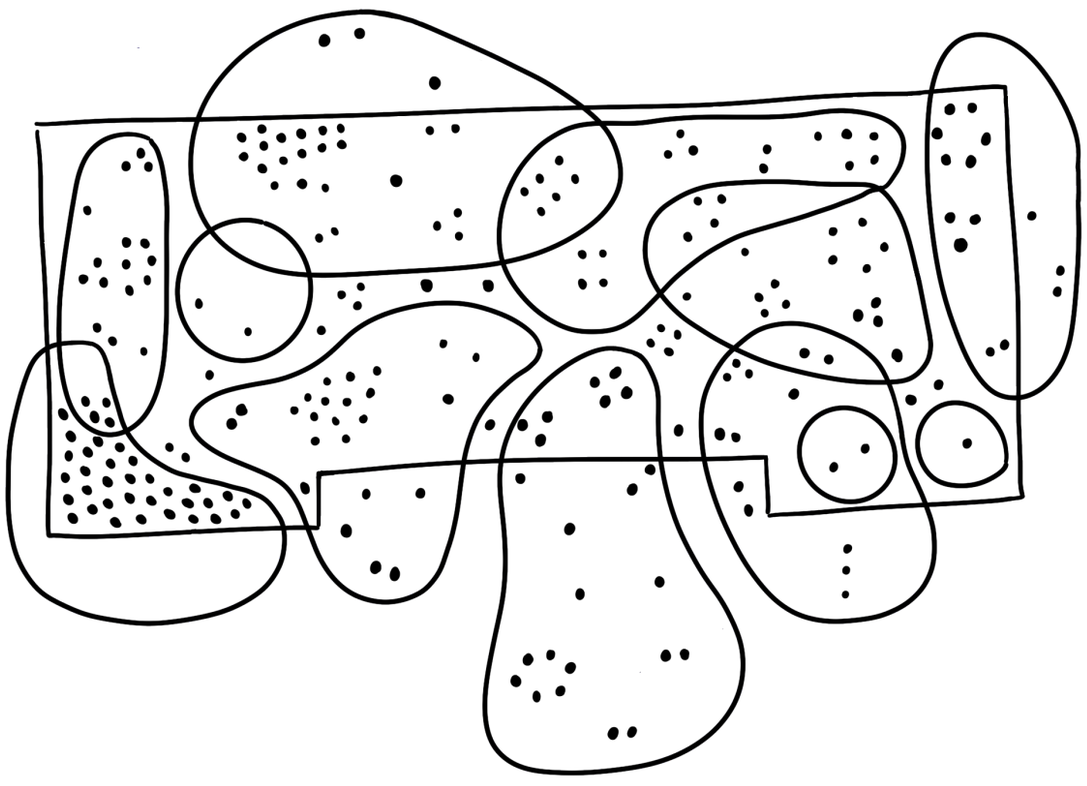


Figure 21: highlighting possibilities in layout in schools

Typologies

Each typology reflects an action that was extracted from the future statements. I chose these 12 actions by questioning how an interaction results in this statement. Each one captures an aspect of how people learn, interact, and engage in an educational setting. The essence of the action is captured in a visualisation shown in the framework in Figure 22. An explanation per action in the form of what type of space is needed to facilitate this action is shown in Figure 23 on the following pages.

While it could be tempting to simplify the actions into a smaller set of broad categories, by combining them, doing so would sacrifice the richness and depth of the framework. The decision to preserve all 12 actions in the framework stems from their ability to capture the complexity and diversity of educational needs. The 12 typologies reflect subtle but important distinctions that highlight different interactions and goals for learning spaces, and reducing them would risk losing these valuable nuances. This does however, bring the challenge of getting lost in the nuance. The typologies are not prescriptive blueprints but rather tools for exploration. Designers are encouraged to consider how these typologies overlap, interact, and evolve within the context of a specific school or educational environment. In some cases, multiple typologies might coexist within a single space, while in others, a typology might inspire a standalone design feature or area.

For more details about the process behind selecting these typologies and the actions considered during their development, refer to Appendix [E].

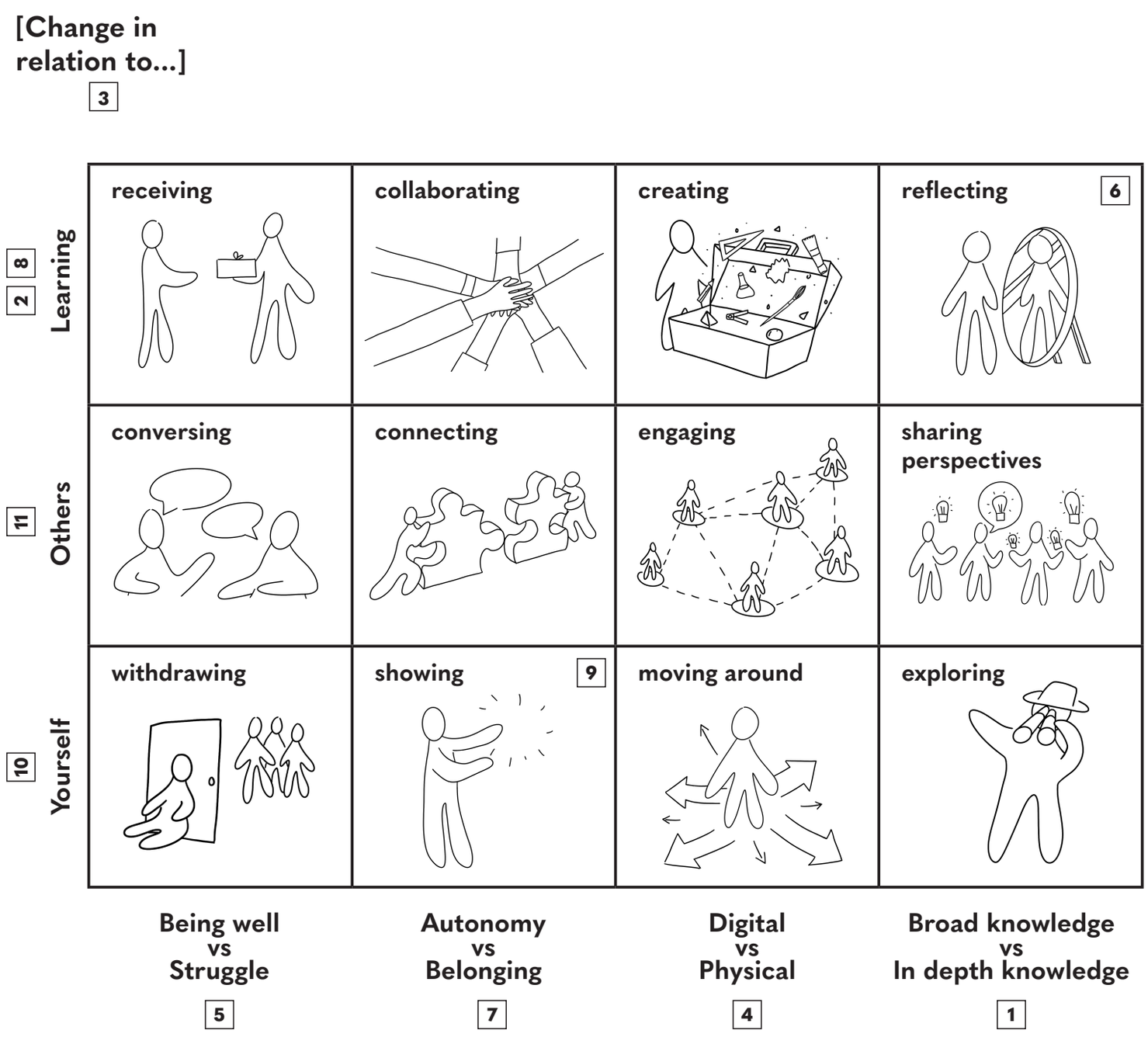


Figure 22: typology actions and visualisation

receiving

Spaces where students can take a step back to absorb information passively. Teachers and other experts can share relevant knowledge.

conversing

Spaces where personal conversations can be held to discuss how people are doing and what occupies their mind.

withdrawing

Spaces where people can spend some personal time to relax and re-energise when needed. Every student has its own battery that thrives in different moments and needs charging at their own schedule.

collaborating

Spaces where it is necessary to work together to fulfil a mutual goal. Students can take on different roles and find their strengths and weaknesses in group dynamics.

connecting

Spaces where people can connect with new people to learn to empathise with different people or to find people alike. Also, facilitating connection on a deeper level with people they already know, challenging to open up.

showing

Spaces where people can share what they have been working on or thinking about. It is motivating and fun for people to feel seen and get positive reassurance.

creating

Spaces for students to experiment with things like mechanisms, materials. Creating tangible objects gives perspective and trying out things helps grasp theoretical issues.

engaging

Spaces that are dedicated to have various interactions with different people. Having encounters and informal interactions.

moving around

Spaces that stimulate to stand up and move is proven to be beneficial for learning, mental- and physical well-being and (re)gaining focus.

reflecting

Spaces that set the right environment to question work that has been done to understand experiences, identify patterns, causes, and consequences.

sharing perspectives

Spaces where people can gather perspectives other than their own. In this way people can learn about topics they weren't familiar with or create more depth in topics of interest.

exploring

Spaces where people can find things that inspire and motivate them. Finding something that you are not looking for can give someone a spark.

Figure 23: typology descriptions

Archetypes

To make the typologies more relatable and show that they can be approached in many ways, they are connected to archetypes. The real life examples that those archetypes represent are recognisable spaces and objects that people are familiar with and have personal experiences and associations with. Four actions were selected to put focus on of which every action has multiple archetypes. For every archetype the action is relevant in a different way.

The development of archetypes involved collaborative sessions with students and designers. Participants brainstormed a wide range of potential archetypes for each action, to cover diverse perspectives on the actions. I made a selection of archetypes, prioritising capturing a broad spectrum of possibilities. and interesting overlap between actions.

When selecting the archetypes, I made assumptions about their atmosphere and interactions. To validate whether other people's associations with the archetype were in line with the expectations, association tests were executed with four participants. The feedback led to refinements in the wording and the selection of the archetypes, to ensure that they resonated with a broader audience. Find more information about these tests in appendix [H]. The final set of archetypes, along with the spread of archetypes on the actions, is shown in Figures 24 and 25.

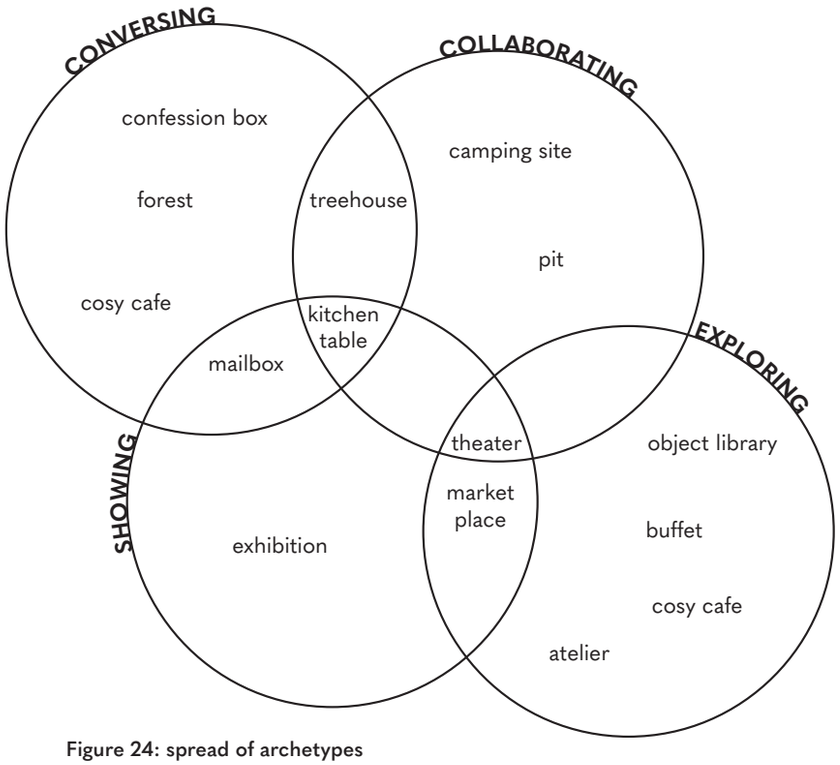


Figure 24: spread of archetypes

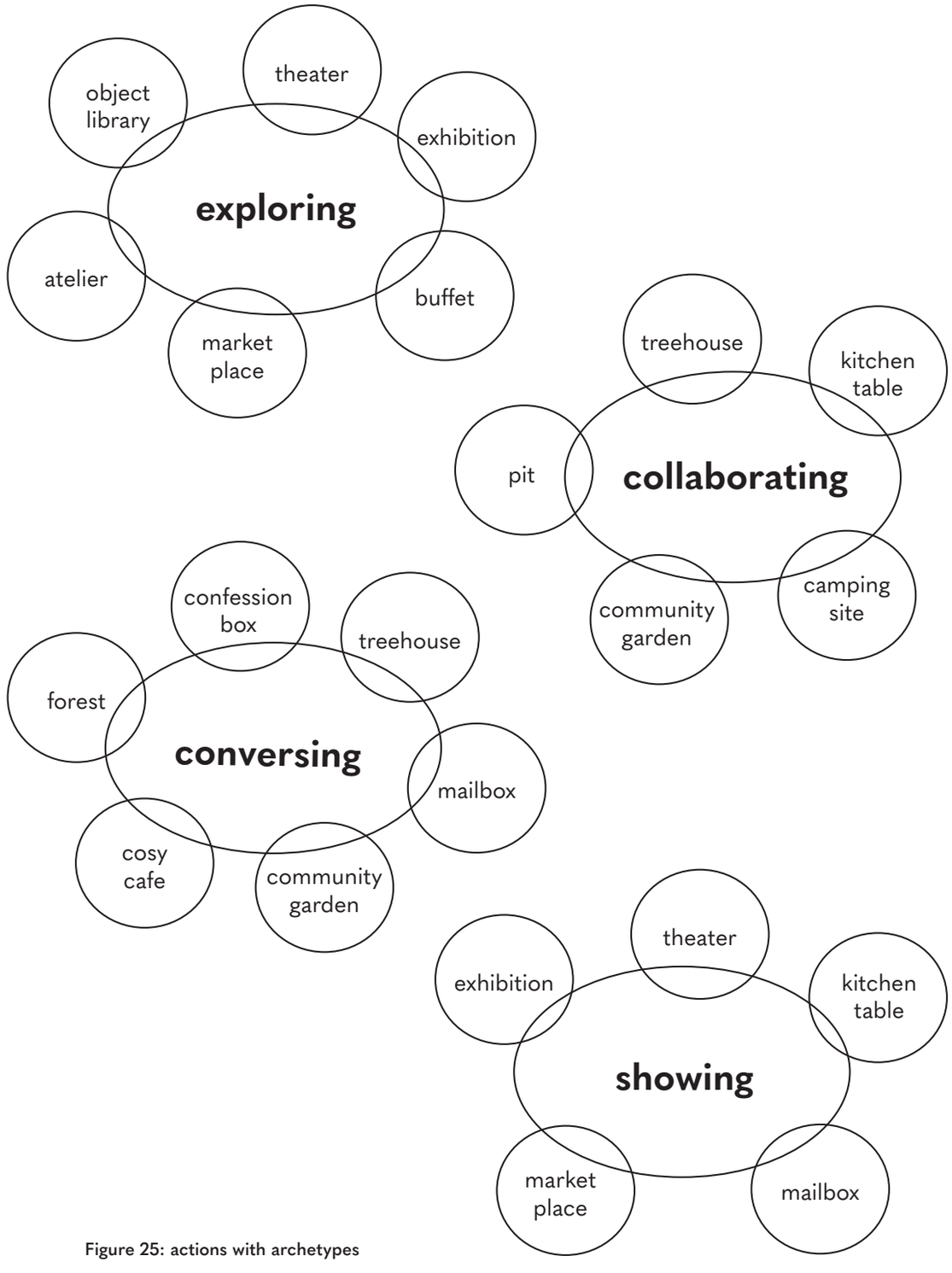


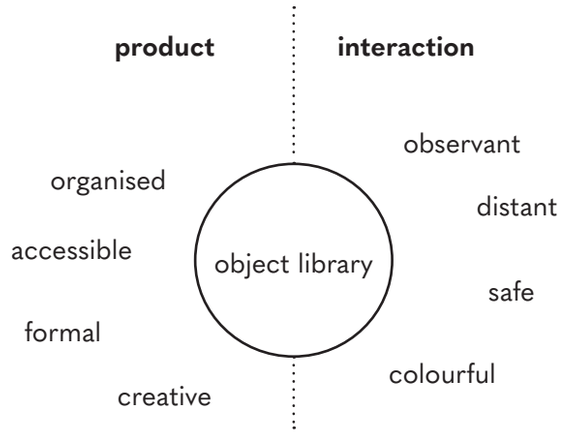
Figure 25: actions with archetypes

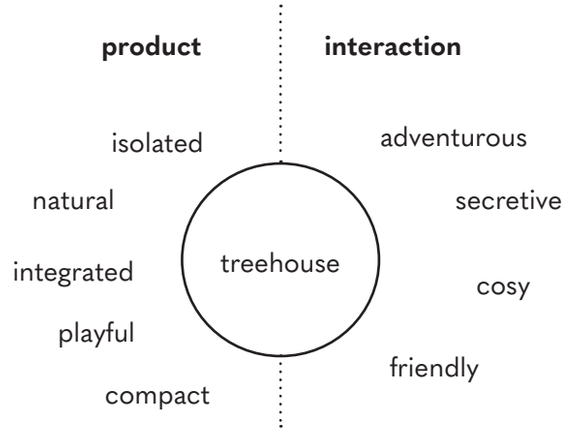
Qualities

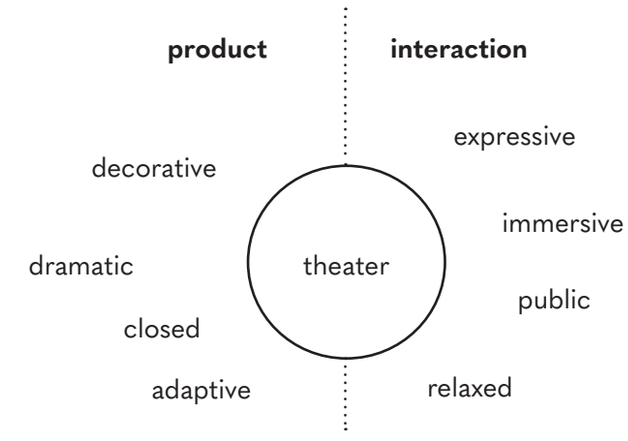
Each archetype was further broken down into qualities. Qualities are the key attributes that define the archetype's essence. These qualities connect the abstract typologies to design elements, helping designers dissect the archetype, taking a step back from the literal space. The qualities are subdivided in product qualities and interaction qualities. The product qualities define how something looks, feels, or functions and the interaction qualities focus on the way users engage with people, a space or object.

To find the suitable qualities, a test with four people was conducted. For every archetype, they selected eight qualities out of a list of 58 that matched their perception of the archetype. These selections were then analysed for patterns and grouped to identify common themes. These recurring qualities became the foundation for each archetype. See Appendix [I] for more depth about the tests.

In addition to these qualities, I chose qualities to highlight specific aspects of the archetypes. Whether people resonated with the selection of archetypes and qualities was confirmed during final validation, see Appendix [P,Q,R]. The complete overview of all qualities for every archetype can be found in Appendix [K]. As a preview, in Figure 26, four archetypes are shown with their qualities.







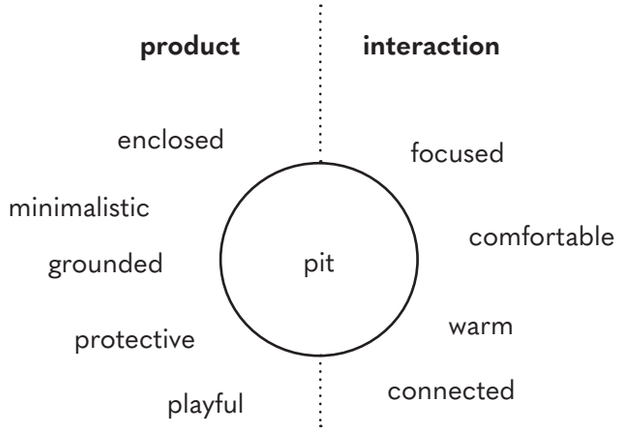
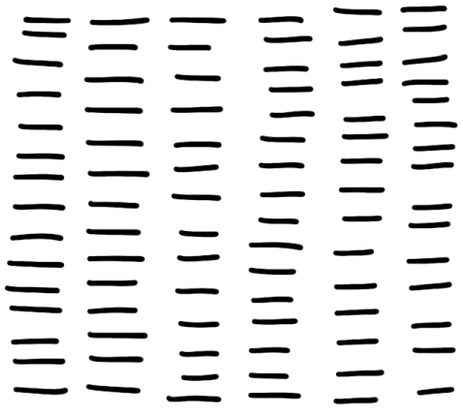


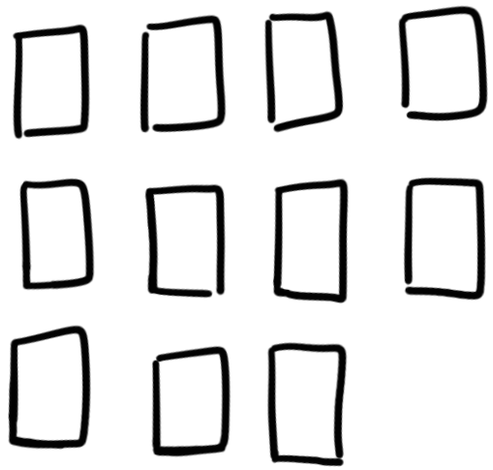
Figure 26: archetypes with qualities



collecting
context factors

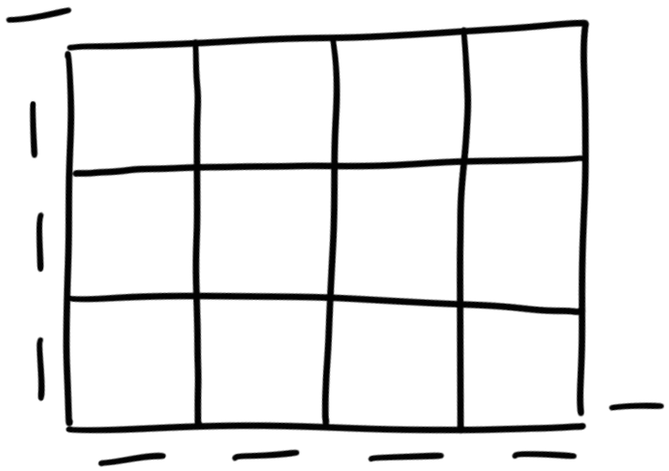
finding relations
and storylines

clusters



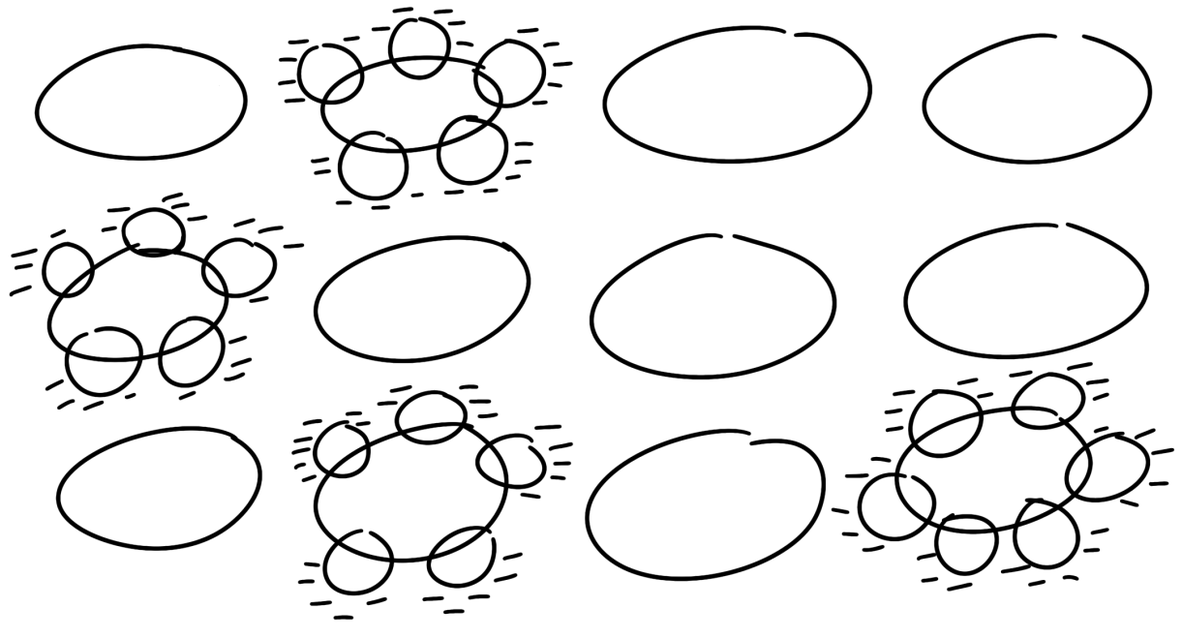
linking clusters
looking for connections
trial and error

framework



extracting typologies,
archetypes and
qualities

typologies, archetypes and qualities



Conclusion (Figure 27)
Starting with field research and literature research, 158 context factors were collected. These context factors were then placed side by side to find the relations, through which the context factors were gathered in 11 clusters. By looking for connections between the clusters in a trial and error proces, a 3x4 framework was created. In this framework statements about the desired future directly evolved into key actions, also known as the 12 typologies, relevant for future learning environments in 2035. Each action accommodates diverse user preferences, represented spatial archetypes. These archetypes are further broken down into product and interaction qualities.

Figure 27: process of Part I

PART II

Beyond exploring the theoretical foundations of learning environments in secondary schools, this part of the project focuses on translating these insights into a practical tool for school design projects. A key aspect of this part is understanding Triomf's approach to design and their core values. To determine the desired interaction between the product and the designers an interaction vision is created. This formed the base for brainstorming ideas, after which the idea for the tool emerged.

The designers of Triomf Design are initially the ones to use the tool. Their way of working and identity features are taken under the loupe, to ensure that the tool fits into their design process. By spending time at their office and organising two collaborative meetings, insights were gained to map their ways.

Besides schools, Triomf's portfolio currently consists of designs of various types of spaces. For example, offices, museums and cultural buildings for events. To get a sense of their style and portfolio, an insight into their website where they present their projects is shown in Figure 28.

The design team at Triomf Design shows a dynamic, creativity-first approach that extents every phase from idea to final production. They rely mostly on SketchUp for 3D visualisation, diving straight into modelling as a way of experimenting and shaping concepts. For more detailed presentations, the team uses Twinmotion, creating realistic renderings that capture the full effect of their ideas. Inspiration often comes from Pinterest and a collaborative, hands-on method, with focus on originality, where they prioritise crafting their own unique designs rather than relying on pre-existing furniture or setups.

In this chapter, the process of a design project at Triomf will be captured in a project journey. Secondly, I extracted four core values of Triomf's work.


Amare – cultuurgebouw


Stadsklooster – cultuurgebouw

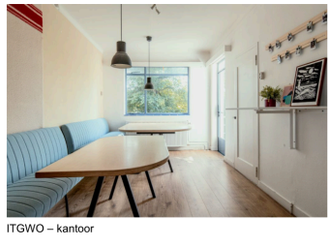


Greener – circulair kantoor


MPOWER – middelbare school


De WarmteTransitieMakers – kantoor


Oogst – de nieuwe boerenwinkel


ITGWO – kantoor


TivoliVredenburg Omloop – cultuurgebouw


RadarVertige – praktijkleerstraat


RadarVertige – opleidingslocatie


RadarVertige – kantoor


De Noordwester – museum


IFFR x De Doelen – concert & congresgebouw



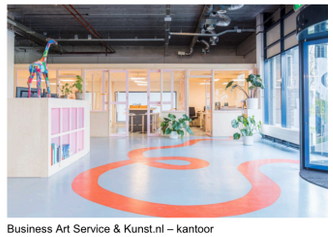
Noordertuin – tuincafe



Steck – winkel voor stadsvergroening



TivoliVredenburg Centrale Hal – cultuurgebouw


Business Art Service & Kunst.nl – kantoor



SPAR mini – eenpersoons supermarkt

Figure 28: projects done by Triomf Design

Project journey

A project at Triomf differs from project to project, but can be mapped into a global project journey, as seen in figure 29. The process generally unfolds in three key phases: preparation, designing, and production. Triomf is committed to an entirely in-house process, managing everything from idea generation to construction. This hands-on approach gives them great control over material selection and the fine details of production, allowing them to bring their designs to life precisely as envisioned.

The process begins with a preparation phase, where Triomf collaborates with the client to discuss possibilities and expectations. Once the project agreement is finalised, the project starts during one of their weekly catchups on Monday, where they review project progress and align on upcoming tasks. Additional project-specific meetings may be scheduled when needed, but feedback is often exchanged organically throughout the week, as team members share quick updates behind their laptops.

In the designing phase, the team adopts an intuitive and experimental approach, testing ideas directly in SketchUp. During client presentations they show their designs after which adjustments are made. Budget and feasibility are considered throughout the entire design process, but they typically take on greater importance following the initial design presentation, becoming a central focus of discussions and decision-making.

Finally, the production phase focuses on the technical details, adjusting designs when needed to ensure precision and practicality.

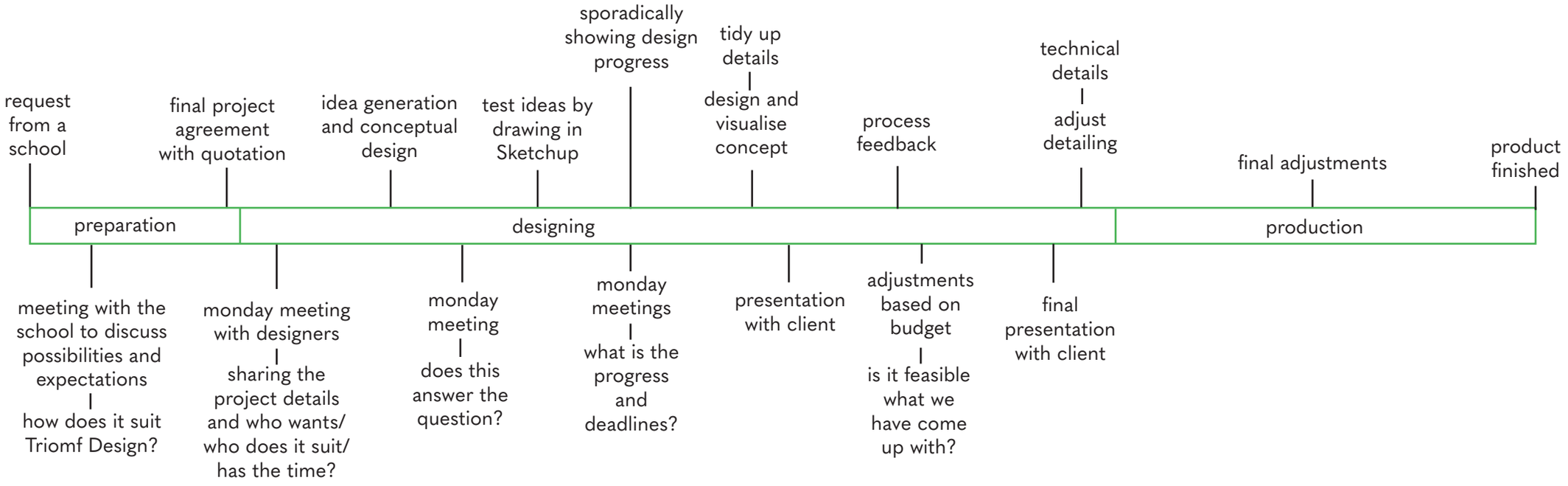


Figure 29: project journey at Triomf Design

Values

In the outcomes of Triomf's projects but also in the way the team works together, I extracted four values that they reflect: dynamic, unique, creative and intuitive. See Figure 30.

Triomf thrives on a dynamic approach, embracing flexibility and adaptability to tackle challenges. An intuitive mindset is central to their workflow, the team often jumps directly into experimentation, allowing room for creativity to shape each design element. With their focus on creativity they ensure every project is fresh, imaginative, and distinct. Their designs aim to break away from conventions, creating environments and products that stand out while meeting functional and aesthetic goals.

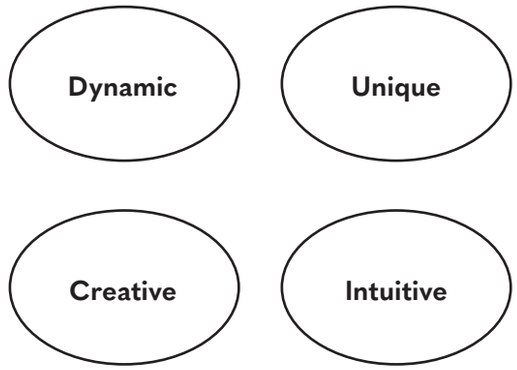


Figure 30: triomf 's values

Interaction vision

An interaction vision establishes the desired qualities of the interaction between the user and a product, system, or space (Pasman et al., 2011). It focuses on the moods, feelings, or experiences that these interactions should evoke, helping designers craft products that resonate with their users. Unlike approaches that emphasise product properties (such as materials or features) or user characteristics (like physical or cognitive abilities), an interaction vision centers on the relationship between the two (Pasman et al., 2011).

In my project, the interaction vision provides how users, designers in this case, should interact with the tool. Translating the typologies into actual design solutions is not neccessarily straightforward. To give designers actionable tools rather than abstract actions, it was crucial to articulate the relationship between the user and the product (or space). Using an interaction vision helps bridge this gap. The interaction vision for this project started with identifying an analogy unrelated to the design context that captured the desired qualities of interaction.

The analogy is in the form of a picture, see Figure 31. The image shows a random bunch of Lego blocks with several people with their hands grabbing the pieces. I used my imagination to envision what is happening: these kids are making a creation of some sort with the gathered Lego blocks, looking for pieces that fit their vision or inspire them to go in a certain direction. All of them creating something unique or creating something together.



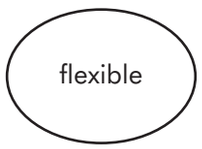
Figure 31: interaction vision analogy
From Children playing with Lego [Photograph], by Lego

This analogy is a broad image that is interpretable in multiple ways. To refine my interpretation and clarify how it influences the design of the tool, I identified six specific interaction qualities. These qualities, listed and explained in Figure 32, provide direction for the design process, translating the abstract analogy into actionable insights.

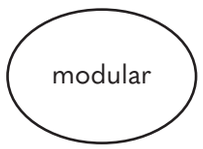
Each of these qualities a part of shaping the interaction between the tool and its users. They ensure that the tool aligns with the intended experience. This focus on interaction qualities bridges the gap between the conceptual vision and the tangible design, ensuring the final product resonates with its users while addressing their needs.



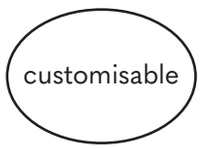
The interaction qualities guided the ideation phase, serving as both a source of inspiration and a set of criteria for designing the tool. They sparked creative ideas while ensuring that the design aligned with the envisioned interaction. The outcomes of the ideation phase are in Appendix [L].



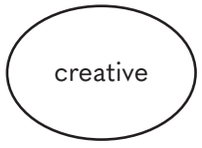
It can be used in any way the participants like and they can make whatever they like. Use as many or little pieces as wanted, follow a structured path or go with the flow.



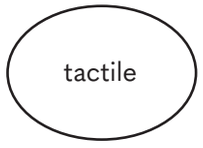
Components of the interaction are easily interchangeable or rearrangeable, much like LEGO bricks.



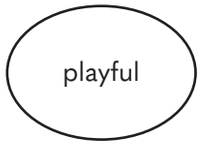
The end result can vary greatly based on the choices and creativity of the participants.



Open-ended creativity, where participants can build and design without strict limitations.



There's a hands-on, engaging aspect to the process that encourages exploration and experimentation.



The interaction is inherently enjoyable, fostering a sense of play rather than stress. Colorful and variety of shapes and options

Figure 32: interaction qualities

Design Tool: Learning in 2035

The tool creates a hands-on interaction with the user and serves as a base for discussion and ideation.

Translating the theoretical solution for the physical learning environment in 2035 to a tangible tool for designers was a deliberate and intuitive process. Due to the extensive research and framework creation in part I together with the interaction vision, brainstorming sessions quickly revealed the most fitting solution: a card set. For a deeper look into the brainstorming process, refer to Appendix [L]. A card set aligns with the framework and interaction vision, offering a practical and engaging way to apply the 12 actions and archetypes to the design of learning environments.

The card set was chosen because it creates a hands-on interaction with the user and serves as a base for discussion and ideation. It emphasises that each action can be facilitated in a variety of ways.

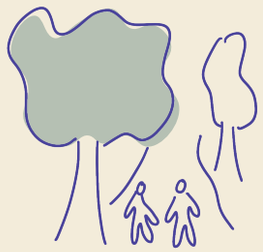
The cards are designed to support collaboration, sparking conversations and inspiring new ideas. They convey the right amount of information to be useful in the design process without limiting interpretation. By interacting with the cards, users are encouraged to experiment, discuss, and think critically about the spaces they are creating.

In this chapter, the card set design is shown first. Then, the design choices will be discussed, including the layout, shape, visualisation, qualities and intended use. Each decision was made to ensure the tool is both practical and inspiring for designers and other stakeholders involved in shaping educational environments.



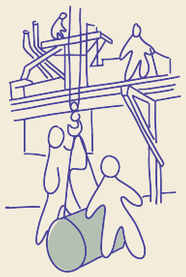
The front of the cards

FOREST



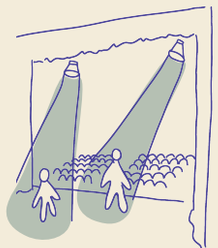
reloading · moving around · conversing

CONSTRUCTION SITE



creating · collaborating · sharing perspectives

THEATRE



collaborating · showing · receiving · exploring

COSY CAFE



moving around · reflecting · conversing

PIT



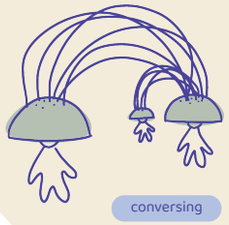
collaborating · connecting

COMMUNITY GARDEN



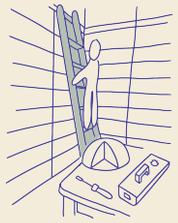
creating · collaborating · conversing

CONFESSION BOX



conversing · connecting

OBJECT LIBRARY



creating · exploring · moving around

MARKET PLACE



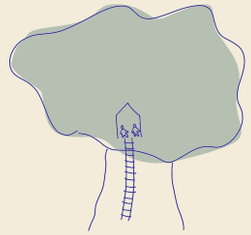
moving around · exploring · showing · engaging

CAMPING SITE



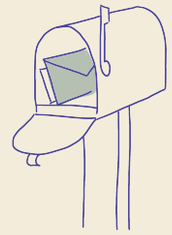
collaborating · engaging · moving around

TREEHOUSE



conversing · collaborating · reloading

MAILBOX



receiving · showing · conversing

MARKET PLACE



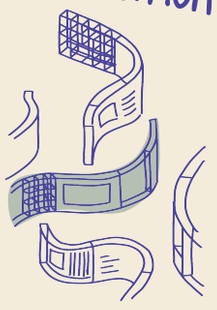
moving around · engaging · exploring · showing

BUFFET



engaging · moving around · exploring · sharing perspectives

EXHIBITION



exploring · moving around · showing

ATELIER



connecting · creating · sharing perspectives · exploring

COMMUNITY GARDEN



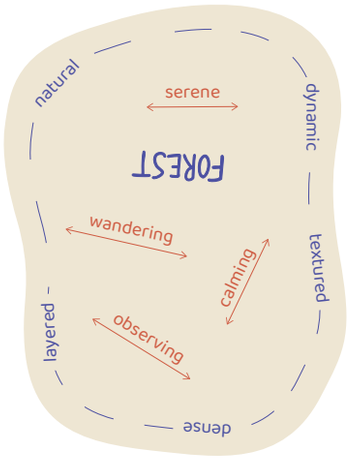
creating · conversing · collaborating

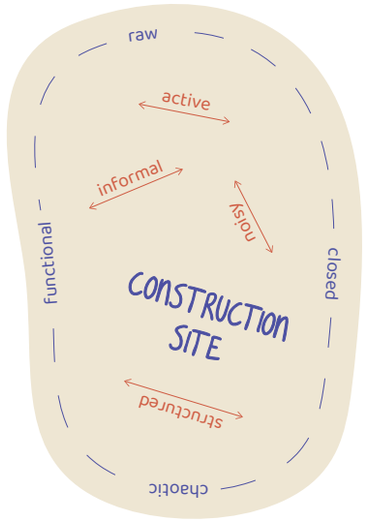
KITCHEN TABLE

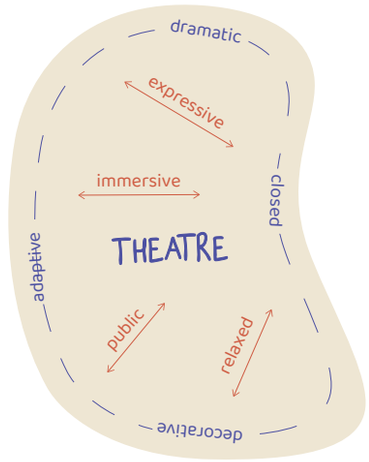


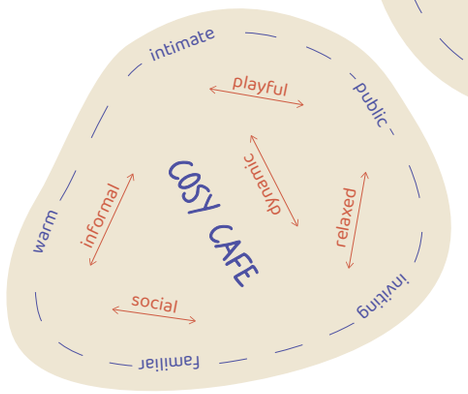
connecting · reflecting · conversing · collaborating · showing

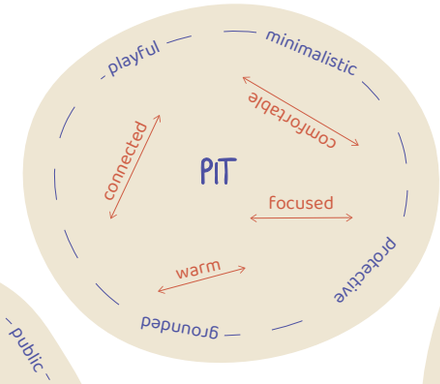
The back of the cards

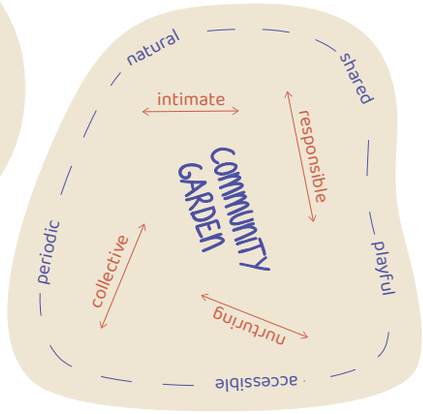


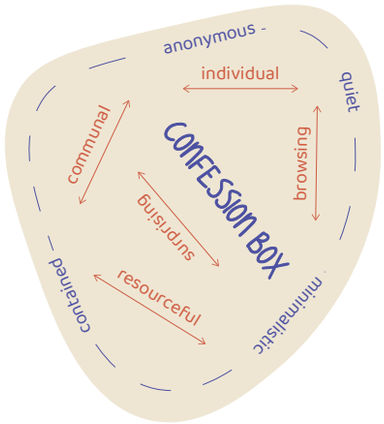


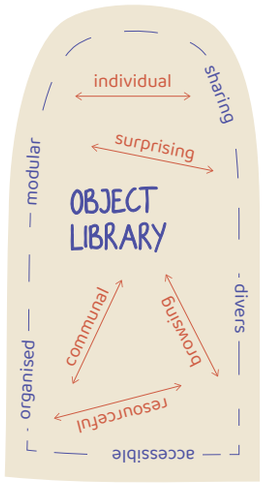




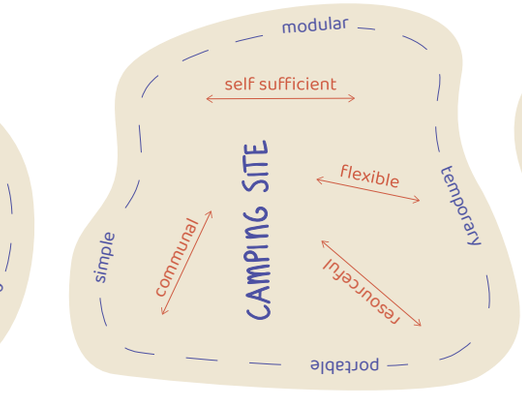


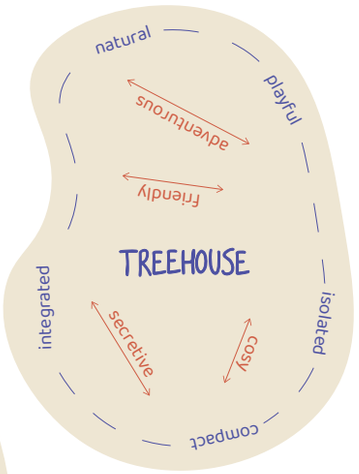


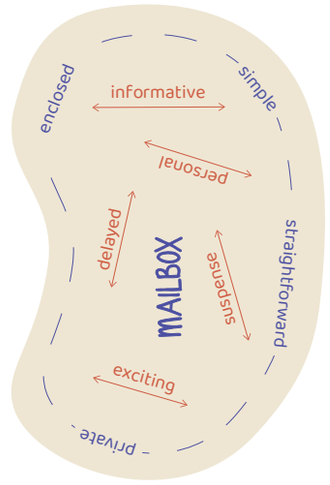




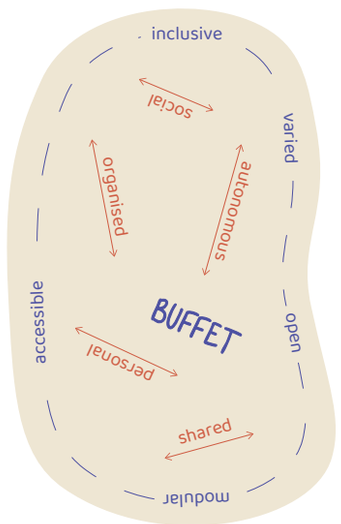


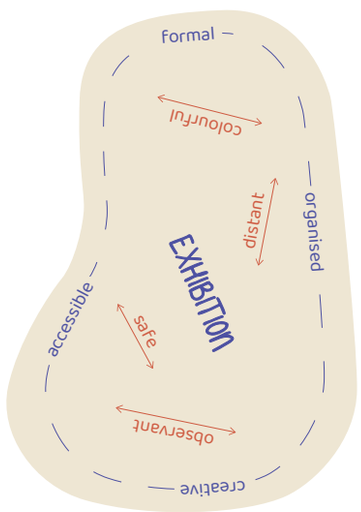


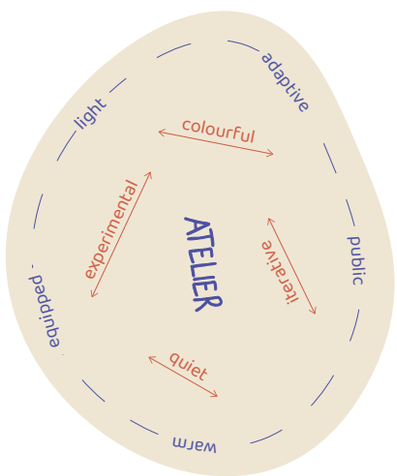




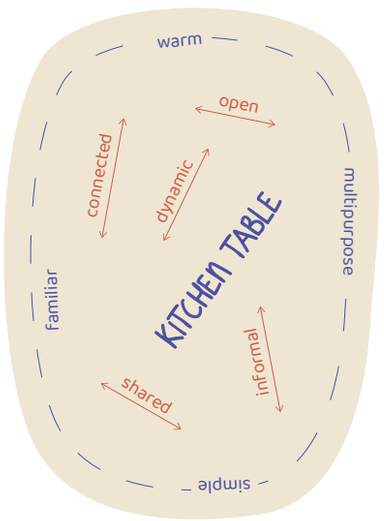












Layout

The front of the cards includes three key elements: the archetype title, a visualisation, and action labels that relate to the archetype, see Figure 33. These elements were determined to be the most critical information for users to see at first glance, based on initial testing and feedback. (see appendix [O]).

Each card combines a visual with a title, allowing users to draw inspiration through multiple channels. The actions are colour-coded, enabling users to group cards with the same labels, making it easier to create an overview and quickly recognise specific actions when needed. Early testing with designers highlighted the effectiveness and convenience of these colour-coded labels.

On the back of the cards, the product and interaction qualities are displayed. Arrows represent interactions, while the outlined shape indicates the spatial element (the product). The qualities are arranged in varying directions for several reasons:

1. It encourages users to focus on each quality individually.
2. It allows group members to view and interpret the qualities from different perspectives.
3. It prompts physical interaction with the card, encouraging engagement and exploration.

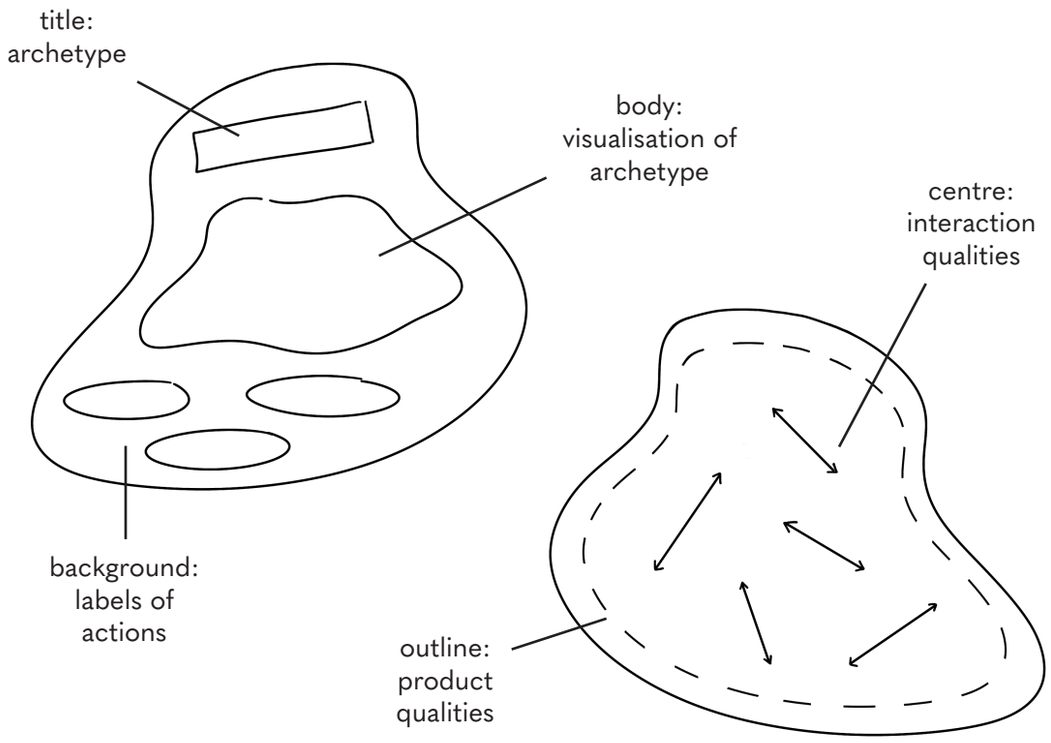


Figure 33: elements in layout

Shape

To encourage playful exploration, each card has a unique, organic shape, breaking away from the standard card deck structure. The imperfect fit of the shapes reflects the framework's open-ended nature, emphasising that there's no single "right" solution. This design invites users to interact physically with the cards, experimenting with arrangements and combinations to spark creativity.

The unique shapes also serve a practical purpose. With so many cards, the distinct shapes help users associate each card with its archetype, making it easier for them to be identified beyond just their titles or content. This makes locating specific cards simpler and more intuitive.

The cards foster collaboration by inviting users to engage in discussions about how archetypes connect and can be interpreted. Their playful design naturally sparks conversation and encourages deeper exploration of the framework. The varied shapes represent the diversity and complexity of the archetypes, making the cards visually engaging and intriguing.

Each card contains key information, including the archetype title, a visual representation, action labels, and qualities. To ensure readability and usability, the cards are designed to fit within 120x100mm dimensions.

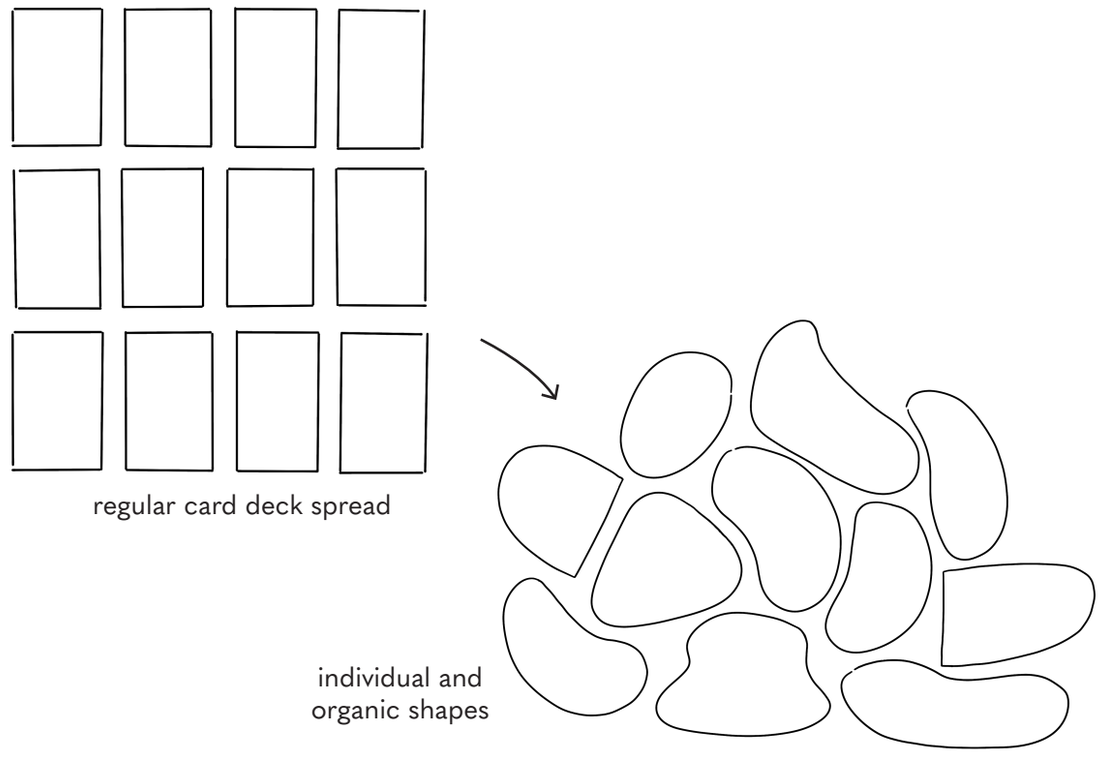


Figure 34: regular card deck to individual and organic shapes

Visualisation

The visualisations communicate the archetypes while remaining open to interpretation. They were designed with specific criteria in mind to effectively communicate the archetypes while remaining open to interpretation. I formulated the criteria through an initial visualisation, presented to the designers at Triomf as a first prototype (see Appendix [N,O]). This was followed by a discussion exploring alternative visual styles, which informed further refinements. The full exploration of the visual development process can be found in Appendix [M].

The criteria include:
• Being simple and non-insinuating, leaving room for imagination.
• Translating the key qualities of each archetype into visual form.
• Maintaining readability and accessibility for both designers and stakeholders, such as school boards, teachers and students.

To achieve these goals, the visualisations were created in a drawing style with limited use of color and minimal details for people. This approach ensures the focus remains on the elements and interactions occurring in the archetype, rather than on distracting specifics like object shapes or colors. The aim is to allow users to engage with the essence of the archetype without being stuck on minor details.

Each visualisation strikes a balance between providing enough direction to guide interpretation and leaving space for imagination. Some visualisations take a top-down perspective, while others offer a more immersive view of the scene. For some archetypes two visualisations are made, with both perspectives. This variety reflects the different ways archetypes can be interpreted and applied. See Figure 35.

The density of each visualisation correlates with the nature of the archetype it represents. For example, archetypes like ‘market place’ appear more “crowded,” than for example ‘forest’.

By visualising archetypes with these principles in mind, the focus remains on conveying their qualities and interactions in a way that inspires creativity without locking the user into a fixed concept.

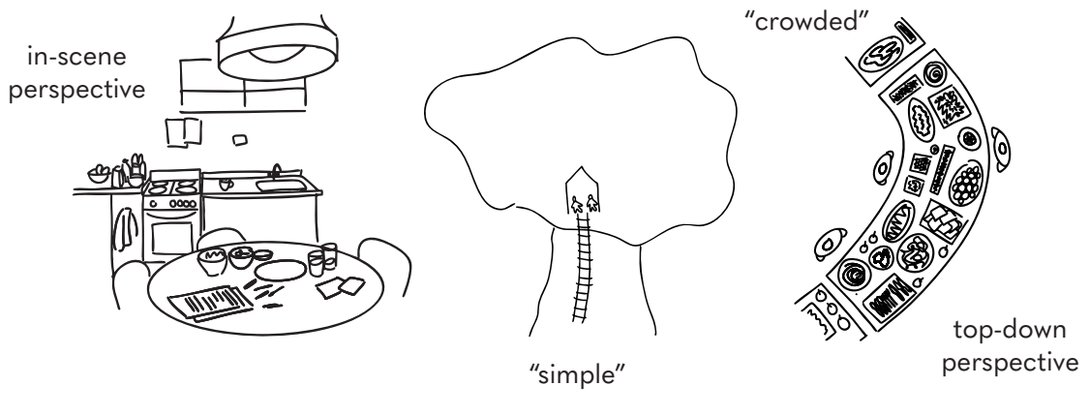


Figure 35: examples of different perspectives and ensity of visualisation

Qualities

The qualities encourage users to explore the archetypes on a deeper, more abstract level. While the archetypes themselves offer inspiration, the qualities help users step back and reflect on the essence of the archetype. By doing so, the qualities can spark creative directions and help dissect the archetypes for designing spaces that align with the design goals.

One of the key reasons for including qualities is to prevent users from directly replicating the archetypes into a space. When tempted to simply recreate what they see, the qualities provide an opportunity to think beyond the literal representation and instead focus on the atmosphere and intentions that the archetype represents. This shift in perspective encourages a more intentional and thoughtful design process.

The distinction between product qualities and interaction qualities further enhances this reflective process. Product qualities focus on the tangible aspects of the space, such as its physical features or layout, while interaction qualities emphasise the intangible, how people engage with the space and with one another. This dual perspective helps users ask critical design questions, such as: What is the interaction I want to facilitate in this space? How does the physical environment support and shape that interaction?

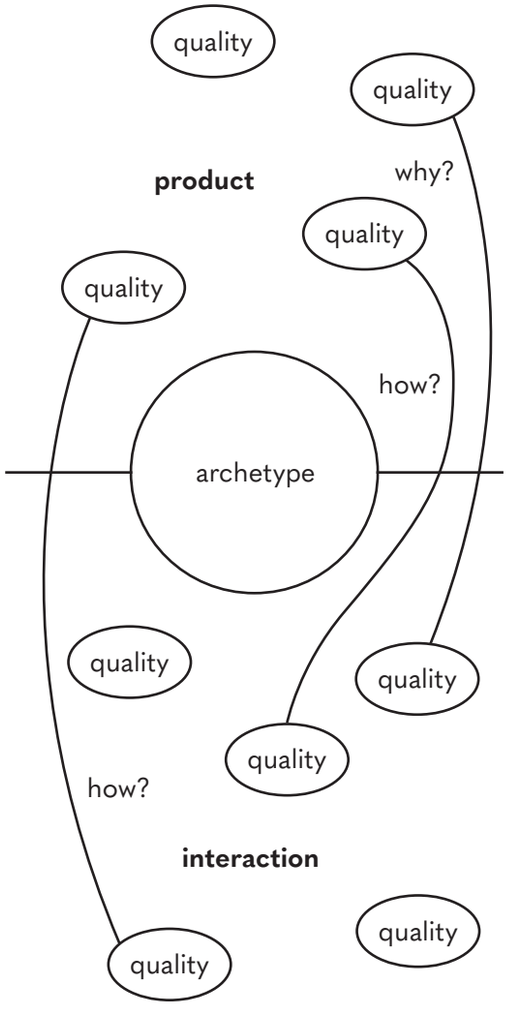


Figure 36: qualities and possible relations

Intended use

While the flexibility of the card set allows users to adapt it to their own preferred way of using it, a proposed method of use is provided to guide its integration into the design process. The cards are intended to support and inspire designers during three key moments in the process, as illustrated in Figure 37.

At each moment, vision, idea and check, the card set serves as a collaborative tool and to stimulate discussion and reflection. Ideally, all the cards are laid out on a table to create a shared workspace where ideas can flow freely. Users are encouraged to physically interact with the cards, moving them around, grouping or connecting cards based on relevance, or even removing cards they find less applicable or unhelpful. This tactile engagement fosters a sense of exploration and experimentation.

Turning the cards around offers another layer of insight, encouraging users to view the archetypes from a fresh perspective or discover new connections.

The process is intentionally open-ended, allowing designers to tailor their approach to their specific goals and team dynamics. Ultimately, the card set is designed to bring structure to the creative process while maintaining the flexibility and freedom necessary for innovative thinking.

1
vision tool

In conversation with the client. As a tool to help present ideas and visions, or to create a vision together. The cards are helpful to express expectations and opinions.

2
idea tool

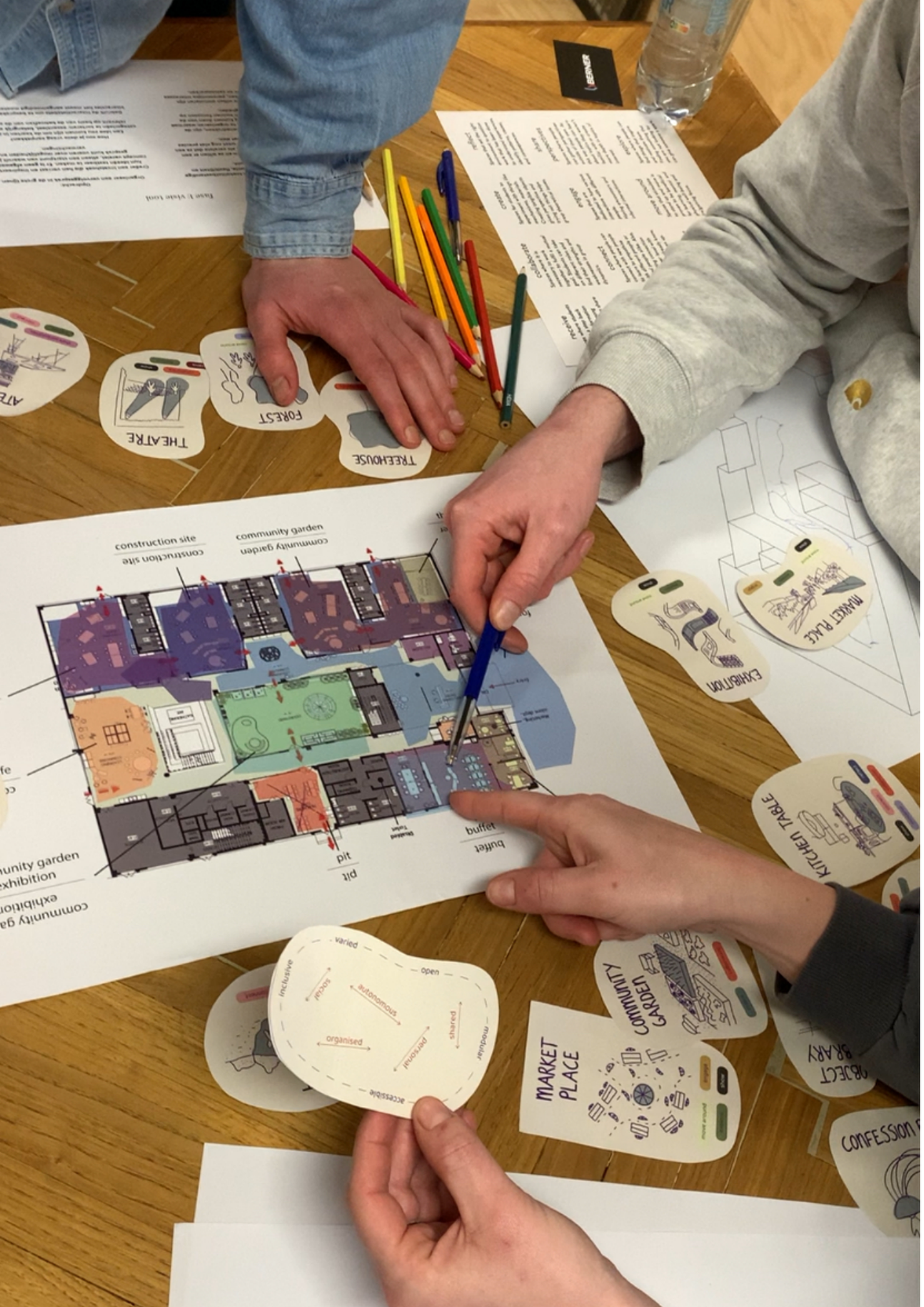
At the start of the design process, when there is a new job. The designer(s) can gather the cards to find inspiration and ideas that suit the assignment.

3
check tool

When a concept is designed and the project is finalising, the tool can be used to validate whether the design is divers and suitable to the request.

Figure 37: interaction qualities





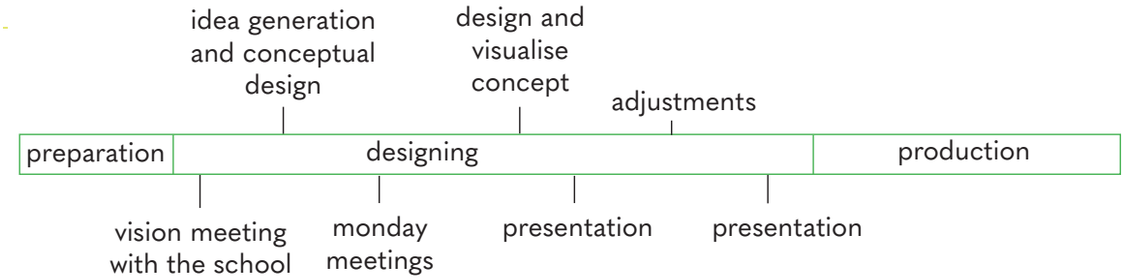


Figure 38: product placed in project journey

The card set fits in the project journey at Triomf, as shown in Figure 38, deployable at several stages of the design process. During the preparation phase, the cards can help spark initial discussions, encouraging the team to explore diverse possibilities and align on shared goals for the project. They can be part of conversations with the client to put a vision into words. In the designing phase, the card set becomes a collaborative tool for ideation and reflection, enabling the team to come up with ideas and to refine their concepts and ensure their designs address the unique needs of the project. Once there is an initial concept the cards can serve as a checkpoint, to confirm that the final output aligns with the intended vision.

Container





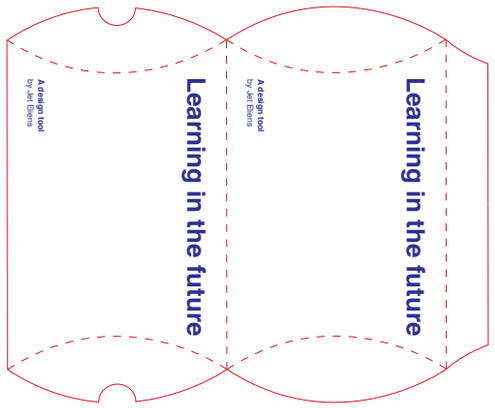


Figure 39: packaging

The packaging, or container of the card set, is the first thing users see. Its goal is to enhance the experience of using the card set, facilitating that initial step of the interaction vision that starts when laying out a pile of Lego blocks in front of you. Additionally, the packaging should capture the user's interest, making them want to open it and see what's inside.

Some practical aspects to consider include protecting the cards, using sustainable materials, and ensuring the container is easy to carry.

To spark curiosity, the container has a shape different from a standard square box, yet remains familiar and intuitive to open. In a test on how people would retrieve the cards, all five participants opened the container from one side and shook the cards onto the table. Four of them peeked inside before doing so, which aligns with the intended interaction and fosters curiosity. The red lines are symbolic for the theoretical guidelines on which this tool is built.

The container is compact enough to fit into most bags. Made from 300g paper, it provides protection for the cards while allowing for efficient production, through the ability to stans it out of paper. Figure 39 shows the flat shape of the container and when it is folded.

Validation

The validation process of this project consists of two key phases:
Validation of part I – assessing the relevance and applicability of the proposed typologies and archetypes.
Validation of part II – assessing the tool's usability and performance.

Part I
Part I of the project was tested with both teachers and students to ensure that the proposed framework aligns with real-world learning environments in secondary education. For full description of tasks and questions, see appendix [Q,R]. The validation focused on two main aspects:

1. Relevance of typologies
Are the 12 identified actions comprehensive and reflective of the activities and interactions that teachers and students consider essential for learning in secondary schools?
2. Alignment of archetypes
Do the proposed archetypes for spaces and objects effectively support these actions in a way that is both tangible and practical?

To evaluate these aspects, different testing approaches were used for teachers and students:
For teachers I organised a scenario-based test. Teachers were presented with three different learning day scenarios.
For each scenario, they were asked to consider how students would move through a learning space by choosing and arranging the archetypes. At the end of the test they were asked to fill in an evaluation form. This test was conducted twice, with four teachers total, in a collaborative setting.

For students I organised a situation-based test. Students were given realistic learning situations. For example, "you are doing a project and you have a fight with a group member. You are going to discuss this with a teacher to come up with a solution." They were asked to determine where they would prefer to be in those situations and to discuss their choices in relation to the available archetypes. These tests were conducted with three groups of five students, engaging in discussion and reflection on spatial preferences.

This validation process ensures that the proposed typologies and archetypes are not only theoretically sound but also resonate with the actual experiences and needs of teachers and students.

Results
Teachers rated all actions a 6 or 7 out of 7. The actions on one card were seen as a package deal, that all actions happened simultaneously, which caused some confusion. After explaining, this was resolved. The teachers had clear ideas of what kind of spaces the students could go in and how they could help them there. They fully dived into the future perspective and didn't raise practical questions. When asked if they deemed it feasible in 2035, there were skeptical at first and ended with that it is feasable, but there has to be action taken and this goes slowly. Overall, teachers consider the actions comprehensive and reflective of the activities and interactions for learning in secondary schools.

The students easily dissected the archetypes into their essence and atmosphere. Also, when asked to describe what a space needs for a specific situation, they had clear ideas about that. However, students did have different ideas of where





one would want to be in the proposed situations. They had strong opinions on what would work and what would not and discussed their preferences together.
For example when two students discussed where they would want to practice a conversation in German they said:
“I prefer to be open when I practice with someone.” - one student
“I don’t want anyone to hear my German.” - other student
All students responded positively to the archetypes, only three students mentioned in most spaces it looks crowded and they were missing more quiet spaces.

Part II
Part II of the validation process focusses on testing the effectiveness of the design tool with the designers at Triomf. The goal is to assess whether the cards function as intended across three key stages of the design process: creating a vision, ideating, and checking.

The test focussed on whether the cards effectively support the designers in:
1. Creating a vision: developing and articulating a design vision that can be discussed with the client.
2. Ideating: generating creative and relevant design concepts for the school environment.
3. Checking: assessing a final school design for diversity and suitability to ensure alignment with project goals.

To test the tool, a case study was created based on a hypothetical school design request. The case study guided the designers through the three phases. At the end of the test they were asked to fill in an evaluation form and I asked questions about their experience.

The test was conducted with four designers at Triomf, working collaboratively through the process. By simulating a real-world design scenario, this validation ensures that the tool is practical, intuitive, and beneficial for designers in educational projects. For full description of tasks and questions, see Appendix [P].

Results
The test provided valuable insights into the effectiveness of the design tool and its usability within the design process. Overall, the tool was well-received, with each designer engaging with it in their own way.

Flexible use of the cards
One of the most notable findings was that every designer approached the content differently. Sometimes they engaged with the cards in a straightforward, literal manner, while other moments they explored their deeper, more abstract meanings. They all constantly switched between the two, also occasionally reminding the others of looking at the cards from a different perspective. This flexibility suggests that the tool can accommodate a variety of working styles and creative approaches.

Integration into the design process
The three intended use types, creating a vision, ideating, and checking, aligned well with the designers’ workflow. Each step sparked curiosity and interest in experimenting with different ways of applying the tool beyond its original intent.

Challenges with the check tool
Among the three tools, the check tool received the lowest rating. This may be due to the nature of the test setup, designers were asked to evaluate a hypothetical concept they had not created themselves.

This suggests that the check tool might be more effective when applied to a project the designers are personally involved in.

Strength of the idea tool
The idea tool stood out as the most successful component. Designers found it highly effective in generating creative ideas quickly, leading to fun and unexpected concepts they might not have developed otherwise.

Perceptions of the vision tool
While the vision tool was useful, some designers saw its primary value in discussions with clients rather than in forming their own internal vision. This feedback highlights its potential role as a communication aid in the early stages of the design process.

Effectiveness of qualities on the back
The qualities listed on the back of the cards proved to be particularly useful in dissecting the archetypes. Designers appreciated the randomized placement, as it encouraged them to consider each quality individually. Following the validation, the title of the archetype was also added to the back to enhance clarity.

Conclusion
The validation of Part I confirmed that the proposed typologies and archetypes align well with real-world learning environments. Teachers found the actions comprehensive and relevant, engaging with the future learning scenarios. While initially skeptical about feasibility, they concluded that with the right steps, these ideas could be realised by 2035.

Students demonstrated a strong ability to analyse and interpret the archetypes, providing valuable insights into spatial preferences. Their varied responses highlighted the importance of flexibility in design, as different individuals have different needs in similar learning situations. While the archetypes were well-received, some students expressed a need for more personal spaces.

The validation of part II confirmed that the tool successfully supports creative thinking and adaptability in the design process. While some refinements, such as using the check tool in a real project, may enhance its usability, the overall response was positive. The tool not only helped designers generate fresh ideas but also encouraged them to engage with design challenges in new and diverse ways.

Conclusion

This project presents an approach to designing future learning environments by combining theoretical guidelines with a practical design tool. The guidelines, in the shape of typologies and archetypes are built upon literature research, field research and pattern analysis. The typologies are based on desired future situations highlighting relevant actions for learning environments in 2035. These actions are: receiving, conversing, withdrawing, collaborating, connecting, showing, creating, engaging, moving around, reflecting, sharing perspectives and exploring. Every action can be carried out in multiple ways, each aligning with different user preferences. To represent this diversity, 5 to 6 archetypes illustrate various spatial interpretations of each action. Dissecting these archetypes into product- and interaction qualities helps designers to focus on the essence and atmosphere of the archetype rather than the practical layout.

The typologies, archetypes and qualities together, offer structured yet flexible guidelines that help designers navigate the complexity of educational spaces towards 2035.

To translate these insights into practice, a card set was developed as a design tool. Rooted in an interaction vision inspired by collaborative play with Lego blocks, the tool encourages designers to experiment, discuss, and ideate. By incorporating visualisations, color-coded labels of the actions and the qualities, the cards provide flexibility in interpretation while maintaining a clear connection to the guidelines. This approach ensures that the tool is not only informative but also sparks creativity and collaboration.

Together, the theoretical guidelines and design tool offer a comprehensive approach to designing future learning environments. The framework provides the theoretical grounding necessary to understand the impact of spatial configurations, while the card set bridges the gap between research and practice, enabling designers to apply these concepts in a hands-on, intuitive way. This dual approach ensures that learning environments remain adaptable, dynamic, and flexible to the changing needs of education, ultimately contributing to more engaging and effective spaces for students and teachers.

Recommendations

This project has demonstrated the potential of the developed theory and tool in shaping learning environments. However, there is room for further exploration and refinement. The following recommendations outline possible directions for future development, testing, and broader application.

Expanding the scope
While the tool has proven valuable for designing secondary school learning environments, its potential could extend further. Could it be adapted for other spaces where creativity, flexibility, and diversity are essential, such as libraries, coworking hubs, or even public spaces? What elements would need to be adjusted or added to make it applicable in these settings?

Another possibility is expanding its use within schools but beyond spatial design. Could it also help in rethinking teaching methods, pedagogical approaches, or even school schedules? The same principles of flexibility and collaboration that guide spatial design might also inform more dynamic ways of structuring education itself. Exploring these broader applications could uncover new ways of fostering learning environments that are not only well-designed but also more adaptable to evolving educational needs.

A different approach to testing
People often find it easier to express what they do not want rather than articulating an ideal outcome. What if testing sessions were structured around this insight? Instead of focusing on building a design vision from scratch, users could be encouraged to eliminate undesirable options first. Would this lead to a clearer and more refined final result? Additionally, long-term testing could reveal how repeated engagement with the tool shapes design decisions over time. How does familiarity with the cards influence creativity and decision-making? These approaches could offer a deeper understanding of the tool's strengths and possible refinements.

Defining the limits of the tool
A key question is how many cards are too many. At what point does the number of options become overwhelming rather than helpful? Additionally, how distinct should the actions described on the cards be? Is there a natural limit to how many different ways an action can be facilitated before examples become repetitive or overly nuanced? Exploring these boundaries could help refine the tool's effectiveness, ensuring that it remains both comprehensive and intuitive to use.

Testing in real-world design projects
So far, the tool has been tested in a fictional setting, separate from the constraints of an actual project. While this has allowed for open-ended exploration, applying it in a real-world design process could provide valuable insights. How do practical considerations, such as budget limitations, student capacity, or administrative constraints, affect the way the cards are used? Would the tool need to be adapted to accommodate these realities? Testing within real projects would bridge the gap between conceptual exploration and practical implementation, revealing areas for refinement.

Using the tool in client conversations
Rather than serving only as a tool for formulating a design vision before meeting with a client, it can also be used as a dynamic part of the conversation itself. Testing its role as a discussion aid might lead to more interactive and insightful exchanges, helping clients articulate their expectations more clearly. Could this approach result in a more collaborative and responsive design process?

Exploring individual vs. collaborative use
The cards have been tested as a collaborative tool, fostering group discussions and collective decision-making. But could they also be effective in solitary design processes? How does the absence of group dialogue impact the way decisions are made? A more introspective approach might lead to different types of design choices. Would individual use encourage more personal and unconventional ideas, or would it limit the breadth of perspectives that emerge? Exploring this could uncover new dimensions of the tool's usability.

Providing clearer instructions
The cards do not fully communicate their intended use on their own. First-time users may benefit from a structured introduction, perhaps a guide explaining the labels, possible workflows, and ways to engage with the cards effectively. Developing clearer instructions could ensure that users can navigate the tool more intuitively, making it more impactful.

Comparing across educational systems
Educational environments vary widely across different countries, cultures, and pedagogical traditions. How well does the developed methodology align with the design approaches used elsewhere? How could the tool be adapted for different school systems, or even for primary education settings? Exploring these questions through international case studies or comparative research could offer insights into how universal the tool's principles are and whether adaptations are needed for broader applicability.

Post-implementation evaluation
Beyond the design phase, could the tool also serve as an evaluative framework? Once a school has been designed and implemented, the cards might be used to assess whether the intended outcomes have been achieved. Could they help identify unforeseen challenges or unexpected successes? This retrospective application could turn the tool into a continuous learning mechanism, informing future projects and iterative improvements.

Conclusion
By exploring these possibilities, the tool could evolve into a more versatile and insightful resource, not only for designing school environments but also for shaping broader creative and educational processes. Future research and testing could unlock new applications, ensuring that the tool remains relevant and adaptable in an ever-changing educational environment.

Reflection

Looking back on this project, it was a process of exploration and learning, about the research itself and about how I work. Although it is an individual project, conversations, interviews, and feedback sessions played a big role in shaping my ideas and keeping me on track. Having the freedom to structure my own project was both a challenge and an opportunity. On one hand, it was refreshing to be able to follow my intuition and shape the process in a way that made sense to me and the context. On the other hand, it also meant dealing with moments of uncertainty, especially in the beginning, when structure felt elusive. ViP helped a lot in this regard, although it also did the opposite, it provided clear steps that I could organise my insights and activities around. At times, ViP also pulled me into abstract thinking that left me feeling lost in words and principles. In those moments, having guidance from experts was very valuable. Enthusiasm about the project made it easier to bounce ideas around without pressure.

Topic
I feel fortunate to have found a topic that aligns so well with my interests. Combining spaces, interactions and secondary schools, was a pleasant and unexpected discovery. Exploring space from an interaction perspective proved to be both exciting and insightful, deepening my understanding and appreciation of the relationship between environment and experience.

Planning and project structure
Planning in this project went surprisingly well. There was a balance between structured weekly planning in the beginning and a more flexible task-based approach as the project progressed. What really helped was the fact that no one was breathing down my neck about planning. Instead, gentle reminders here and there gave me just enough oversight to stay on track while still allowing me to work in a way that felt natural. Having the space to self-manage, while knowing there was support when needed, made the process feel both productive and sustainable.

The role of AI
Using AI tools like ChatGPT and Copilot made certain aspects of the project easier, like finding relevant sources, summarising papers, and helping to articulate my ideas. But AI also has clear limitations. While it could surface useful information, it wasn't great at structuring insights or making meaningful connections between them. It often provided abstract, repetitive descriptions that weren't particularly helpful in moving my thinking forward. As a practical tool for efficiency, it had its benefits, but for deeper, more nuanced thinking, it was clear that human insight and conversation were still essential.

The value of expert and peer input
Asking for feedback through different channels was useful. Regular check-ins with supervisors and experts, as well as the informal input from others, made a big difference. Coach meetings were a valuable tool, preparing slides helped to structure the insights and think of aspects to discuss in advance. This made discussions more focused and productive, and the act of preparing the slides itself often helped me clarify my own thinking before the meeting even happened. The ViP expert eye of Matthijs was also very helpful, I learned a lot about the method and his input was making the project better. His enthusiasm and suggestions worked motivating.

Visuals
One of the biggest takeaways from this project was the importance of visualising ideas. While my drawings weren't overly detailed, they helped capture the essence of concepts in a way that words alone often couldn't. It took some reminders along the way, but gradually, I integrated more and more visual elements into my work. In hindsight, I see how these visualisations not only made the project more accessible to others but also helped me refine my own thinking.

Final thought
In the end, the process led me somewhere I'm proud of.

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