

BREAKING THE CIRCLE OF NEEDS

THROUGH MANIPULATION CARDS IN A PARTICIPATORY DESIGN STUDY

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Abstract

The role of designers is shifting within a changing society, the new generation of designers increasingly want to create novel and sustainable technologies to have positive impact on the planet and its inhabitants. In this research we explore how the needs and practices of participants in a participatory design session can be influenced to create sustainable practice-oriented concepts within a future everyday context. The research consisted of four participatory design sessions, two intervention groups and two control groups, each consisting of two participants. The sessions were put in a designed speculative future context about summer comfort. The intervention group applied an idea generation technique to think creatively and differently about their everyday practices and the results were compared to the control group afterwards. The findings contribute insights into a newly designed method designers could apply when designing in the context of a future everyday scenario. This includes the following subjects; the experience of the participatory design session and the differences between the intervention and control group.

1 Introduction

The role of designers is shifting within a changing society, the new generation of designers increasingly want to create novel and sustainable technologies to have positive impact on the planet and its inhabitants [11]. Design research can generate knowledge for designers to make better informed design decisions by combining social sciences, such as everyday needs and practices, with a design approach.

Needs and practices are defined by our culture and society, which include existing design, previous research and the status quo, or the standards of living [20]. By applying participatory design, these existing needs and practices shape new design because the participants will bring these needs and practices to the sessions as requirements. Designers will create novel designs from these insights and these designs will on its own create new, but corresponding, practices and needs. We call this the "cycle of needs". Shove [2003] argues that participatory design is unlikely to make much change in the direction of sustainability. Her argument for this is that participants have unsustainable practices and needs to begin with, which they will bring to the sessions and give as input for the designers. This leads to designers creating unsustainable designs.

However, we as everyday users of products and services can change our practices and needs to become more sustainable in the future. Simultaneously, designers can create novel everyday designs where the product or service can urge people to change their behaviour in the form of more sustainable practices and needs [9]. An interesting design challenge arise from these aspects including the participatory design method, a future everyday context, rethinking needs and practices, and a focus on sustainability.

In this research we will explore how the needs and practices of participants in a participatory design session can be influenced to create sustainable practice-oriented concepts within a future everyday context. In this exploration we used idea generation cards to give "triggers" to participants to think creatively and differently about their practices and needs.

This method including triggers is similar to Scott et al. [2003] but, as described above, idea generation cards will be used as the triggers. With this research we can give insights of a method that anticipates for possible change of needs and practices in the future while including users to the transformation process by applying the participatory design method. Furthermore, the method will focus on creating sustainable design concepts for the future. The method will also be reflected upon by its researchers and participants to give recommendations for future work.

The research consisted of four participatory design sessions, two intervention groups and two control groups, each consisting of two participants. The sessions were put in a designed speculative future context about summer comfort. The intervention group applied an idea generation technique to think creatively and differently about their everyday practices and the results were compared to the control group afterwards. A semi-structured exit interview was conducted with all groups to gain more insights.

In this article we will first discuss the related work of the topics participatory design, practices and needs, future studies and speculative design, and finally idea generation techniques. Next, we present our study including the workshop, participants, and test set-up. Our findings are structured in 2 themes with corresponding sub-themes and weend with a discussion of the gained insights and interpretations.



2 Related works

2.1 Participatory Design

Participatory design is as much design as it is research where it is used to iteratively come up with designs together with the corresponding stakeholders while it simultaneously adds to the body of knowledge for designers [1, 22]. The methodology involves effective participation of the stakeholders within the development process of a certain product or service [8]. Participatory design began to take form during the 70s in the Scandinavian workplace concerning HCI and spread across Europe and the United States through conferences and publications [3, 8, 14, 22]. Throughout the years it developed within multiple topics and is now applied in different ranges and scales in the field of design, including the understanding of everyday practices [1, 14, 17].

Shove [2003] describes in her paper that the participatory design methodology is unlikely to change the trajectory of sustainability. The work focuses on the sustainability of the environmental aspects of the daily consumption of energy and water. Other work describe that participatory design actually does work when designing for sustainability, including creating acceptable persuasive designs to change unsustainable behaviour and concrete methodologies for sustainable design [15]. Although, the works focus on very specific areas within the topic of sustainability and none of these works focus on the changing of practices and needs.

2.2 Needs and Practices

Practices are the customary, habitual, or expected procedure or way of doing something and needs are things that are wanted or required. Needs are met by applying certain practices. An example is the need “to be clean” or “cleanliness” is met by the practice of “showering” or “taking a bath”. Needs can be viewed on a multi-layered scale where needs can be close to a certain practice and are interrelated. For example, the need to wash clothes, or washing clothes as a practice, can be seen as fulfilling the need for being socially representative [20], which can be seen as one layer deeper.

Changing these needs can be done by changing its corresponding practice, or elements within the practice, to be more sustainable. Practice theorists describe these different elements which are involved with a practice and are applied in the design methodology practice-oriented design [9]. Practice-oriented design is an approach which consists of multiple concepts but all use practice as a main focus point in the design research process [9, 10, 18, 21].

2.3 Future Studies and Speculative Design

Speculative design can be seen as a future vision of a designer. Dunne and Raby [2013] describe speculative design as where designers show a possible future which can be used to better understand the present and create discussion on what kind of future is desired or not. However, because of these infinite number of futures, it needs a clear scenario so that people can relate to a future world and critically reflect on their own. This method is related to the showroom method whereby it tries to discover the preferable future by exploring futures together with experts to design a catalyst for debate and discussion with involved stakeholders [5, 7]. Previous work also demonstrates a combination of speculative design and participatory design [6]. However, within our study speculative design is combined with social studies concerning the long term effect of everyday technology on society.

2.4 Idea Generation Techniques

Coming up with new ideas and novel concepts is a major driving force for the development of businesses and is often an integral part of creative work [13, 16, 23]. A business does not only need creative individuals but also specific techniques to be most effective with its creative human resources [13]. It is important that participants conduct a broad exploration of the solution space and idea generation techniques are a big part of this [12]. There is a multitude of different techniques to generate the best, most or profound ideas in different stages of a design process [16, 23].

Examples of a idea generation techniques are Design Heuristics and Harvey Cards [2, 4]. These techniques are meant to open-up the mind of participants in the idea or concept ideation process [12]. Design Heuristics and Harvey Cards focus on the characteristics of user products and support creativity by transforming the products by changing its characteristics. With this they aim to facilitate a broader exploration during the concept generation stage of the design process [4].

To conclude, from this work we gained insights on how participatory design can be combined with practice oriented design and how to approach this in our research where we included the method of idea generation cards. Furthermore, insights were gained in building a relatable speculative scenario with context using artefacts.

3 Method

The method consists of four phases, setting the scene (12 min), the timeline (5 min), manipulation cards (10 min), the concept phase (10 - 15 min), and the exit interview (10 min). The study has two groups: the intervention and the control group. The used protocol can be found in appendix A. This workshop aims to determine if the designed method helps participants create sustainable concepts that focus on changing the practice rather than the technology.

3.1 Design

At each stage in the workshop, participants were repeatedly reminded to apply to think aloud to provide the researchers with the participants' thoughts.

Setting the scene: The participants of this study, users of the Atlas building as students, are placed in a speculative future scenario. This scenario is a narrative where the atlas building must be evacuated between 11:00 and 15:00 every day due to the warmth. The building, made of glass, can no longer cool properly due to brownouts. Atlas users must continue their activities at another location. To get the participants to empathize with the scenario, we first give them a verbal explanation from the facilitator of the focus group session. Then the users experience an escape sound, a sound clip that simulates the ringing of the bell and the need to leave the building like you are in the building. And for closing, an image of a mobile application helps users leave the building with an augmented reality system.



Figure 1. Setting the scene: app + soundscape

Timeline: Then the participants are tasked with generating a story that is the continuation of the scenario given. For this purpose, a board was designed to guide the participants through these phases. On the panel, pairs of blocks have been printed, forming a combination between the need and the corresponding practice. They fill in the blocks by writing down on sticky notes which tasks belong to them. When they have filled in the set, they can continue after the next block until the day is filled in till 3:00 p.m. This assignment aims to get the participants into the giving scenario and already warmed up to the concept phases

Manipulation cards: This tool, the manipulation cards is only used by the intervention group and is the core of this research. The purpose of these cards is to force the participants to look at the practices differently and design them differently. The themes that these cards respond to were designed by Harvey Bernstein [2, 4], who created a card game for brainstorming and idea generation sessions. The descriptions have been adjusted to fit the method, but the underlying concept has remained the same. The deck consists of 14 cards, of which the participants draw one random card each and must apply it to the practice. The result is that the practice is twisted in a direction the participant did not think of. If they can't figure out the card, they may take another one until the entire timeline is adjusted.



Figure 2. Materials

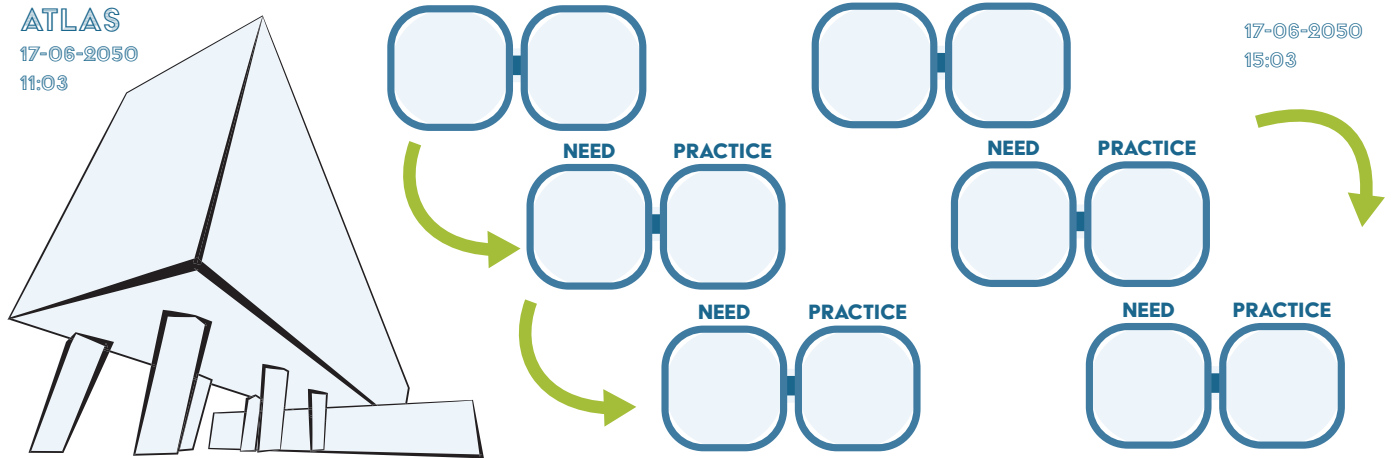


Figure 4. Board of timeline

Concept phase: The concept phase in the workshop is where the participants will come up with one or more concepts by sketching. For this, they get a4 paper and different colors of pens. The assignment they get is: "create sustainable solutions within the new workspace for you as a student in this future context." without giving a description of what sustainability means. They may use the timeline, but it is not a must that their concept connects to their imagined story. The output sketches are used in the evaluation to answer the research question.

Materials. Tools that were needed to conduct the workshop: color markers, paper and sticky notes. These materials were used as a conveying method for the participant's ideas. On the sticky notes, participants could use words to describe the timeline, and the paper was used to draw the concepts. In addition, the manipulation cards and the board were needed to guide the session.

Figure 3. Manipulation cards

<p>Substitute</p> <p>Exchange, switch, replace. What other practices can be substituted?</p>	<p>Fantasize</p> <p>Trigger surreal, preposterous, outlandish, outrageous, bizarre, thoughts. Think "what if? What if alligators played pool or day and night happened at the same time?"</p>	<p>Change Size</p> <p>Make practice bigger or smaller. Change proportion relative size.</p>	<p>Transfer</p> <p>Move your practice into a new situation, environment, or context. Adapt, relocate, dislocate to a new environment.</p>	<p>Add</p> <p>Extend, expand, supplement. Magnify your reference matter; make it bigger.</p>	<p>Distort</p> <p>Twist the practice out of its true meaning. How can you alter it?</p>	<p>Parody</p> <p>Ridicule, mimic, mock, caricature. Make fun of your practice. "roast it", transform it into a visual joke or pun.</p>
<p>Disguise</p> <p>Camouflage, conceal, deceive, encrypt. How can you hide, mask, and shift your practice to another frame of reference.</p>	<p>Subtract</p> <p>Simplify, omit, remove elements. What rule can you break?</p>	<p>Sympathize</p> <p>Relate to your practice. Put yourself in its shoes. Think of it as having human qualities.</p>	<p>Transform</p> <p>Convert. See your practice in a state of change. Think of soccer to butterfly transformations.</p>	<p>Mythologize</p> <p>Build a myth around your subject. How can you transform your practice into an ironic one.</p>	<p>Aliens Land</p> <p>Pretend you are a Martian and you see our world for the first time. Challenge your normal beliefs. Pretend gravity was reversed or fruit had teeth.</p>	<p>Animate</p> <p>Bring life to inanimate practices (having human qualities). Apply repetition, progression, narration.</p>

Exit interview: Concluding the workshop, a semi-structured exit interview was administered to the participants. The purpose of this phase is to extract information from the participants they have not yet shared with us during the session, despite having to think aloud.

The framed questions are:

1. How was your overall experience of the session?
2. The concepts you designed, on what practices are they based?
3. Do you have the idea that you could not convey your ideas by the expressing method?
4. Do these practices and needs correspond to those we have today as well?
5. How did you get to your concept (design process), what was your way of thinking?
6. Are your concepts sustainable, and to what extent?
7. Intervention group - How did you experience the Harvey cards for stimulating your creativity?
8. Intervention group - Did the Harvey cards change the way you see needs and practices?

3.2 Data collection

Qualitative data were collected during four workshops with 2 participants each. The qualitative data collected during the sessions were audio recordings, observation notes, and the participants' output; concepts. During the session, participants were given an hour to go through the participatory design session of three/four different phases. The final phase of the focus group is a semi-structured discussion among the participants. The researchers moderated the entire session by asking guiding questions and checking the time.

Participants for this workshop were found through convenience sampling and were asked to complete a consent form before participating in the focus group (see Appendix B). The selected procedure consisted of two inclusion criteria. First, the participant must be familiar with the Atlas building. They are expected to be familiar with how the building is put together in order to empathize with what it is like to function within these walls. Second, the participant must be students of the master of Industrial Design, which means they are driven to generate concepts and apply speculative design and feel comfortable empathizing with this. The workshop is held in the squad room of Atlas on the 4th floor to involve the students as much as possible in the scenario.

3.3 Data analysis

The audio recordings of the study were transcribed, and a thematic content analysis was conducted with the transcripts, the researchers' observation notes, and the designed concepts (see Appendix C). This analysis involved coding the collected data, identifying common themes, comparing design with different principles, and concluding insights from those themes. The themes provided an understanding and structural overview of the participants' opinions about the different ways of conveying the envisioned future. In addition, the analysis provided a categorized overview of, for example, recurring phrases. The designs lead to the conclusion as they compare the intervention and control groups.

4 Findings

In the thematic analysis, two main themes arose; experience of workshop and concept evaluation with six sub-themes. Each is described in this chapter as individual findings and what data they are based on.

4.1 General experience of workshop steps

Different user experiences emerged among the 8 participants during the workshop across the different phases. This data is divided over the overall experience, how the needs and practices are applied, and how well the intervention group can use the manipulation cards.

Storyboard assignment. The direct positive experience that several participants shared was the engagement that arose during the timeline formation and the creative adaptation. We observed, especially in group 1, that the participants were very involved in the design process through their enthusiastic engagement, and by the many ideas that were generated.

"... I thought it was nice to work with the timeline, such as including the practices as well." -P3 group 2

In the process, limitations and confusion emerged concerning the participants' understanding of the storyboard assignment, including applying the needs and practices. This way of building up a timeline felt contrived and participants recommended changes.

"I also found that first part that, we just had to map this out from need practice, I think that was the hardest part." - P3 group 2

"... I also found the timeline hard, because I had the feeling you have to fill the timeline... Maybe it was easier if we wrote down our day, and then see what would have changed if it became warmer." - P4 group 2

The process became more manageable when the method became clearer as the timeline was filled in.

"... It took me a while to get used to the term of needs but afterwards we went through it quite quickly." - P5 group 3

The participants were unfamiliar with the terminology of needs and practices and the relationship between them. Examples had to be given to the participants in order for them to understand the assignment better. This obstructed the usability of the application from building a timeline consisting of these blocks.

"Need to get in there before applying the needs and practices" - P5 group 3

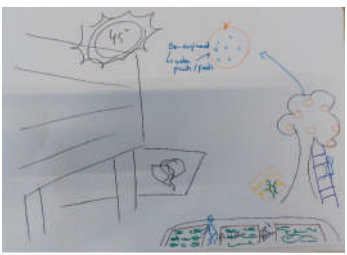
Understanding of the manipulation cards. As previously mentioned, the option was given to the user to pick the next card when the manipulation card they had could not be quickly applied to the practices. It was striking that this occurred only once in both sessions with the "animated card" and "substitute card". The start of the assignment was the most challenging, with participants clearly showing signs of confusion, and the time to manipulate the practise using the manipulation card was the largest.

Interactions in later rounds with the manipulation cards went relatively smooth, including more appropriately seen applications, compared to the first interaction.

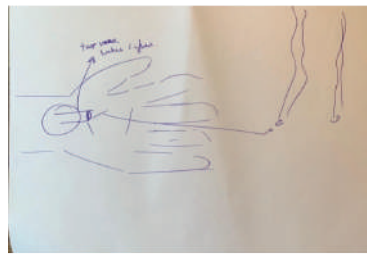
The novel practices are within the scope of the assignment, from which it can be deduced that the cards are better understood. As the testing progressed, more and more "fun" was observed with the participants, and multiple solutions emerged per practice manipulation. The participants also quickly thought in terms of concepts instead of only manipulating the practice itself, see appendix D.



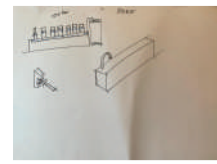
Figure 5. Workshop session



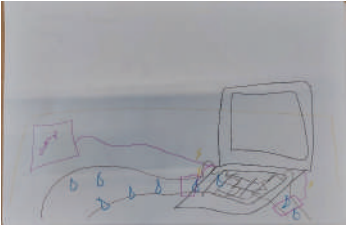
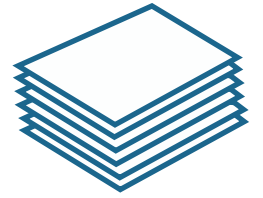
#1: Bio-engineered gardens that would provide fruits and vegetables to a community of individuals that was able to cope with the increase in temperature throughout the day.



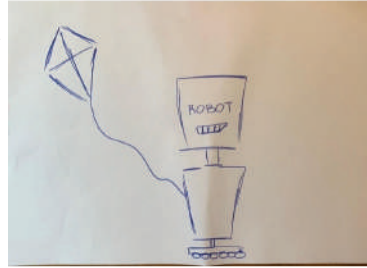
#6: Water infusion into the body through a collection of tubes to keep you hydrated throughout the day.



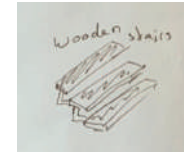
#11: High pressure water faucets, of proposed 100 bars, where many different individuals can come to get water together, a form of social water source.



#2: Sweat-powered laptop that uses the sweat given off by individuals, collected by tubes and used to power your laptop or other electronic devices.



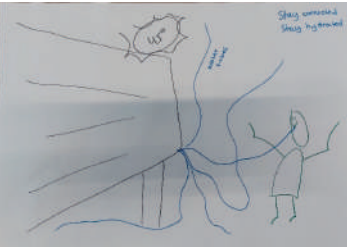
#7: Robot connected to a kite which is capable of transporting individuals.



#12: Wooden stairs to ascend from Atlas, with the idea of the staircase being made of sustainable wood.



#20: Solar powered capsule holding building where individuals can sleep, and get their work done while they are dreaming.



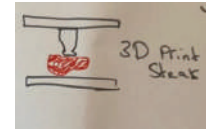
#3: Many water tubes connected to the Atlas building that dispensed cold drinking water to anybody connected to these tubes to provide hydration.



#8: Tarp strung between trees to provide shade on the tables set below them.



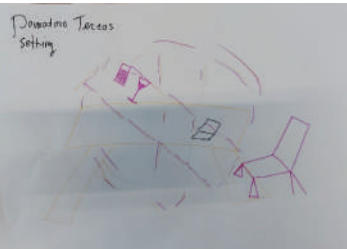
#13: Robot connected to a kite which is capable of transporting individuals.



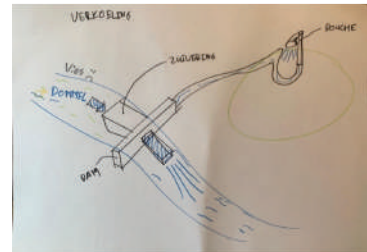
#14: 3D printed steaks.



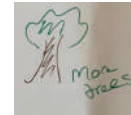
#21: Solar umbrella that floats in the air due to solar powered motors, where individuals can stand underneath it.



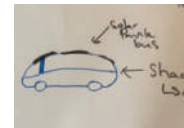
#4: Spinning table that on one side had a laptop and desk dedicated to working, and spinning the table around provided a table to place cool drinks and snacks on top of.



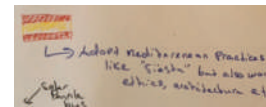
#9: Engine connected to a dam, that purifies the water and sends that cold purified water directly to your shower-head.



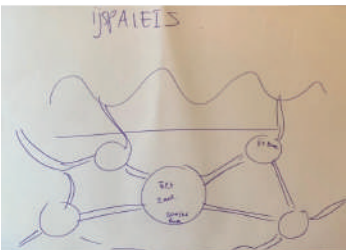
#15: Planting more trees.



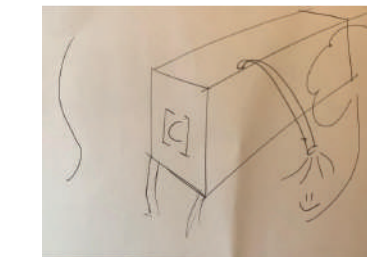
#16: Solar powered bus to transport individuals around in the shade.



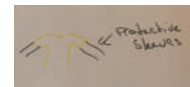
#17: Adopting Mediterranean practice of taking a siesta during the warmest part of the day, as well as their work ethics, and architecture.



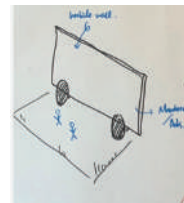
#5: Ice palace, a collection of underground tunnels that connect with one another, to allow for cooling, storing of food and comfort from the warm sun.



#10: Large battery situated outside that is able to produce cool air to cool people standing underneath it off.



#18: Protective sleeves to give your body sunblock as you walk outside.



#19: Wall on wheels where individuals can walk behind it as it moves to provide shading.



#22: Sun screen dispensing door frame that coats the individual as they walk through it to protect them from the sun.



4.2 Differences between control group and intervention group

The goal of the study was also evaluating and comparing the concepts that the intervention and control groups made. The analysis provided the sub-themes of conceptualizing and achieving sustainability, which will be described in the following section. First, an overview of the designed concepts per team and group can be found below.

Conceptualizing. The theme conceptualizing focuses on the concepts made by the participants in the ideation session where a focus has been placed on future thinking. The aspect of feasibility and realism was seen differently at the control and intervention group, with the control group having a more feasible and realistic mindset. For example, participant 1 (intervention group) mentioned to spend less time worrying about the feasibility and realism of their concepts.

"The crazier the better" -P1 group 1

However, both groups thought in a futuristic context.

"Like very futuristic. We were really thinking futuristic." -P8 group 4

In the concepts we see that the bio-engineered gardens and the underground ice palace need completely new technologies and radical change in living, while the water filtration system and sunscreen spray use technologies already known. Participant 2 also mentioned that the manipulation cards made her think very openly, which also connects to the concepts being far from feasible and realistic.

"What I really liked was that through thinking about the practice, and then directly using the (manipulation cards) is very open, and you are able to think very openly about what is going on. I have a very open concept mindset." -P2 group 1

What is interesting to note is that although the intervention group developed less realistic concepts than the control group, they both tried to think about them realistically. It was observed that participants from the intervention group spent more time thinking about how the concept would work in real life.

"It is indeed very futuristic, a lot would have to change to for this to work on the campus, you would need a large investment to even make it possible." -P1 group 1

Achieving Sustainability. Different groups applied sustainability differently, where an overlying trend in sustainability can be noticed when looking at the results of the intervention and the control group. As the term sustainability delivered by the researchers allowed for personal interpretation, a variety of different approaches can be observed between the four groups. This can be seen in the concepts, for example, mental sustainability (group 1 concept 4) and food consumption sustainability (group 4 concept 2).

Furthermore, the data showed differences in the intervention and control group concerning practice-focused sustainability and technology-focused sustainability. What is meant by practice-focused sustainability is achieving sustainability through practice, or the practice is the core of the concept. Technology-focused sustainability is achieving sustainability through technological innovation.

Although all the groups had similar needs and practices, the concepts they developed have visible differences in terms of resource usage. Overall, the intervention group utilized less artificial resources but instead use resources situated around them or created new practices, such as the bio-garden on campus (group 1 concept 1), and the ice palace (group 2 concept 1). It is also observable that the intervention group had a stronger focus on using natural available resources to accomplish those practices in optimal ways.

"But the moss garden is sustainable right? Because you then have green on the building which in turn helps the building to cool off. That is why you have more and more buildings with green natural elements." -P3 Group 1

"Well previously, people always dug ice cellars, and then they would put an ice block inside of this, and it hence became a sort of freezer" -P4 group 2

On the other hand as seen in for example the battery powered fan (group 3 concept 3), and the 3D-printed meat (group 4 concepts 3), the control group more consistently used technology to create their concepts. This group used mostly mechanical and technological solutions to achieve sustainability.

"...I think the solar panel part in green energy can be easily involved and or integrated." -P7 group 4

"We have the concept of 3D printing steaks because steaks are really bad for the environment" -P8 group 4

While all four of these groups utilized the common practices of social interaction and cooling, a difference can be observed when regarding the alternatives in approach towards sustainability. The intervention group considered more natural/nature inspired sustainable concepts including practices. Group 1 and 2 can be seen to have used nature inspired design, such as the bio-garden suited for the warm proposed climate and underground ice palace. Both these ideas focused primarily on the practice of social interaction and cooling, and utilized natural (sustainable) resources to accomplish those practices.

However, when looking at the concepts the control group made to target those same practices, namely group 3 concept 3, and group 4 concept 10, the practice in sustainability has been shifted. The control group conceptualized in a more technology sustainable approach. For example, the concept group 3 came up with is a large battery situated outside to create cool air for gathering people below, and group 4 have a floating mechanical umbrella to accomplish the same goal.



Figure 6. Concept generation

5 Discussion

Our findings show improvements that can be made to the session and insights about the difference between the control and intervention group.

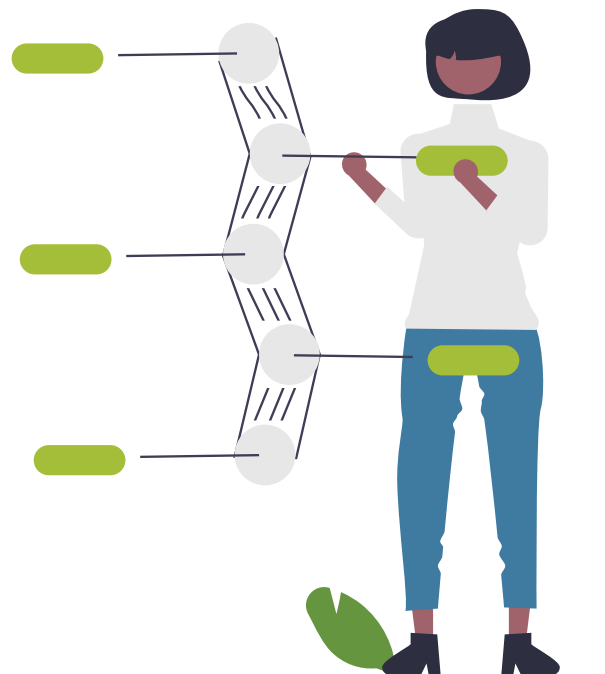
5.1 Participatory design session and its assignments

The results suggest that many concepts generated by both groups in the session were quite speculative and far fetched, implying that the method might be too free or future focused. We argue that the reason for this is that the scenario is in a far future scenario in 2050 where participants were already opening up their creative minds to think differently about practices and needs because "it's 2050, anything is possible". By applying an idea generation technique on top of that created too much freedom for the intervention participants which led to the concepts being too unrealistic and unfeasible. However, the results do show that participants think differently about how to achieve sustainability using practices. This challenges the argument of Elizabeth Shove [2003] that participatory design can not change the direction of sustainable innovation. For future work we suggest that the session should stay within a shorter time period, ranging from 5 to 10 years in the future instead of 20 to 25 to create ideas which are more useful to research future everyday practices.

The developed method for the participatory design session was tailored to a specific scenario fitting the assignment. It would be interesting if applied in future work iterations where a different application be the main scope of the method. This can be applied by using different topics than sustainability and future thinking, and could lead to a more different outcome than observed in our process and results.

The contribution to the social studies is our implementation of the manipulation cards to creatively trigger the participants in ways that they would previously not have come up with, and can be adapted for future studies with the same purpose. The application of this manipulation card tool in practice-oriented design can also be further analysed in future work.

Furthermore, the designed session in this particular research urged the designers to create concepts from the newly constructed practices in the manipulation cards assignment. We argue that the results can also be made more realistic and feasible if this assignment was not used as a foundation to create concepts, but more as a warm up exercise, or trigger [19], to warm up the participants for the ideation session. Further iterations of future work could explore this alteration.



5.2 Differences between control and intervention groups

In the results we see that the intervention group came up with more practice-oriented sustainability in their concepts, while the control group relied more on technological innovations that were sustainable. From this we can conclude that the participants who applied the idea generation cards as triggers were provoked to take a more practice-oriented approach in their ideation process, or put the newly design practice central in their concept. Although the results show a difference between the groups, more research is needed to further validate this insight.

Putting the practice central in the design is connected to the use of energy. Some of the intervention group concepts fixed the need for energy by doing a certain practice, while the concepts of the control group still relied on traditional power generation such as solar power. Although the concepts were mostly very speculative and futuristic as discussed above, the participants of the intervention group rethought their practices in a speculative context to fill their everyday needs in a more sustainable way.

5.3 Limitations

Our research showed insights on the use and results of the designed method. However, we do want to note that the participants were all master students of the faculty of Industrial Design at the TU/e and our sample size was relatively small. It should be considered that their, technology focused, views and ideas most probably will differ from other people in our society. Furthermore, because the data we collected were concepts created in ideation sessions means that a lot can influence the outcomes of these sessions. Therefore, we hope this study will instigate more research with a bigger and more diversified group of people.

6 Conclusion

In this article, we conducted a qualitative study using the participatory design methodology in a future context focusing on sustainability. To analyse the method a control and intervention group were used. The findings contribute insights into a newly designed method designers could apply when designing in the context of a future everyday scenario. This includes the following subjects; the experience of the participatory design session and the differences between the intervention and control group. We hope our study inspires further research into this subject.

Appendix A - User test protocol

Introduction

Context:

This user test will focus on an alteration of participatory design where Industrial Design students will ideate on their study/work environment in a future scenario about summer comfort.

Research questions:

How can we design a participatory design method where the users rethink their needs and practices for a future scenario?

Population:

One pilot test of minimal 2 Master Industrial Design students and two sessions consisting both of a study and control group of minimal 2 Master Industrial Design students each (a minimum of 10 students including the pilot participants).

Data collection:

During the session notes will be taken by the researchers and the exit interview will be recorded. The resulting concepts will be gathered as well.

Main task

The main task of this user test is to use a practice focused assignment within a participatory design session concerning the work environment of students in a future scenario. Two groups will be ideating for this scenario where one will conduct a practice focused assignment and the other group will not. The resulting ideas and their rationales will be compared afterwards where the researchers will focus on how different the needs and practices are from current needs and practices. The duration of the test will be approximately (52 min) 1 hour; 5 min explanation (sign consent form etc.), 7 min briefing + artefacts, 5 min warm-up assignment, 10 min practices assignment, 10 – 15 min ideation session, and 10 min exit interview.

Setting:

The location of the experiment is a closed room at university. Researchers will guide the session and take notes. During the exit interview, audio will be recorded using a phone.

Materials: checklist (material, purpose, available)

Material	Purpose	Available
Script (briefing scenario)		
Phone/laptop for soundscape artefact		
Phone for escape route artefact		
Warm-up assignment		

Altered Harvey cards assignment		
Paper to write down practices		
Ideation assignment		
Exit interview script		
Consent forms		

Script

1. Explanation

Hello all and thank you for joining us today. In this session you will ideate from a future scenario context in the theme of summer comfort using speculative artefacts. The session will take about 1 hour and consists of a briefing on the future scenario and interaction with the artefacts followed by a small warm-up assignment to get you started.

STUDY GROUP ONLY: The next assignment is called a practice-focus assignment where we use certain cards to come up with novel practices.

Afterwards we will conduct a group ideation session where you will come up with sustainable concepts for the scenario. Are there any questions?

2. Scenario briefing + artefacts

Imagine a future where in the summer months the Atlas building is entirely closed to staff and students from 12 until 3 in the afternoon. Rising temperatures in the summer resulted in a huge increase in the need for indoor cooling to make the building comfortable to work in. These cooling technologies are very energy demanding and at the same time energy prices kept rising to new all-time highs. Eventually the university decided to close their buildings in the middle of the day to reduce energy usage and costs. This means that every student and employee of the university is forced to leave the building between 12 and 3 and find cooling elsewhere. To give a more vivid view of this scenario we designed two speculative artefacts. The first artifact is a soundscape where you can experience the moment when the building closes through sound. The second artifact is a visualization of an app designed to show you the quickest route to the nearest exit.

Let them listen to soundscape and interact with the app

But what does this mean for design and what kind of new products and services can arise within this scenario?

Do you have any questions or are there any uncertainties about the scenario we are trying to communicate to you?

3. Warm-up assignment

Sketching session

4. Practices-assignment

We will now start with the practices-assignment that consists of two steps. As you already know the scenario for which you will be designing, we will be looking more at the practices and needs that could arise during this specific scenario. Practices are the customary, habitual, or expected procedure or way of doing something and needs are things that are wanted or required. Often needs are met by applying certain practices. An example is the need “to be clean” or “cleanliness” is met by the practice of “showering” or “taking a bath”.

Create a step by step story using certain needs and practices you would experience within the scenario of leaving the building of Atlas at 12 and finding comfort somewhere else until 3. For example, you will have to keep working on school work or you will spend free time outside of the Atlas building while staying comfortable. Start at the beginning of

Now that you have a nice and vivid story, we will start with step 2. We would like to see if you can open up your mind by using idea generation cards. In front of you there is a pile of cards and each one of them has a different word written on it. These words imply you to do a certain action to your story. We will guide you through it if you have any questions. If the cards do not help you or it is too hard to apply, you can just skip it and take another card.

This assignment is to really open up your creative mind and rethink the application of practices and needs within the scenario. In the session following this one, things will get more concrete and less abstract so for now ideas can go anywhere and there are no limitations.

Any questions?

5. Ideation session

The purpose of the ideation assignment is to ideate on the practices that you develop as a result of listening to the soundscape and receiving the briefing about the user testing. Keep the scenario of needing to leave Atlas from 12-3 due to the increased heat, however otherwise you have the freedom to be as creative as you want with the coming assignment.

Test group

Following the warm-up assignment, and the introduction of needs and practices, you are asked to ideate on the potential needs and practices that would arise from needing to leave Atlas from 12-3 due to the increased heat. Using the list of needs and practices that you have written down, each individual must grab a card from the "Harvey card" collection. Using this card, ideate on the products or services that could be implemented in the given scenario. You will have five minutes to ideate before closing the round.

Control group

Following the warm-up assignment, you are tasked with ideating possible solutions to solve the issue of having to leave Atlas from 12-3 due to the increased heat. You have no restrictions except your own creativity; however, you are encouraged to ideate keeping sustainable design in mind. Keeping the scenario in mind, please get sketching for the coming 5 minutes.

6. Exit interview

- a. Do you have the idea that you were not able to convey your ideas by the expressing method?
- b. The concepts you designed, what practices are they based on?
- c. The concepts you designed, what practices are they based on?
- d. Do these practices and needs correspond to those we have today as well?
- e. How did you get to your concept (design process), what was your way of thinking?

Appendix B - Research on using participatory design in a future context

Participation Participatory design sessions (focus group)

You will be asked to participate in a workshop for educational purposes. Participation is voluntary and requires your informed consent to use the output for research. Please read this information carefully before you decide to participate, and ask the researcher for clarification if you have any questions about the research. You can leave the study at any time, and there are no consequences. Please inform the researcher if you plan to leave the study.

What?

The Workshop is set up by Jules Sinsel (Master student TU/e), Dylan van Oosterhout (Master student TU/e) and Pom Smit (Master student TU/e). The aim of this research is to investigate how participants create concepts around the future scenario using different methods.

Collecting data

Therefore we organize a focus group meeting where you will generate sustainable solutions for a future scenario. With this form, we would like to confirm that you have given us the consensus to use the output; the designed concepts and the audio (the session will be recorded when permission provided).

To protect your privacy, your data will be coded. Data can only be traced back to you with the key of the code. The key to the code remains safely stored in the local research facility (canvas). In reports and publications about the research, the data cannot be traced back to you. Some people may have access to all your data at the research site. Also to the data without a code. This is necessary in order to check whether the research has been carried out properly and reliably. Persons who have access to your data for inspection are the members of the research team. They will keep your data confidential. We ask you to give us your permission to access your data if someone else needs access.

You can withdraw your consent to the use of your output at any time. This applies to this study and also to storage and use for future research. The research data collected up to the moment you withdraw your consent will still be used for the research. The data will be stored in a secure location for 24 months.

Contact information If you have any questions, please contact

jules.sinsel@[student.tue.nl](mailto:jules.sinsel@student.tue.nl)

d.c.j.s.v.oosterhout@student.tue.nl

p.c.e.smit@student.tue.nl

the study. Both the Researcher and you will receive a signed version of this consent form.

Thank you for your attention.

1. Do you agree to participate and share your results from the Workshop and give your consent?

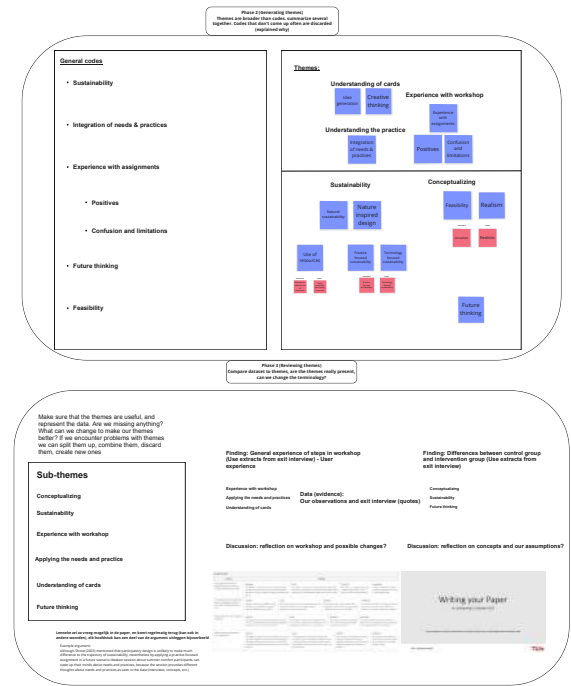
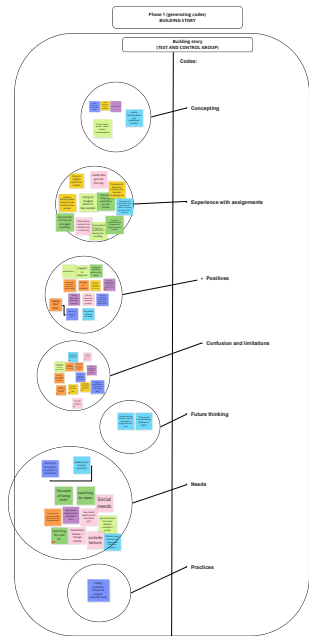
Agree

2. Name

This content is neither created nor endorsed by Microsoft. The data you submit will be sent to the form owner.

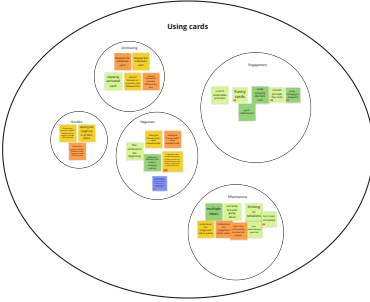
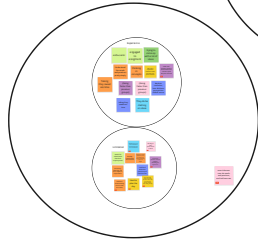
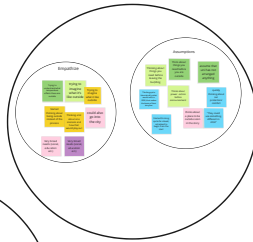
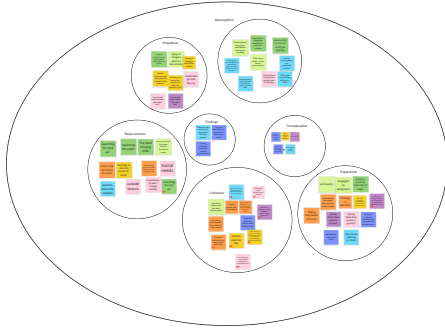
 Microsoft Forms

Appendix C - Thematic data analysis + data





Insights of building story (user experience)

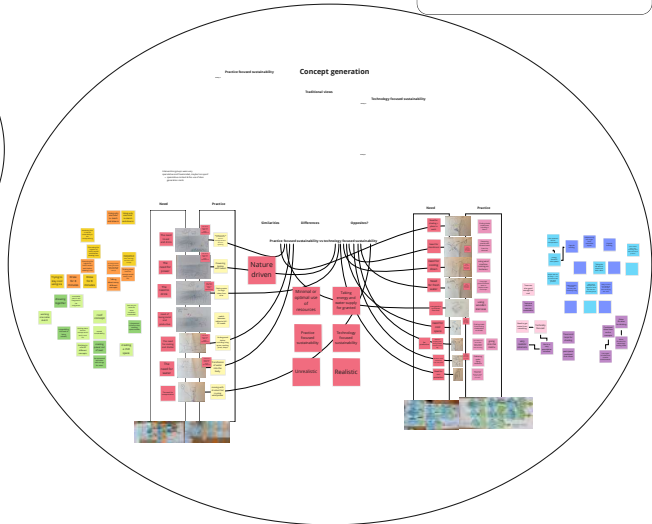


Exit interview transcription
 GROUP 1 GROUP 2 GROUP 3 GROUP 4



RQ: How can participants break free from their traditional views on practices and needs during a participatory design session within a future everyday context?

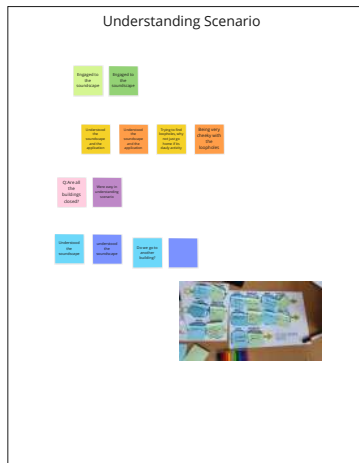
- To do:**
- Assign themes to the individual sketches
 - Group the themes together to create codes
 - Compare the control to the test group
 - Evaluate the efficiency of the Harvey cards, did they make more sustainable, creative, how effected the project?





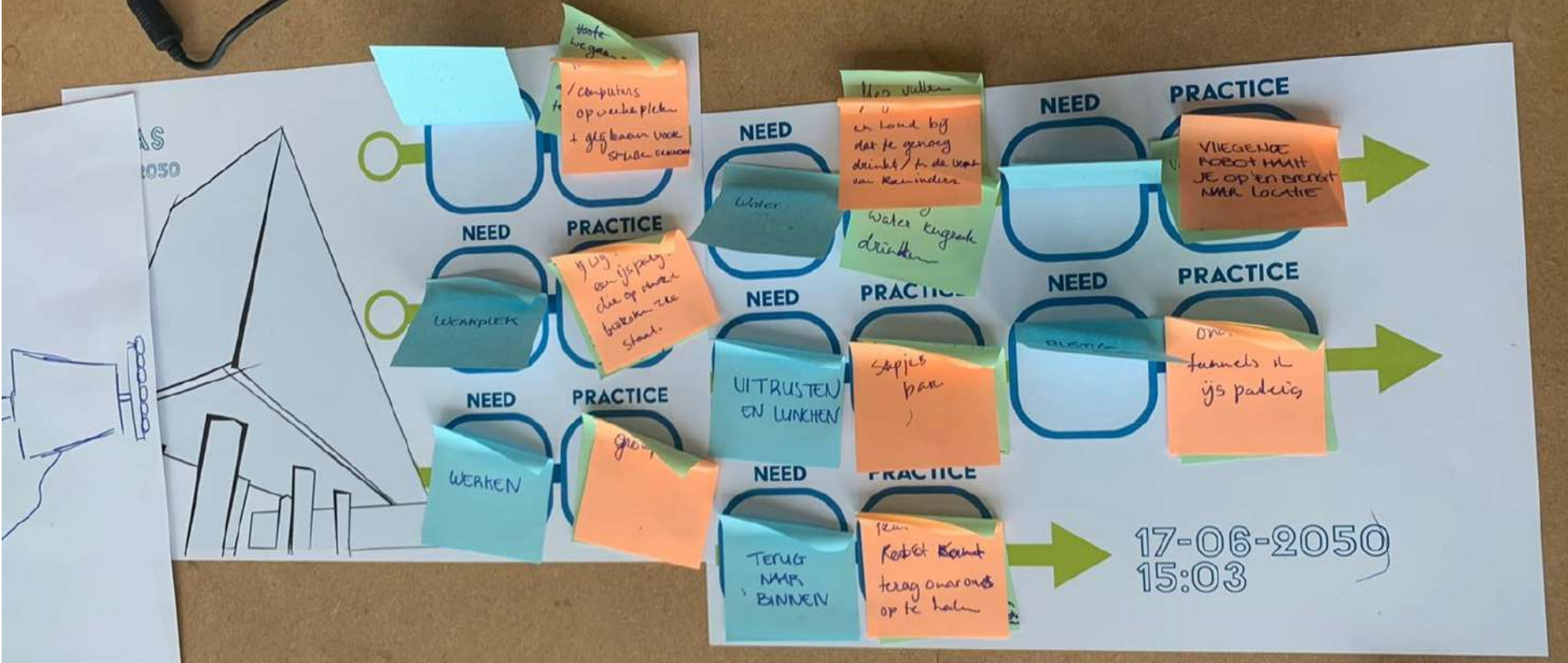
General observations

Intervention group was very speculative and free

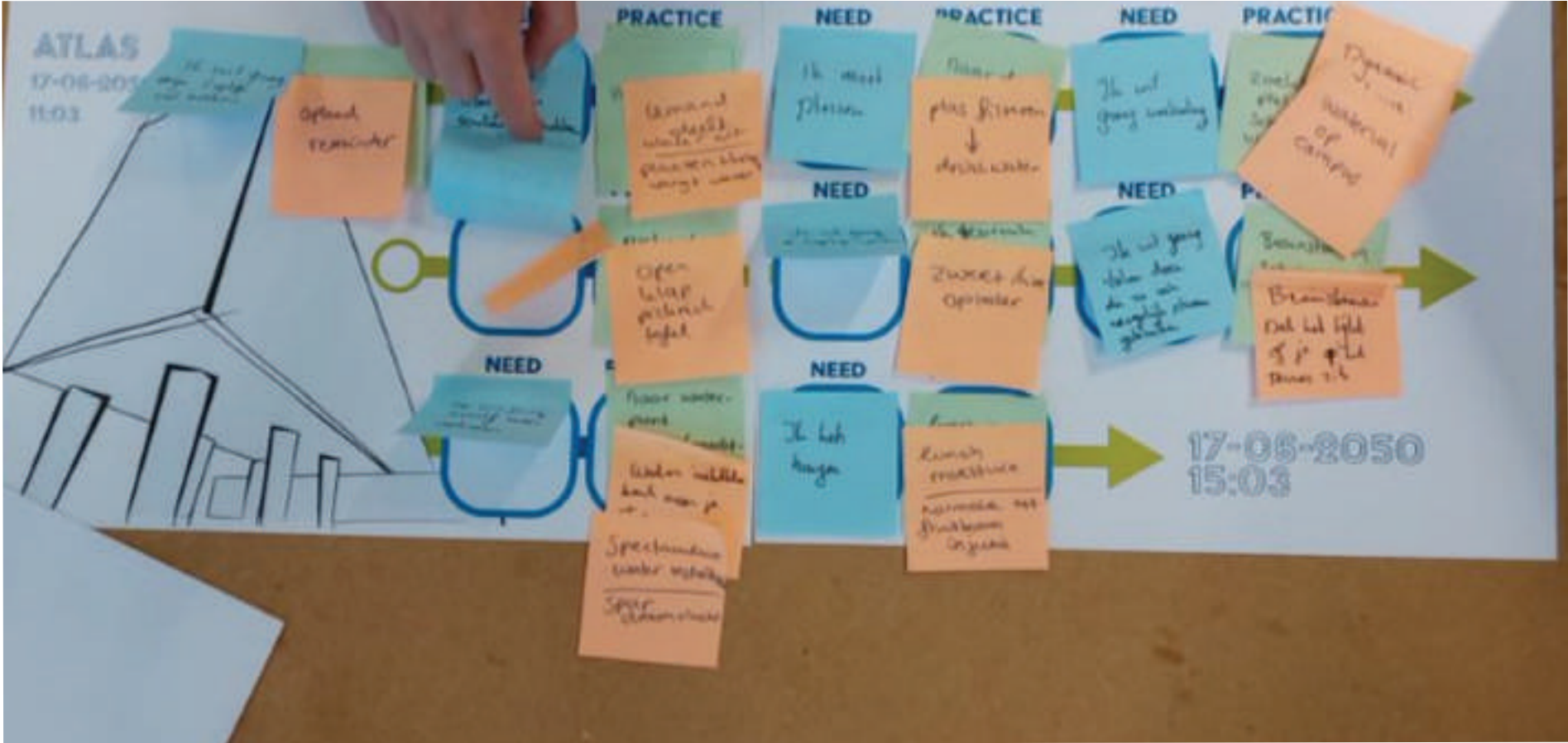


Appendix D - Sticky nodes group

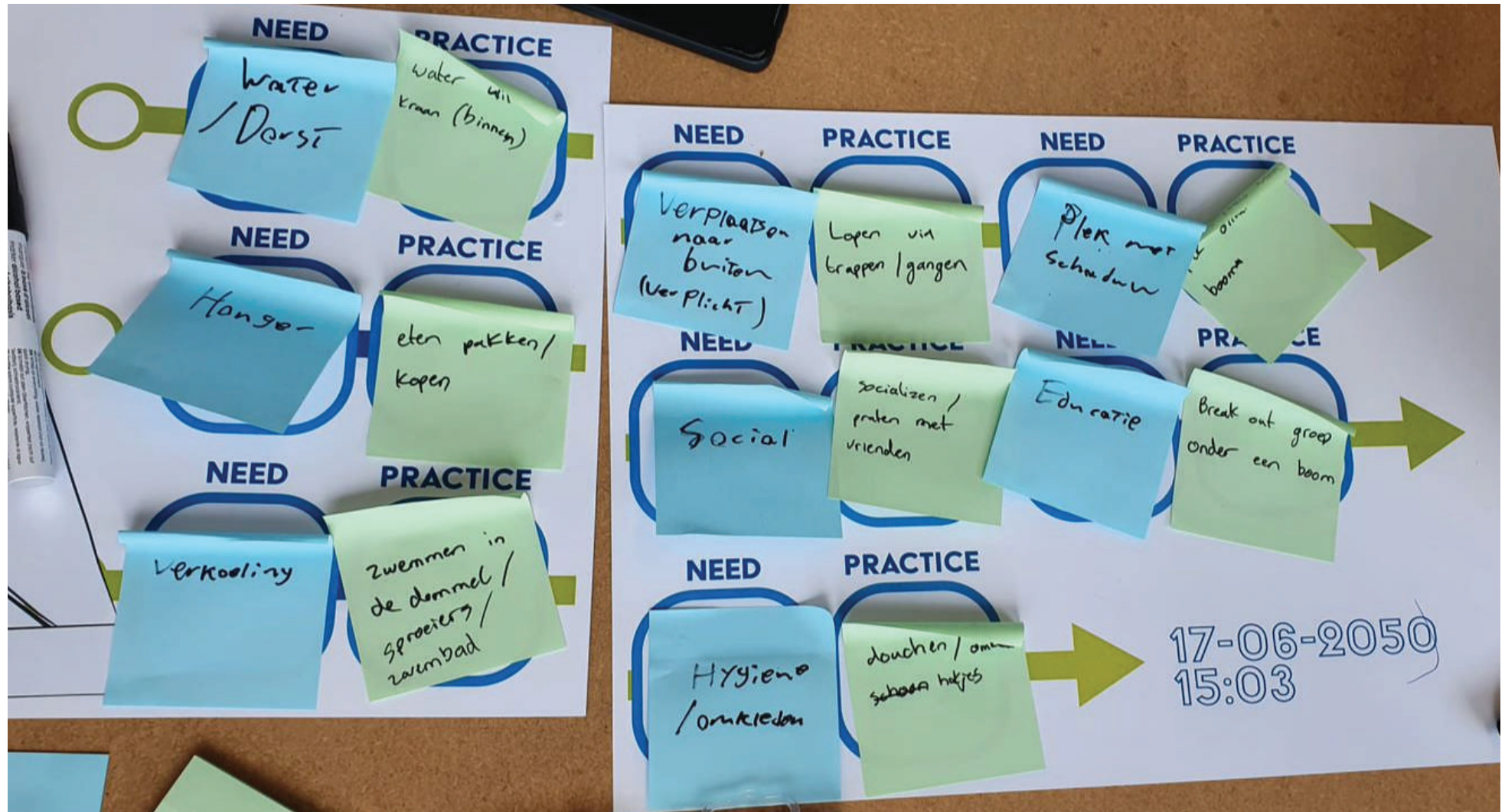
Group 1



Group 2



Group 3



Group 4

