Appendices

Appendix A: table observations and interviews

class visits and observations

Visit no.	Class	School system	School
1	Science	Regular	DaVinci College
2	Practice program	Dalton	Lentiz Dalton College
3	History	Dalton	Lentiz Dalton College
4	Design reading	Regular	Zandvliet College

interviews

Participant no.	Role	School system	Course (in case of)	School
1	School Principal	Regular		Lentiz VMBO Maasland
2	Pedagogical Employee/ Teacher	Regular (extra classes for improving skills)	All round	Mariscollege Houtrust
3	Teacher	Regular	Science	DaVinci College
4	Teacher	Free school	Math	Vrije School Rotterdam-West
5	School Principal	Dalton		Lentiz Dalton College
6	Teacher	Dalton	History	Lentiz Dalton College
7	Teacher	Regular	Dutch	Zandvliet College
8	Teacher / consultant policy making in education	Regular	Physics	
9	Teacher	Dalton	Biology	Lentiz Dalton College

Appendix B: interview questions

Objective
The aim of these interviews is to gather insights on:
Factors influencing in education from a pedagogical perspective.
The emotional experience of students facing academic challenges.
The evolving role of teachers and the impact of technology on education.
The relationship between learning environments and student engagement.
The day of students and teachers at school.

1. Daily work & student interactions
What does a typical day look like for you? Where do you usually interact with students?
Which students come to you for support? How do they reach you, and what does their journey look like?
How do students feel about coming to you for help?

2. Changes over time
How long have you been working here?
What differences do you notice in students now compared to 10 years ago?
How do you think these changes will continue in the future?

3. Future of education & teaching
How do you envision your job in 10 years?
How do you think the role of teachers will evolve?
What changes do you foresee in teaching methods?
How might the school system adapt, and how would this reflect in the learning environment?
How do you anticipate technology shaping education?

4. Learning environments & student reactions
How do students feel in different spaces (e.G., Classroom, common areas, informal spaces)?
Are there essential elements that make a learning environment different from a break area?
How do students react to changes in their learning environment?
Can you describe how students respond differently to various spaces such as classrooms, hallways, and specialized rooms (e.G., Tech labs)?
Have you noticed generational differences in how students interact with lessons and each other?

5. Current teaching practices
What are the essential elements of an effective learning environment?
What does a typical lesson look like for you?
What types of activities do you include in your lessons?
Are you satisfied with the current lesson structure?
Do teachers follow strict guidelines, or do they have flexibility in structuring lessons?
How does intrinsic motivation play a role in the current education system?
How do you feel about the environment in which you teach? How has it changed, and how would you like to see it evolve?

6. Barriers to change
Why do changes in learning environments happen so slowly?
How does your school respond to evolving ideas about education and changing generations?
What are the biggest challenges in adapting to new educational needs?

7. Addressing learning gaps
What would it take to eliminate the need for tutoring?
How do you see student needs evolving

over time?
What strategies could improve learning outcomes for struggling students?

8. Vision for the future
If you had a free classroom to design as you wish, how would you use it? What learning goals or activities would it support?
What is your ideal vision for your role in education?
How do you think students should ideally experience school?

Appendix C: all context factors

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)

Appendix D: Triomf clustering session

During this session, I gave the design team at Triomf an update on the project. I recapped its purpose, the activities I had conducted, the insights I had gathered, and how context factors were collected. I then introduced the next step of the process: clustering. While I had already clustered the context factors twice before, I wanted to involve Triomf in the process to gain their perspectives. The goal of this session was to provide Triomf with insight into my process and to understand what factors they found most important.

To start, I displayed all the context factors on the windows and handed out dot stickers for voting. This helped identify which factors were most relevant to them while also familiarizing them with the content.

Next, we moved on to clustering. I gave the following instruction:
”With clustering, you will look for connections between factors, storylines, if you will. We aim to form 9 to 12 clusters. It’s important to remember that this is not about what we want to happen but rather about what is likely to happen. Essentially, we are distinguishing between the probable future and the desirable future.
There is no single future, but that’s beside the point. What we want to avoid, however, is simple categorization. In this case, categorizing means grouping factors solely by subject, which is different from clustering.
Instead, we are looking for storylines. Start by picking up one factor, then select another and consider whether there’s a connection. If there is, group them together. If not, move on to the next. Continue this process until all factors have been placed. Within each cluster, some factors may be more relevant or important than others, and occasionally, a factor may stand alone, and that’s perfectly fine.”

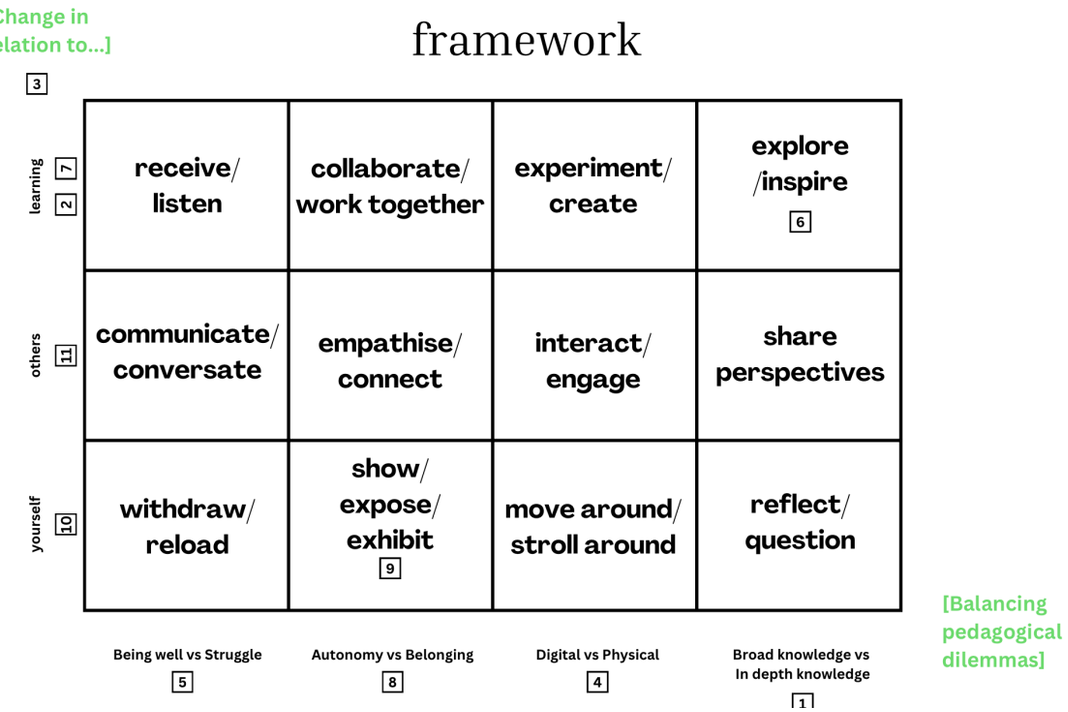




After the instruction, they began clustering. The team was engaged, and despite most of them having no prior experience with this method, the process went smoothly. It was insightful to see their interpretations, though some clusters leaned more toward categorisation rather than clustering. Nonetheless, the session was valuable in gathering their perspectives and refining the process.



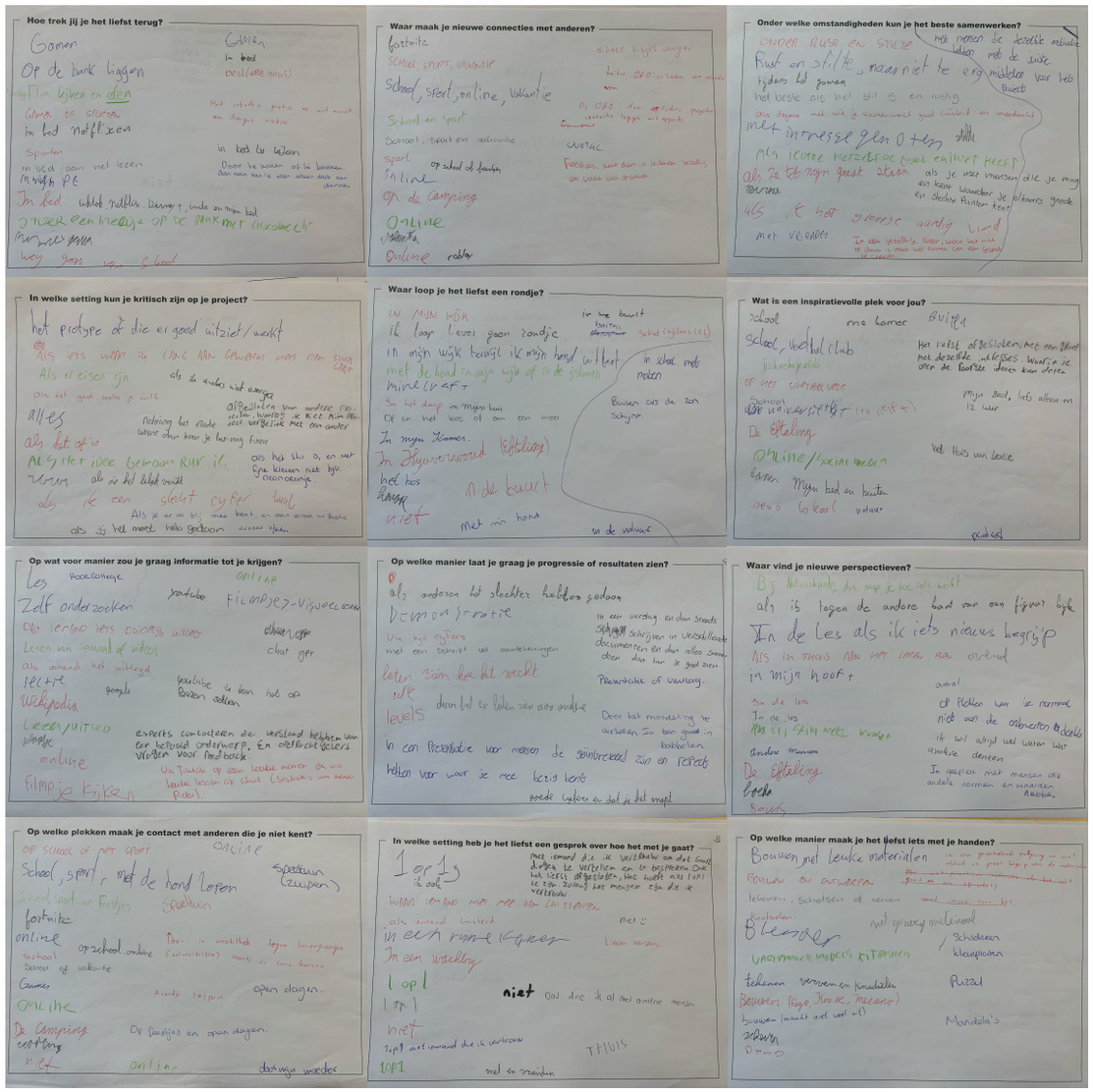
Appendix E: considered action labels



These were the most important words that were considered as what could be seen as the primary action label. To make the future situations usable, they were desctribed as actions. These words are the simplifications. Through tests with desginers, students and teachers was validated whether these actions fitted what the future situation should express.

Appendix F: student brainstorm for archetypes

To include students perspective, I asked them to help me brainstorm for archetypes. I did this by writing a question for every cell in the framework, asking them how and where they would like to perform the actions. It gave me insight into their current view of the school as well as it gave me some ideas for new archetypes.

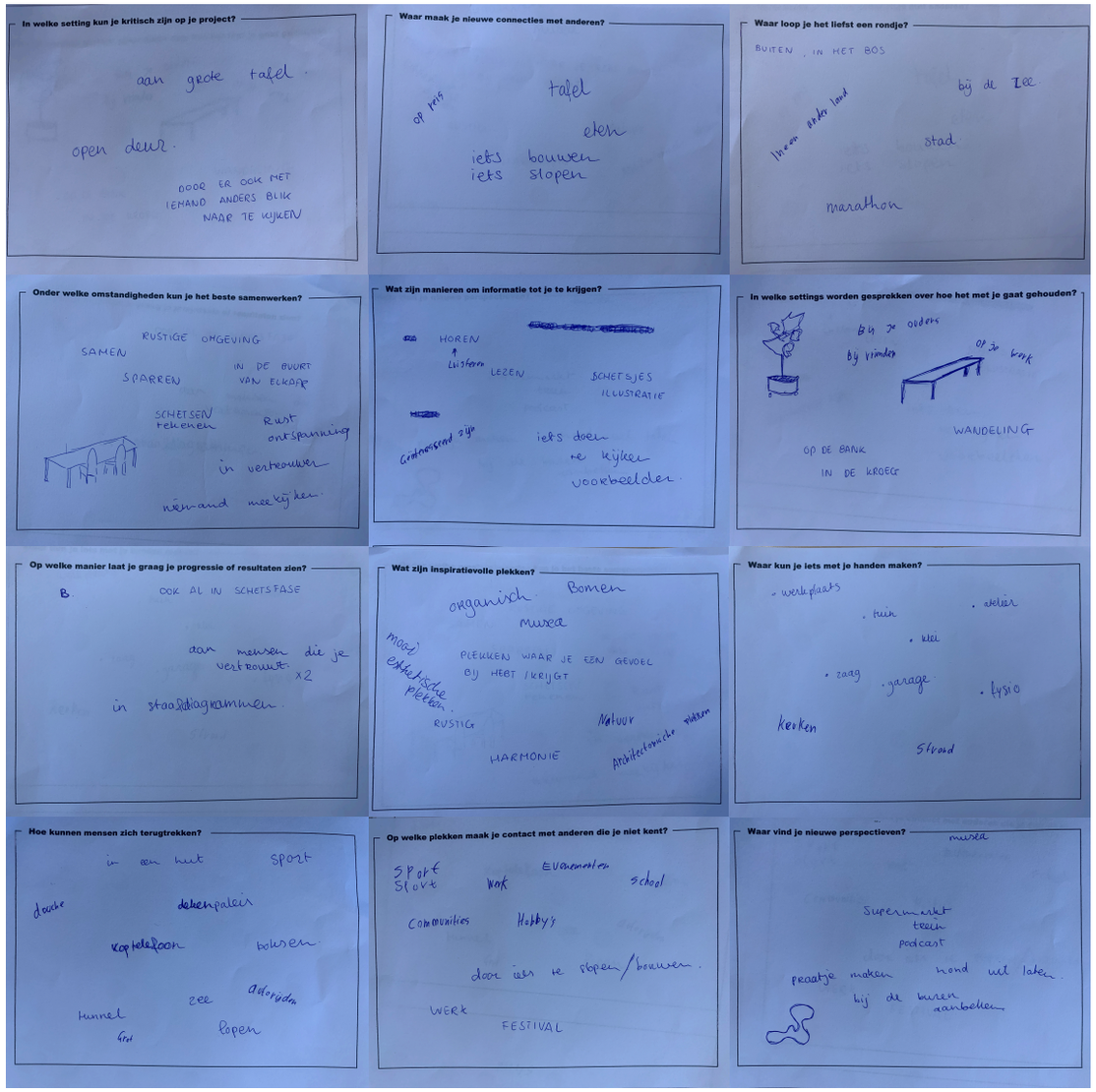


Appendix G: Triomf brainstorm for archetypes

Before brainstorming for archetypes, I gave the designers another update about the project. We discussed the insights and moved on to action.

The same as I did with students, I did with Triomf. I was curious to see how they would approach the questions differently with their experience in spatial design.

There was only about 15 minutes for all the questions, so it was a rapid brainstorm. However, it gave me some ideas for new archetypes and insights into their perspective of archetypes.



Appendix H: test about associations

Since making assumptions in the selection process of the archetypes, I wanted to test with others what their interpretation was of the archetypes I selected. The goal was to see whether they aligned with my expectation and whether some adjustments had to be made. Overall, it went well. Most archetypes were clear. However, some archetypes were more difficult to associate with. The participants mentioned the lack of visualisation, which could help. The archetypes the participants had trouble associating with, I made adjustments in making a visualisation that was fitting and gave more insight about what the atmosphere would be.



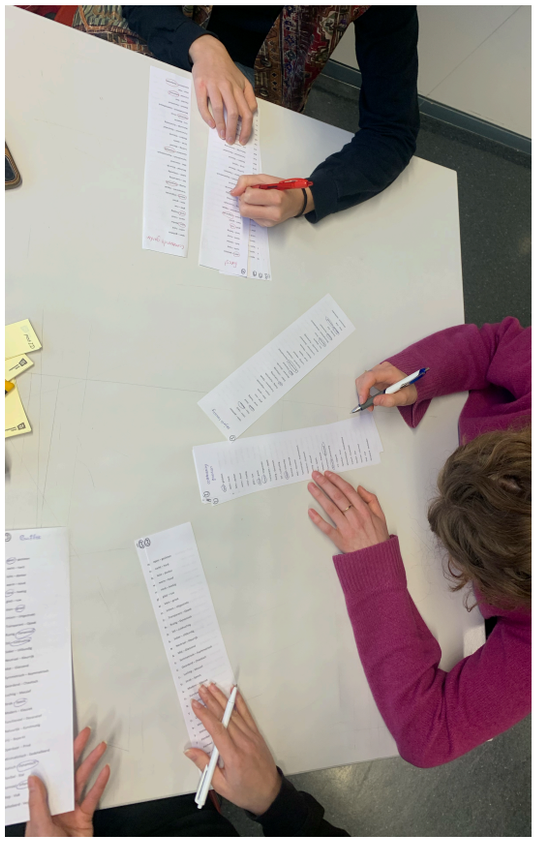


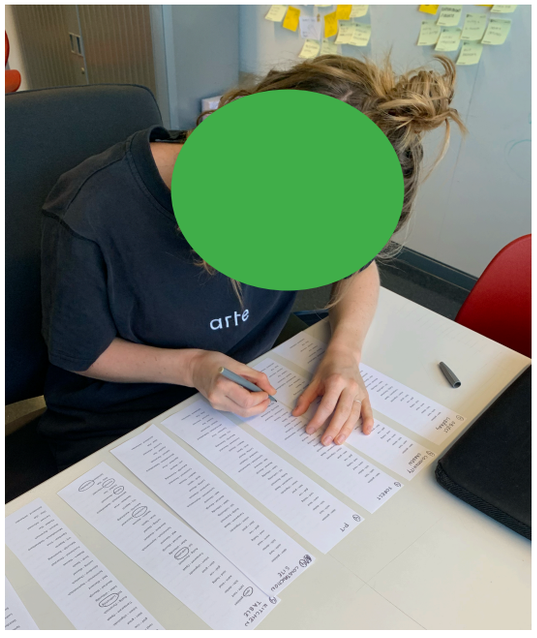
Appendix I: test about qualities

For the qualities on the back of the cards, four participants selected the eight qualities they found most fitting for each archetype.

To streamline the process, I provided a list of opposing qualities, allowing participants to make quicker decisions while also enabling a comparative analysis of their choices per archetype. Since there were 16 archetypes, this method ensured efficiency.

Once all responses were gathered, I analysed the overlapping qualities and identified common patterns. To further refine the selection, I supplemented these with additional specific qualities that captured nuances not initially highlighted. The final collection of qualities was then validated during the last round of testing to ensure coherence and relevance.





Symmetrisch – Asymmetrisch	open – gesloten
Geordend – Chaotisch	zacht – hard
Luchtig – Massief	licht – donker
Strak – Speels	warm – koud
Modern – Klassiek	rond – hoekig
Functioneel – Decoratief	glad – ruw
Natuurlijk – Kunstmatig	klein – groot
Vrij – Beperkt	Intiem – Uitgestrekt
Openbaar – Privé	Transparant – Opaak
Minimalistisch - Gedetailleerd	Rustig – Dynamisch
Statisch - Dynamisch	Stil – Luidruchtig
Flexibel - Star	Sober – Uitbundig
Formeel - Informeel	Neutraal – Kleurrijk
Diep - Vlak	Mat – Glanzend
Geïsoleerd - Verbonden	

Appendix J: archetypes at school test

This was a simple, semi-structured test with a teacher. I described archetypes, after which he reflected on his school through some questions:
Is there a place at school that fulfills this archetype?
What does the place closest to this archetype look and feel like?

This resulted in that there were quite some space that had similarities with the archetypes, but they lacked the atmosphere. Also, for some actions, there were people present, for example a ‘care teacher’, but then there was no designated place for this person to teach.

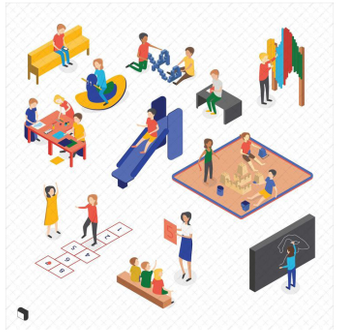
This confirmed the relevance for archetypes and showed how taking out the essence and atmosphere of the archetypes is important.

Appendix K: qualities of all archetypes



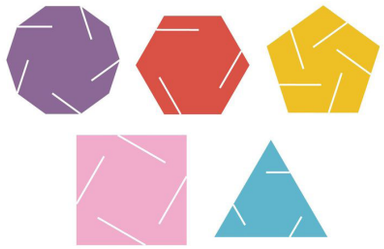
Every archetype as 4 or 5 product qualities and 4 or 5 interaction qualities. Here is shown what the final selection is. This selection is tested in final validation with the designers at Triomf.

Appendix L: product options













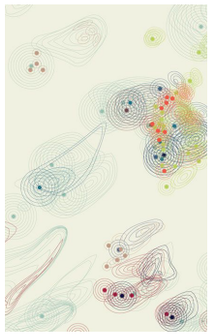




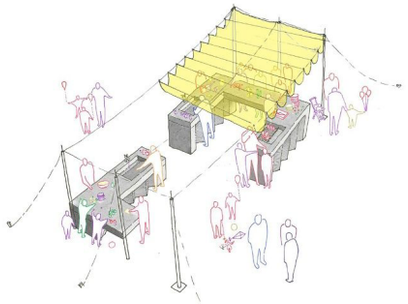
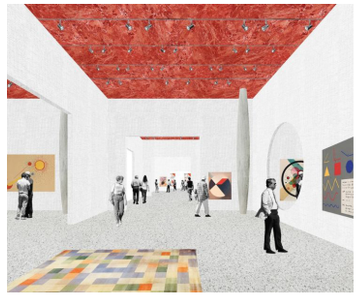
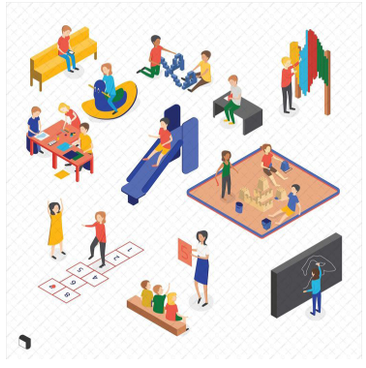
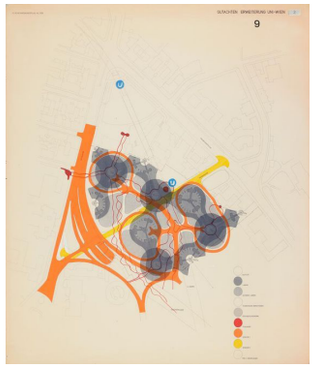
All kinds of products were considered to translate the typologies to a tangible tool. A poster, a plate, a puzzle, building blocks. Deciding the product was based on what best suited the interaction vision. Therefore, it became a cardset, with inspiration taken from the plate for visualisation and building blocks for the shape.

Appendix M: visual style options

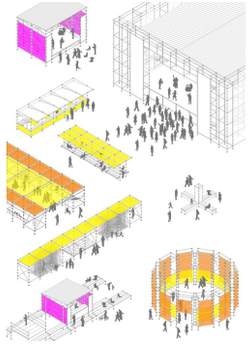










Visual examples were shared with the designers of Triomf to discuss what suited their style and, more importantly, what the cards should convey during the design process. The discussion revealed that a simple drawing style, possibly with a hint of collage, would be ideal. This leaves room for interpretation, sparking creativity, and avoiding overly prescriptive designs.

Appendix N: cards prototype 1



This is the first version of the card set. Randomly cut shapes, a title, visualisaton and labels. Diverse perspectives were chosen for the visualisation to see which worked best. No colors are included to see whether these are neccessary, and to what extend.

Appendix O: test prototype 1 with Triomf

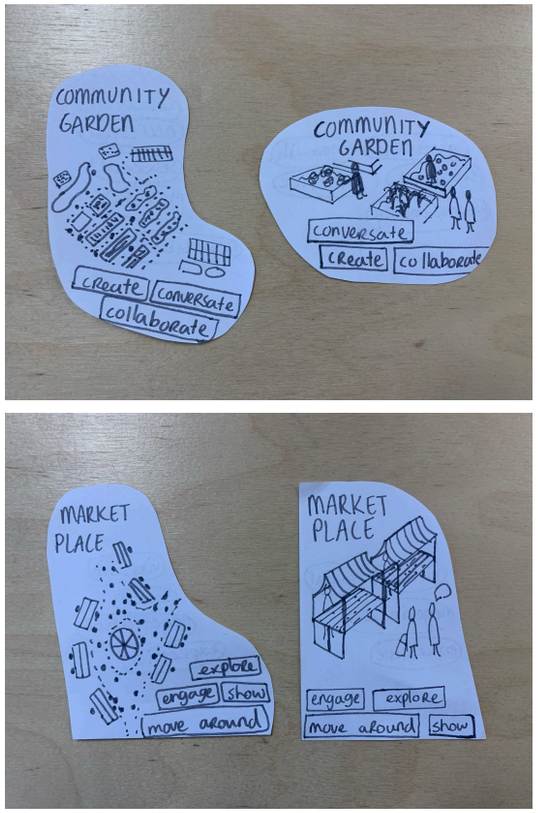
The first prototype was presented to Triomf. The goal was to have a discussion and get answers the following questions:

USE/INTERACTION
How would you use the cards?
If you only look at the words, do you have an image of them? Does anything change when you have the image?

VISUAL
What does the visual aspect do?
If you have to choose between this or this?
Which do you prefer?
How do you interpret the shape?

APPLICATION
How would you apply it to a school?
What do the qualities add?
Do you have an overview of the elements?
What gives inspiration to this?

The key takeaways from this session included the benefit of color-coding the action labels for better clarity and organisation. Participants also found that visualising the archetypes from multiple perspectives was particularly engaging. Keeping these visualisations simple proved effective, as it allowed people to form strong initial impressions of each archetype without being overwhelmed by detail. This simplicity not only made the archetypes more accessible but also sparked inspiration, making them a valuable tool for generating new ideas. Additionally, the combination of clarity and flexibility in the visuals encouraged open discussion and creative exploration. The information on teh cards is perceived as the most relevant.



Appendix P: test concept II with Triomf

Goal: Test how designers interact with the card tool in a real-world scenario and evaluate its usability in guiding the design process.

Phase 2: Using the Cards (60 min total)

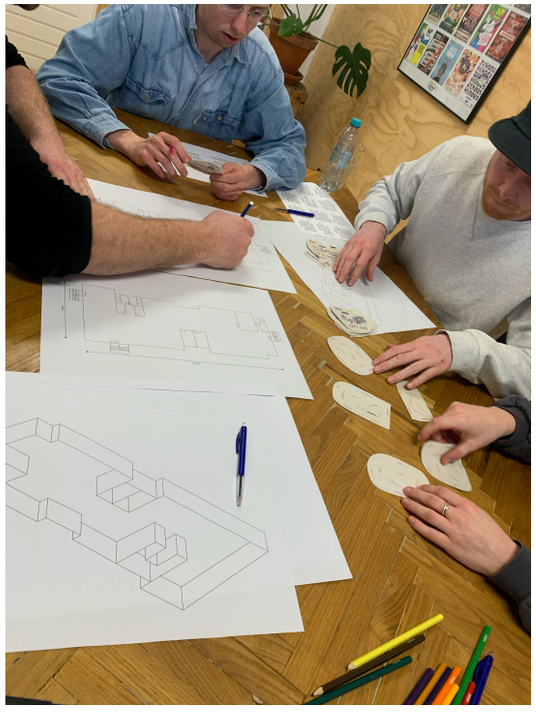
Moment 1: Vision Tool (25 min)
Participants discuss what kind of learning environment they want to create using the cards.

Scenario:
A school wants to transition to a more future-proof secondary school that sup-ports student autonomy, flexibility and well-being. Their school has three floors, and they want to redo one of them. The school has as a requirement they want an innovative approach, but aren't quite sure what that looks like. Elements they want to highlight are the ability to organise activities with which students can take a step back from the knowledge absorption and spend time on this third floor to focus on skills.

Assignment:
It is your task now to create an angle that surprises them and inspires them to make their ideas tangible. Not a finished job is required, just a starting point from which to have a discussion about possibilities and expectations.
How would you tackle this? An idea could be, sort the cards into three categories: essential, important, and less relevant based on the school's needs. Use the interaction labels to discuss which interactions should be most encouraged.

Moment 2: Idea Tool (25 min)
Participants use the cards to brainstorm space arrangements.

Scenario:
Discussion with the school has taken place. From the discussion it became clear that the school wants every student to have one day per school week to spend on the third floor. This day is meant for the students to learn autonomously. They interact with their fellow students to come up with activities they work on individu-ally or in a group. For example, organising a second-hand clothing swap, a space to dive into the world of outer space, a potluck, creating a short film, writing a sto-ry. Students get freedom to focus on their own interests, create their own chal-lenges. Accompanied with teachers, guiding and supporting them. What interac-tions and spaces are needed for this is something they would like a proposal for.



Assignment:
Create a floor map. Think about what the student could be doing, needing wanting. Design with the guidelines in mind, the interactions are relevant. What interactions do you want to facilitate to what extent and how do you want to do that? No idea is too weird.
How concrete do you want the ideas to be before drawing in Sketchup.
You might have a lot of questions about specifics. I don't have all the answers. Take this scenario with a bit of your imagination, we are not there yet and there are many details undecided here. Share your imagination, create your own ver-sion of the scenario. Make your own decisions if need be.

Moment 3: Check Tool (20 min)
Participants evaluate a proposed design (either one they made or an example concept you provide).

Scenario:
Er staat een concept ontwerp voor de school.

Assignment:
Ga na met de kaartenset of de opdracht volbracht is. Geef een suggestie voor een eventuele aanpassingen.

Observation points:
o Do they use the cards effectively to check completeness and diversity?
o Are there areas they struggle to evaluate?
o Do they rely on certain types of cards more than others?

Phase 3: Debrief & Feedback (30 min)
Group discussion:
How did you find working with the card tool? Was it intuitive?
o Were there any limitations or missing aspects?
o How would they improve the usability of the cards?
o Would they use this tool in a real project?
o What are the key values or learning interactions you want to prioritise?
o How do you see these interactions happening in the school?
o Did the cards help structure your vision?
o Did you feel the tool helped structure your design process? Why or why not?
o Did you enjoy using the tool, or did it feel like extra work?
o Were the labels and instructions on the cards clear?
o Did you understand how to use the cards at each moment (vision, idea, check)?
o Were there any interactions or design aspects that were unclear?



o How did the cards influence your design choices?
o Did the cards introduce new ideas or reinforce existing ones?
o At what point in the process did you find them most useful (vision, idea, or check)?
o How did the tool support discussions within your team?
o Did you feel like the tool helped balance structure and creativity?
o Were there any missing elements or features you wished were included?

Observations:
o How do they move the cards around on the table?
o How do they look at the back of the cards?
o Do designers naturally use the labels?
o Do designers naturally use the qualities?
o How do they generate spatial ideas based on the tool?
o Do they combine cards in unexpected ways?

1 = Helemaal oneens
2 = Oneens
3 = Enigszins oneens
4 = Neutraal
5 = Enigszins eens
6 = Eens
7 = Helemaal eens

De tool was nuttig in fase 1: visie vormen.

1 2 3 4 5 6 7

De tool was nuttig in fase 2: ideëen bedenken.

1 2 3 4 5 6 7

De tool was nuttig in fase 3: checken.

1 2 3 4 5 6 7

In toekomstige projecten zal ik de tool willen gebruiken.

1 2 3 4 5 6 7

De informatie op de kaarten is duidelijk.

1 2 3 4 5 6 7

De kaarten zijn flexibel in gebruik. Ik kan ze op mijn eigen manier gebruiken.

1 2 3 4 5 6 7

De labels helpen me de ruimte op de kaart te ontleden.

1 2 3 4 5 6 7

De visualisaties zijn inspiratievol en brengen me op ideeën.

1 2 3 4 5 6 7

De kwaliteiten op de achterkant helpen me om mijn ideeën onder woorden te brengen.

1 2 3 4 5 6 7

De kwaliteiten op de achterkant geven inspiratie voor het ontwerp.

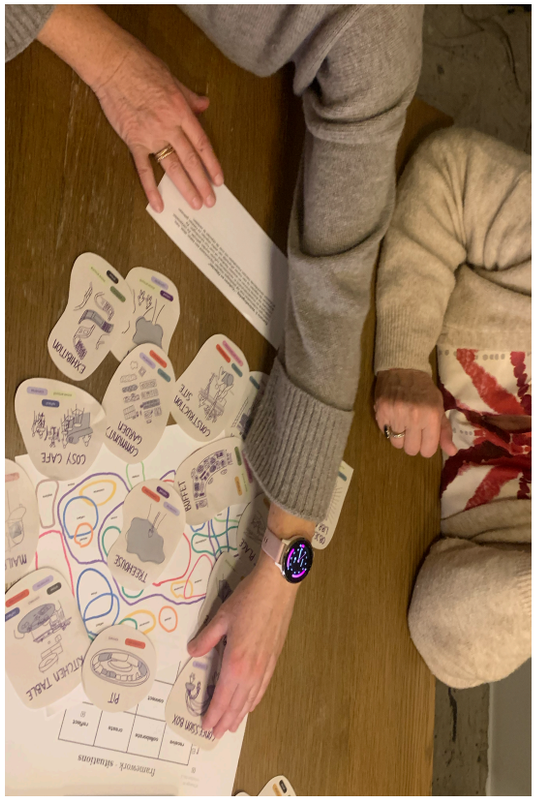
1 2 3 4 5 6 7

Appendix Q: test concept I with teachers

Test topics
1. Relevance of situations
Are the 12 situations comprehensive and reflective of the activities and interactions teachers believe are important in secondary school learning environments?
2. Alignment of archetypes
Do the proposed archetypes for spaces and objects effectively support these situations in a way that feels tangible and practical for teachers?
3. Applicability in real contexts
Can teachers envision using these archetypes and spaces in their current or future classrooms? Are they adaptable to different teaching styles and subjects?

1. Describe your framework to teachers
Provide teachers with:
• A concise description of each situation, explaining its purpose and relevance to learning environments.
• Visuals, diagrams, or descriptions of the archetypes for spaces and objects associated with each situation.
• A clear explanation of the goal: to determine if the situations and archetypes resonate with their teaching needs and contexts.

2. Design testing activities
• Scenario-based discussions
Present teachers with hypothetical classroom scenarios and ask:
O which of the 12 situations apply to this scenario?
O arrange the archetypes in a way you think would best support the scenario.



O do the associated archetypes seem appropriate? Why or why not?
• Reflection questions
Pose open-ended questions like:
O do these situations cover the full range of activities you see in your teaching?
O are there situations or archetypes you find confusing or missing?
O how would you improve these archetypes to better suit your needs?
O what barriers do there exist and how to handle them?
• Feedback through survey
Scaled responses (e.G., 1–7 Ratings) for clarity, relevance, and practicalit

Scenario 1: projectdag - “de innovatie challenge”
Leerlingen werken in teams van vier aan een project waarin ze een creatieve oplossing bedenken voor een maatschappelijk probleem, zoals plastic afval verminderen. Ze beginnen met het verkennen van het probleem, brainstormen daarna ideëen en gaan door met conceptontwikkeling. Dan is er nog een feedbackronde waarbij twee teams hun oplossingen uitwisselen. Aan het einde van de dag leveren ze een zelfgekozen deliverable in: een verslag, object, filmpje, presentatie of iets anders dat hun idee overbrengt.

Scenario 2: verdiepingsdag - “duik in de wereld van natuurkunde”
Leerlingen kiezen een natuurkundig onderwerp dat hen interesseert, zoals zwarte gaten, quantumcomputers of stroomkringen. Ze werken individueel en doorlopen verschillende leeractiviteiten gedurende de dag om zich in het onderwerp te verdiepen. Ze beginnen de dag met zich orienteren op een onderwerp en het verzamelen van diverse bronnen. Doormiddel van kleine experimenten komen ze meer te weten over de principes van hun gekozen onderwerp. Aan het einde van de dag mogen ze op eigen bedachte manier hun resultaten laten zien en individueel of in kleine groepen hun onderzoek bevragen.

Scenario 3: verbredingsdag - “culturen en objecten”
Leerlingen onderzoeken hoe vijf alledaagse objecten (bijvoorbeeld een beker, stoel, mes, kledingstuk en muziekinstrument) in verschillende culturen worden gebruikt. Ze verzamelen informatie via diverse bronnen en wisselen feedback uit over hun bevindingen. Ze analyseren de objecten op een manier afhankelijk van welke objecten ze hebben gekozen en moeten verschillende mensen inschakelen om over de objecten te vertellen.





1 = Very Irrelevant
2 = Irrelevant
3 = Somewhat Irrelevant
4 = Neutral
5 = Somewhat Relevant
6 = Relevant
7 = Very Relevant

Share Perspectives: *Students exchange insights and viewpoints to broaden understanding.*

1 2 3 4 5 6 7

Explore: *Students investigate and discover new knowledge through guided or independent activities.*

1 2 3 4 5 6 7

Engage: *Students actively participate in hands-on or immersive learning experiences.*

1 2 3 4 5 6 7

Create: *Students produce original work, such as projects, designs, or performances.*

1 2 3 4 5 6 7

Connect: *Students build relationships with peers, teachers, and the community.*

1 2 3 4 5 6 7

Converse: *Students discuss and debate ideas to deepen understanding.*

1 2 3 4 5 6 7

Move Around: *Students use flexible spaces to support physical and cognitive activity.*

1 2 3 4 5 6 7

Appendix R: test concept I with students

Test topics
1. Relevance of situations
Are the 12 situations comprehensive and reflective of the activities and interactions teachers believe are important in secondary school learning environments?
2. Alignment of archetypes
Do the proposed archetypes for spaces and objects effectively support these situations in a way that feels tangible and practical for students?
3. Applicability in real contexts
Can students envision being in spaces based on these archetypes?

Situations:
* You are doing a project and you have an argument with a group member. You are going to discuss this with a teacher to come up with a solution. Which space do you think is suitable for this?

* You have built a very nice prototype and want to show it to a teacher. How do you prefer to do this?

* You can choose the subject of a project yourself, it has to be something you don't know anything about yet. Where do you go to get inspiration?

* You are going to brainstorm ideas with your group members. You have to come up with as many ideas as possible in an hour. Where are you going to do this?

* You have just given a presentation, now you need a break. How do you spend it?

* You have to practice a conversation in German or French with another student. Where do you do this?

* You want to have a teacher quickly check the progress of your assignment. Where do you do this?

* You are going to show your results to the entire class. How do you do this if you can choose yourself?

* You need to concentrate very hard on a difficult assignment. Where do you sit to minimize distractions?

* You just heard that you did very well on a test. Where do you go to celebrate this with friends?

* You notice that you are stuck on an assignment and need a different environment to get inspired again. Where do you go?

* You are working on an assignment with a group, but you have to work on different parts separately. Where do you sit?

* You want to interview an expert for your project. Where would you prefer to do that?

* You have been given a complex explanation and want to go through it again calmly. Where do you do that?

* You have to record a video for your project. Where do you choose to do this?

* You need a short break and want to relax without being disturbed. Where do you go?

Type questions after each situation:
* Why did you choose this place?
* Is there already such a place at school? * Can you imagine what such a space would look like?
* What do you think makes this place suitable for this situation?
* What characteristics should this space

have to be able to work well?
* Have you worked in a space like this before? How did you like it?
* Would you use this space alone, or with others? Why?
* What would you change in existing spaces to make them more suitable for this situation?
* Do you think other students would choose the same space? Why or why not?
* How would this space feel? (For example: calm, energetic, inspiring)
* What should be in this space to help you optimally?
* Would you also use this space for other activities? Which ones?
* How important is the location of this space within the school?