Designing for children's agency in sustainability

Master thesis Design for Interaction
Suzanne Spiering

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Acknowledgements

During my period of graduating, I received much
help and support from different people.

I would like to express special thanks to my supervisory
team, Natalia Romero and Stella Boess, for their time
and effort, their insights and for complementing each
other perfectly. You helped me see clearly whenever I was
having a hard time seeing what the priorities were.

Furthermore I want to thank my friend Caroline,
who helped me organize a contextmapping session
with her girl scout group, which was a big source of
information both in that stage of the project, as well as
provided me with contacts for later in the project.

I want to thank Cora, Cor, Sem and Marissa for enthusiastically
trying out my prototypes, even changing their diet for a week.
This provided me with very useful feedback. I also want to thank
all other participants in my research. Without the help of some
of the wonderful girls I met during the contextmapping session,
my family, neighbours, colleagues and colleagues from friends,
I would not have had so much data to use in this project.

Furthermore I want to thank Nathalie, Elsemiek and Daniëlle
for cheering me on while I cheered them on, and for having
fun lunch/coffee breaks together (with comfort food) no matter
how busy we were. Being able to help each other out was
part of what made graduating fun. It was great to graduate
at the same time and finish university in the same period.
My parents, for listening to the unrequested and
endless number of sustainability tips and facts.
Valentin, for always supporting me and trying to help in
whatever way possible, and for being a home in a person.
Stacey, for proofreading this report and providing useful feedback.

While graduation was of, course a, challenge,
the people I could share it with made it a great
time and important period of my master!

Summary

Inspiration for this project are the climate strikes world-wide, in which students strike for climate justice. The children participating in these strikes indicate that they do not feel heard. While striking is relevant to communicate their opinions, change can also be initiated by changing the perspective of for example parents/guardians. This led to the initial design brief to 'help minors of the age 12 to 14 to take agency in developing strategies to decrease environmental impact in their home environment'.

The first phase of the project was the research phase. Agency in sustainability consists of a combination of the readiness to change behaviour and the feeling of self-efficacy one has. One does not only have to believe in their own ability to become more sustainable, but also must believe that those efforts make a difference. The research showed that an additional motivation to be more sustainable (saving money, being healthier) was the reason people stayed motivated in their efforts to be more sustainable.

This study provided an overview of factors that influence the self-efficacy and the readiness to change their behaviour, which together determine whether there is the possibility to take agency over a situation. A lack of intrinsic motivation and existing beliefs regarding sustainable habits or the value of current habits limit the readiness to change behaviour. A lack of information or highly complex information, a lack of constructive reflection, and unclear intention setting limit a feeling of self-efficacy.

The following design goal was formulated:
I want children of the age 12 to 14 to feel an appreciation for food when deciding what to eat together with their parents. My goal is not only to help them eat more sustainably, but also to help the family reflect on the value of current food habits in open. I determined the following desired characteristics: surprising, appreciative, connecting and in control.

Food for Thought helps families to pick meals based on what their limitations or values are on certain days of the week instead of what type of meals they want to eat. This responds to the limitation of not making concrete plans to realize intentions. It is a card set with a mobile application. The cards have on one side different categories of values, ('quick', or 'a treat'), On the back of the cards there are recipes that fit with the value they chose. Giving the family a sustainable meal idea ensures they have all the information necessary to prepare a sustainable meal, thus making it easier for them to fulfil their sustainability goal.

In this way the design bridges between intention setting and self-reactiveness and helps them discuss sustainability with the family.

This method of bridging between intention setting and self-reactiveness was useful to let the families look at their food habits differently and proved to be both educative and easy to implement. Using values to provide users with a fitting approach to behavioural change could be used in other situations where a change of behaviour is fitting.

Figure 1. The design outcome 'Food for Thought' placed on the refridgerator.

0. Introduction

This report is a graduation thesis for the Master program Design for Interaction (DfI) at the faculty of Industrial Design Engineering at the Technical University of Delft. For this report, the climate strikes of students world-wide, illustrating the increasing climate anxiety of these children, were chosen as a starting point. The goal of this research and design outcome is to give children a feeling of agency towards sustainability and help them have open conversations about sustainability with their caregivers.

In the first chapter, I explain the scope of the assignment and the original project brief. In chapter 2 I present literature research on agency, and in chapter 3 my own study on agency in children aged 12 - 14. The conclusion consists of certain limitations and strategies to take agency over a situation. In chapter 4, a more specific context to design for is chosen using brainstorm methods, and in chapter 5 I present my ideation process, three concepts, and iterations to come to a final design. This design is presented in chapter 6. Chapter 7 is about the validation of the design, and the report is concluded with recommendations for future continuation of the project (chapter 8) and the conclusion (chapter 9)

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1. Orientation

This first chapter explains the scope of the assignment: helping children to take agency in strategies against climate change. First I will explain the assignment as originally presented in the graduation project brief, and afterwards the different aspects of the assignment.

1.1. Project brief

The assignment is formulated as follows in the design brief:

"Help minors of the age 12-14 to **take agency in developing strategies** to decrease environmental impact in their **home environment.**

They will be enabled to do this by **using data** on the sustainability and comfort of the environment. The goal will be reached when students feel that data empowers them to **talk to their authorities**."

The complete project brief can be found in appendix A.

1.2. Global school strikes for the climate

Starting point for this assignment is the growing concern for the climate amongst children and teens worldwide, as illustrated by the climate strikes on Fridays in the past year. Greta Thunberg (then 15 years old) was the first child to strike for the climate (Wikipedia, n.d.). She demonstrated outside of the Swedish parliament to ask for stronger climate action. Soon more children followed her example, and the movement spread all over the world. The moment of writing this report (one year later) she is still known and talked about all over the world, and over 7.6 million people participated in a global climate strike week from the 20th to the 27th of September (Global Climate Strike, 2019). This illustrates how important this issue is to children and teens.

1.2.1. Climate anxiety
An increasing number of people suffers from 'climate anxiety', also called 'ecoanxiety' 'climate grief" or 'solastalgia', which are 'various difficult emotions and states arising from environmental conditions and knowledge about them' (Pihkala, 2018) which lead the

American Psychological Association to create a climate-change guide to help mental health care providers. Climate change affects mental health of individuals and can surface emotions like fear, anger and feelings of powerlessness and exhaustion (Moser, 2007). These feelings occur after a climate disaster, leading to post-traumatic stress disorder, but they can also occur because of thoughts of future harm, leading to pre-traumatic stress disorder (van Susteren, 2016). These are experienced more severely by children, and can lead to obsessive-compulsive behaviour. One example is picking up every single piece of garbage on the way to school (American Psychological Association, 2017).

1.3. Environmental impact of humanity

Climate change is one of the biggest challenges that the humankind currently faces. Before 2030, a reduction of 45% of greenhouse gas emissions is necessary to prevent 1.5 degrees increase in temperature (compared to the pre-industrial period) (Intergovernmental Panel on Climate Change, 2018). An increase of 1.5 degrees would mean more powerful storms, acidic oceans, periods of droughts and rainfall extremes. Big contributors to greenhouse gas emissions are the meat and dairy industry, as well as the transport industry.

Other human impacts on the environment are overconsumption (using resources at a faster pace than they can be replaced) with overfishing as an example (fishing more of a fish population than is necessary for it to recover, unintended by-catch), soil erosion, meat production, light pollution (benefitting some species and others not, changing predator prey interactions) or production of toxic materials (pesticides, plastics, nano materials for example influence the environment when they are intendedly or unintendedly released into nature).

The key in sustainability is **balance.** Human actions are not inherently bad or good for the environment, but it is necessary for the future of ecosystems to consider how resources can be used while maintaining the natural balances in ecosystems.

1.4. ENERGE project

This project is in collaboration with ENERGE (Energizing Education to Reduce Greenhouse Gas Emissions), a project by Interreg NWE that aims to achieve a minimum of 15% reduction in total energy consumption at 12 schools in France, Germany, Luxembourg, Ireland, the Netherlands and the United Kingdom. This will be done by implementing sensors to communicate the energy consumption, carbon dioxide levels and humidity of the air in middle schools and homes of students (ages 12 to 18).

As ENERGE believes that providing students with data on sustainability and comfort is a tool that students can use as leverage in the climate debate, it will be researched how gathered data can be used effectively by students to take agency in developing strategies to reduce energy consumption, which in turn will influence the view of caregivers on sustainability and comfort in the environment of the student.

While the ENERGE project focuses on the school context, this project is aimed at the home environment, as that is place where children spend most of their time and will have the most opportunity to change their own behaviours.

1.5. Goal of the project

I will be focusing on the first step of the process: *how can data on sustainability of habits be made actionable for children of the ages 12 to 14?* My goal is to design something that gives them a feeling of control towards the environmental impact of their habits. This understanding of the current situation can be a first step towards acting and starting conversations with caregivers. The first opportunity for this project is the collaboration with ENERGE. Two schools in the Netherlands are involved, which makes it easier to find participants for tests and research. Another opportunity is the data and knowledge that will be gathered at the schools during the project.

2. Agency – literature research

The following chapter explains the definition of agency, the relation with the feeling of self-efficacy, and the different things that can impact this feeling of self-efficacy and therefore the sense of agency. I then explain how this literature shows that children trying to be more sustainable, probably already are an inspiration to others without even noticing.

2.1. Agency: definition & stages

The concept of agency is described by Bandura (1989) as 'the human capability to effect change in themselves and their situations through their own efforts'. There are three types of agency. The first is individual agency, where one uses their own influence to change their own life. The second one is collective agency, where a group of individuals combine their knowledge to change the environment of the group. The third is proxy agency, where an individual wants to influence the environment, but lacks the skills to do so him or herself and finds someone else with these skills to make the change for them. Taking agency consists of four stages (see figure 2), first forming the idea that one would like a certain situation to be different (intention), in the second stage one thinks of strategies to create that change (forethought), after that comes the implementation of the plan (self-reactiveness) and lastly one assesses whether the plan had the desired effect or if a different strategy is needed (self-reflectiveness) (Bandura, 1989).
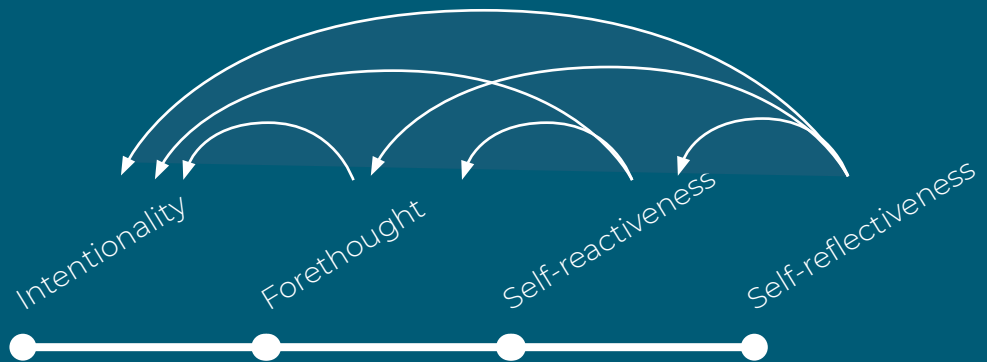
Figure 2. Steps in taking agency as described by Bandura , 1989.

2.2. Self-efficacy

A concept that is linked to agency, is 'self-efficacy'. Self-efficacy is the belief in one's ability to influence events that affect one's life and control over the way these events are experienced (Bandura, 1994). High self-efficacy is a starting point for agency, since without any belief that it is possible to influence the situation, one is not likely to try to change (Bandura, 2008).

Increasing self-efficacy is the main goal of this project, since self-efficacy is the underlying feeling that one has about whether a situation can be influenced. Bandura describes four things that impact self-efficacy: mastery experience (experiencing a situation in which one manages to successfully influence one's own life), social modelling (seeing people similar to oneself succeed), social persuasion (finding the right mentor) and states of emotion and physiology (having a positive attitude).

A high feeling of self-efficacy has multiple benefits. First, having high self-efficacy and taking agency over one's one life is a starting point for behavioural change. This behavioural change can happen in different areas of life and can have a positive influence on one's wellbeing.

In the case of collective agency, contributing or giving back to a community enhances the well-being of a group (Rath & Harter, 2010). Seeing their impact leads to an empowered feeling (Hothi, Bacon, Brophy & Mulgan, 2008). Lastly, wellbeing is enhanced when individual efforts do not go unnoticed.

2.3. Low feeling of agency in children

Currently, there is a group of children who feels powerless regarding climate change and sees striking as their only way to voice their concerns (RTL Nieuws, 2019). As they see striking as their only option, they either do not recognize the influence of their personal behaviours (being part of the whole that creates the problem) nor the ripple effect that their actions can have on others.

While striking can be a very effective way to voice concerns towards policy makers, I aim to design something that gives children a sense of agency in sustainability through **reflection on the impact of their own habits** to decrease climate anxiety.

The following image shows how agency and self-efficacy are influenced by other factors as found during the research activities:

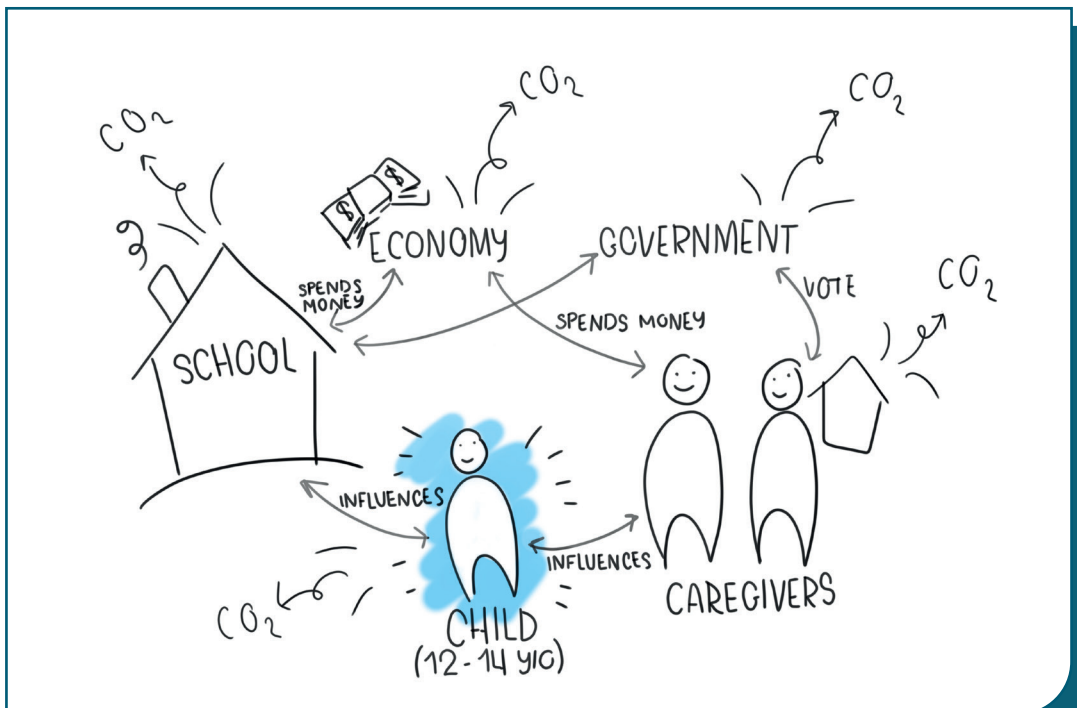*Figure 3. How a child can influence climate policies through links with others*

3. Agency - study in children 12-14 in sustainability

After the literature study on agency, I formulated different research questions regarding sustainability in children aged 12 to 14 and agency. I used different methods to research these topics. The outcomes of this research will be used to define the intended effect I want the design to have.

3.1. Research topics and questions

I wanted to answer the following research questions before defining a design goal. The first set of questions relates to children and sustainability: the knowledge they typically have at the age of 12 to 14 and where that knowledge comes from. The second category is sustainable behaviour and taking agency. What are the differences between children who feel like their actions influence the climate, taking ownership, and the ones who do not? What behaviours make them (feel) successful in creating sustainable habits, or maybe result in the opposite?

Children & sustainability
Q1: Which habits do children of the age 12-14 link to sustainability? How broad is their knowledge of sustainability? To what extend do views on sustainability differ from child to child?
Q2: Where do they learn most about sustainability?
Q3: What is their attitude towards sustainability in those areas and is it clear where this attitude comes from?
Q4: To what extent do the viewpoints of the family influence the view of the child?

Sustainable behaviour & taking agency
Q5: To what extend do children of the age 12-14 think their own behaviour influences climate change?
Q6: What are limitations that complicate taking agency?
Q7: What are strategies that help taking agency?
Q8: What level of detail should information on sustainability be, for them to be able to use it to formulate their own strategies and take agency?
Q9: To what extend does the belief a child has about their own sustainability match how sustainable they actually are?

These questions will be answered with different research methods: interviews with different people, a context mapping session and a session with the ENERGE student committee. How these methods were used, and the results will be explained in the remainder of this chapter. After each activity is explained, first the key insights from the research are presented, and a general analysis is shown at the end of the chapter.

3.2. Interviews

The first method used are interviews. I interviewed the following people:

- A boy, 14 years old. Aimed to gather data for research questions Q1 to Q7
- Two girls, both 14 years old. Aimed to gather data for research questions Q1 to Q8
- A boy and a girl, 11 and 12 years old respectively. Aimed to gather data for research questions Q1 to Q8
- Mother of a girl of 11 years old. Q1 to Q4, Q6
- A representative of GGD Haaglanden, about project 'Zuivere Lucht', Q6 to Q8
- A middle school geography teacher. Aimed to gather data for research questions Q1 to Q5.

3.2.1. Setup
In each of these interviews I followed an interview guide, set up before the interview. After the first interview, some tools (small assignments) for the children were used to structure the discussion and help them verbalize their thoughts. These changed each interview depending on how well a worksheet helped during the previous interview, after which it was improved or left out. One example can be seen in figure 4. I asked the children to place their family members on a line from most to least sustainable, and afterwards asked them to explain why. Another activity was 'sustainable dilemmas', a quiz in which they had to pick between two difficult options and discuss the answers with each other. The interview guides, the transcripts and the work sheets used for the interviews can be found in appendix B.

In the analysis was looked at both quotes, as well observing communication if more than one person participated in the activity and observing how they used the provided materials.
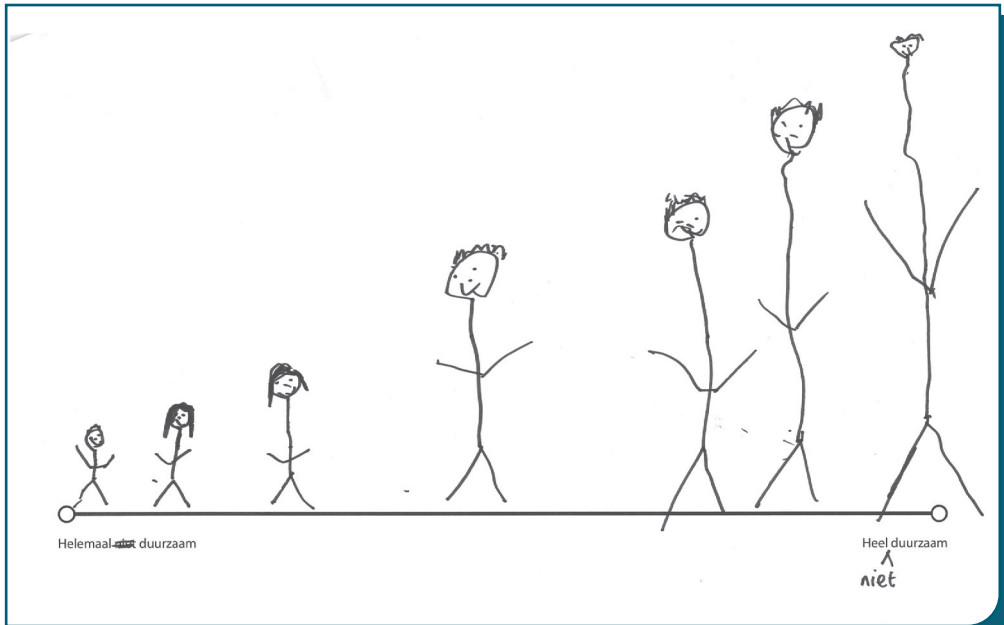
Figure 4. Ranking of family members from most sustainable (left) to least sustainable (right): participant himself, his sister, his mother, his uncle, his father, his grandma and his grandpa respectively

3.2.2. Key insights

1. The interviews showed a big difference between children in terms of their knowledge about sustainability. In school, the children learn in geography about climate change and sustainability, but this information is on such an abstract level that it is difficult for them to link it to their own life. Additionally, the interviewed geography teacher indicated that at the age of 12 to 14, there is a gap between the interest of girls and boys in sustainability, as the girls are for example more interested already in following the news and developments in the world.

2. In most cases, the 'hidden' emissions of habits are not clear to the participants. One example: one of the participants understood that regular cars, motorbikes and scooters emit CO_2 (smoke coming out of the exhaust) but thought that the use of electric cars and bikes did not. Similarly, he did not understand the CO_2-emissions of the use of electricity, which became clear only during the interview.

3. Parents seem to play a role in making this knowledge more applicable. The child who knew most about sustainability and could name many ways her habits influence the environment (food, both choice of food and ways of preparing, packaging, material use, showering, and more). She indicated to talk about it with her parents.

4. Every participant that successfully created a sustainable habit, often had an underlying motivation to do so and found a way in which sustainability could be a tool to reach that goal. For example saving money by recycling more effectively, or saving money by eating plant-based instead of a diet with meat.

5. Sustainability showed to be a complicated topic. One of the participants for example wondered what is more sustainable: heating water on the stove when cooking rice, or getting tap water as hot as possible and then heating it to boiling temperature on the stove?

3.3. Context mapping session

A context mapping session at a girl scout group with 21 children of the ages 11 to 15 years old was the next research activity. The goal of the session was to find more tacit knowledge about the way children experience taking agency in general and in sustainability, touching upon all research questions. The approach as described by Sanders and Stappers (2012) was used to set up this session.

3.3.1. Setup
They received a sensitizing booklet one week prior to the session, which can be seen in figure 5. The topic of the contextmapping was 'sustainable habits', and mainly served to gather data on Q1 to Q5, specifically the role of those in the environment of the child on the viewpoint of the child. In addition, they received a sheet with stickers, a consent form for participation, and a garbage bag in which they were asked to collect their plastic waste. Twenty sensitizing booklets were handed out, of which 8 where filled out and returned.

At the beginning of the session, I asked the participants to hand in their sensitizing package, numbered them. I let them fill out a three question questionnaire with the corresponding number and gave out an envelope with the materials they needed for the session (including the same questionnaire again to be filled out at the end of the session). Numbering them enabled me to compare their answers in the beginning and at the end and relate them to their sensitizing booklet.
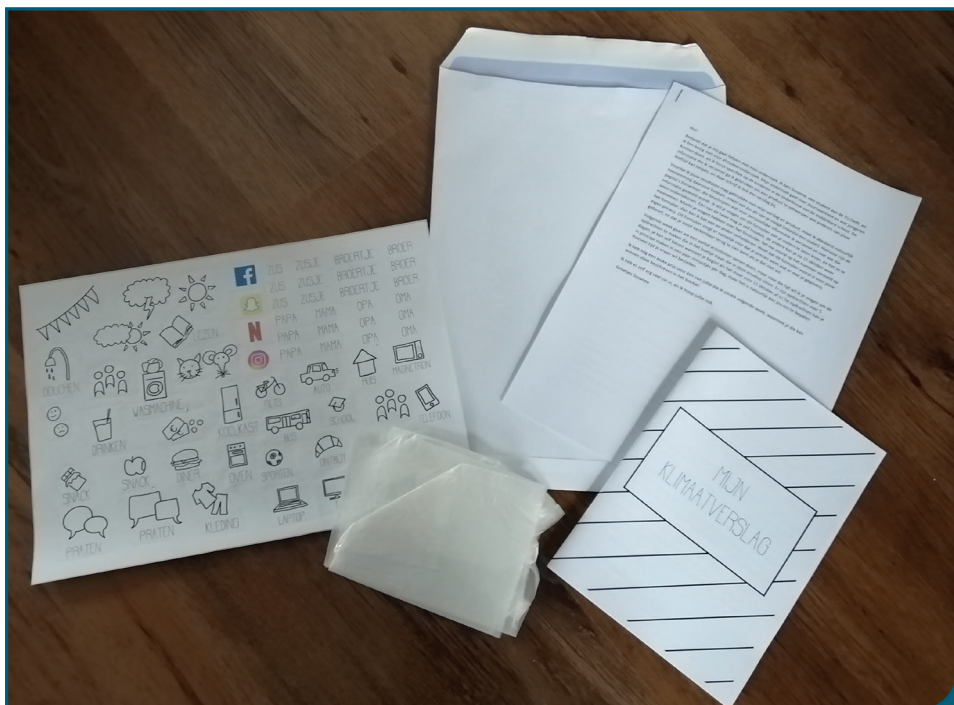
Figure 5. The sensitizing package: a booklet, a sheet with stickers, and a consent form with information on the research

During a 1.5-hour long session they were asked to make an overview of the intentions they set at one point and whether they managed to change that behaviour and create a visual representation of their plastic waste from the past week. These exercises aimed to answer questions Q6, Q7 and Q8 on limitations and strategies in agency. A dilemma quiz with dilemmas on sustainability aimed to show how children in the age group discuss sustainability and to see how they might influence each other.

The script for the session, the sensitizing booklet, the materials used for the session and the filled-out materials can be found in appendix C.

For the analysis, the answers in the sensitizing booklet were related to the questionnaires the children filled in. After noticing that the children who returned a filled sensitizing booklet were interested in sustainability, I also looked at the differences between the questionnaire answers of the group that did and the group that did not fill in the sensitizing booklet.
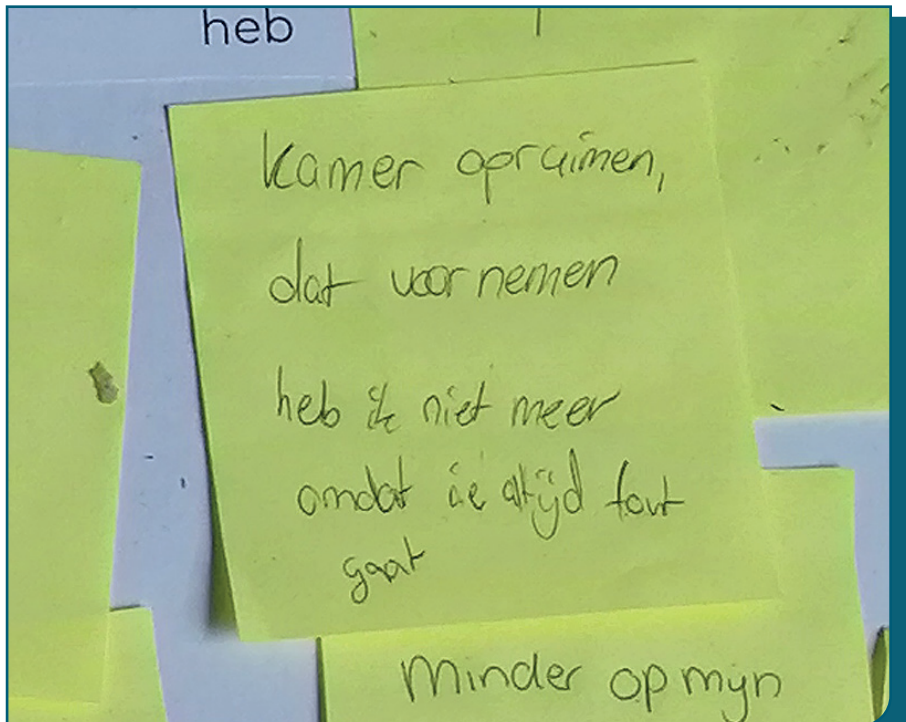
Figure 6. One of the good intentions that did not work out for one of the participants: 'Cleaning my room, I don't have that intention anymore because it always fails'

3.3.2. Key insights

1. Children often determine how sustainable they are based on one or a few habits. For example, one girl thought she was quite sustainable, saying she used natural skincare. However, when looking at the average duration of her shower each day, she took the longest showers of everyone who filled out a booklet (average of 13 minutes a day, compared to an average of 6 minutes a day for the others).

2. The girls who filled out their sensitizing booklet, turned out to be most interested in sustainability and had a positive view on their own influence. The others either did not believe their efforts were significant, or they just were not interested in the topic. Some loud comments during the session resulted in a lowered feeling of agency in some of the girls, commenting 'It is not only my actions that matter, we have to do it together'. The realization that others might not be willing to do the same effort as they were, was not a good motivation for them.

3. Looking at intentions the participants failed/ succeeded at, it seems that it is easier to add a new habit to the current habits, than it is to stop or change a certain habit. Eating more fruit for example is something many of the participants managed to do, while taking shorter showers or going to bed earlier is something that they indicated to be more difficult.

4. In the sensitizing booklets, even though they did not always mention them as an inspiration, they did indicate that family members had sustainable practices comparable to their own, which could be an indication that they do see them as an inspiration for their own habits (see figure 7 for an example).
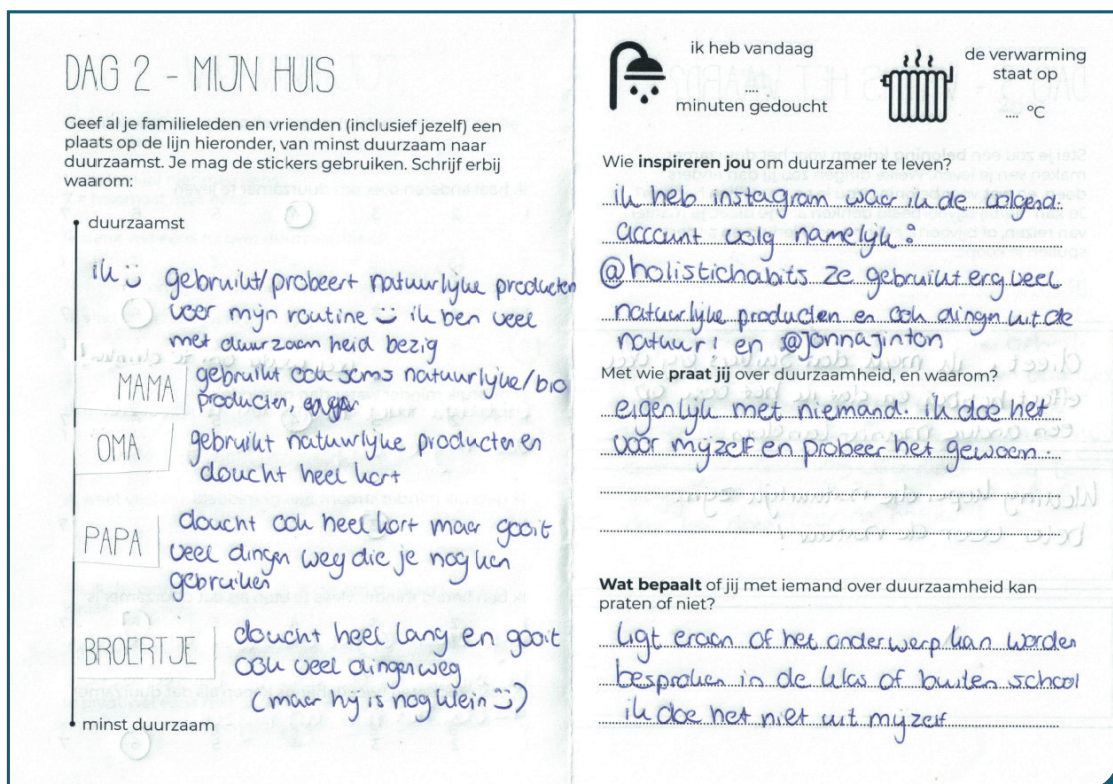
Figure 7. One of the sensitizing booklets. Participant does not mention her family as an inspiration, yet her mother and grandmother have sustainable practices along the same lines

5. When presented with the dilemma 'Free vacations forever' or 'The plastic soup disappears', all children indicate that they would choose to let the plastic soup disappear (see figure 8 for a drawing of one of the children). The plastic problem seems to be something they worry about.

6. While some participants were impacted negatively by the fact that others were not putting in the same effort as they were, one girl actually was surprised by how sustainable she was compared to the others, which increased her feeling of self-efficacy. (see figures 9 and 10 for the two types of answers given in the questionnaire)
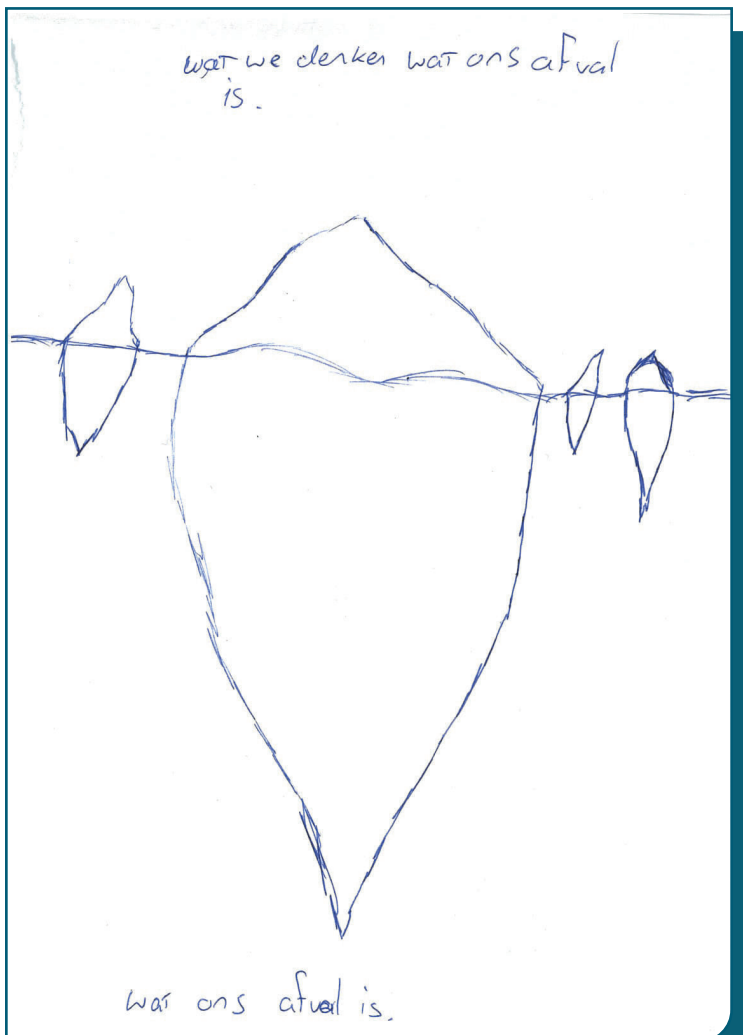
Figure 8. How much waste we think there is vs.. how much it actually is.

7. Some children had the intention not to watch Netflix in the evening in bed, as it made them go to sleep way too late on weekdays. They however did not manage to change the behaviour, maybe because they underestimate how difficult it is to make that decision in that moment. While they could have come up with a strategy (leaving their phone outside of their room at night for example) there was a lack of reflection. Another example is the girl writing the note in figure 6, saying she did not have an intention anymore because she kept failing.

Figure 9. Two participants more positive after the contextmapping session

Figure 10. Two participants less positive after the contextmapping session

3.4. Session ENERGE student committee

The ENERGE student committee visited Delft in October 2020, which was the perfect opportunity for an additional session to learn more about the sustainability and comfort habits of students and how and with whom they communicate about this. Groups from two different schools visited, one group of 6 students and one of 4. The group of 4 were all above the target group for this project, in the other group were two children in the target group and 4 older than the target group, which was considered in the analysis of the research data.

After a short presentation from me, they were asked to fill out two sheets on their communication about sustainability both at home and at school, and one on their sustainable habits (which can be seen in figure 11). They wrote their answers on post-its and placed them on the sheet. The script, presentation slide and work sheets (both empty and filled out by the participants) can be found in appendix D.

3.4.1. Key insights
1. These children seemed to think a big difference could be made through changing government policies.

2. The children said they did not like Greta Thunberg, as they felt that the whole movement was looked at for the way she behaves and her aggressive tone. They did not necessarily see her as an inspiration.

3. They were able to look critically at the sustainability of different options. For example: what is more sustainable? Everyone a Chromebook with all the books, or using the same book for six years and passing it onto someone new each year? They also were able to identify possible limitations to sustainable developments, for example what would happen if everyone would buy an electric car right now, and would want to have a new one in 5 years if the developments are going so fast that there will be much better electric cars in a few years.

Figure 11. The participants filling the 'sustainable habit' sheet with postits. Picture taken by Lina Li.

Figure 12. Observing the actiivities of one of the groups, aksing for clarification on some of their anwers. Picture taken by Lina Li.

3.5. Results

The results from all the research activities are combined in this section to elaborately answer all research questions. The results were analysed by gathering all quotes and observations from the different research activities.

These were categorised in different ways. First the types of sustainable behaviours were grouped, then the willingness to perform sustainable behaviours. Then I realized that there were participants in the research who felt perfectly capable to be sustainable, but still were not willing to change behaviour. I ended up with a framework with four quadrants, combining self-efficacy and readiness to change behaviour to determine if participants have agency. Figure 13 shows the initial categorization of the quotes and observations.
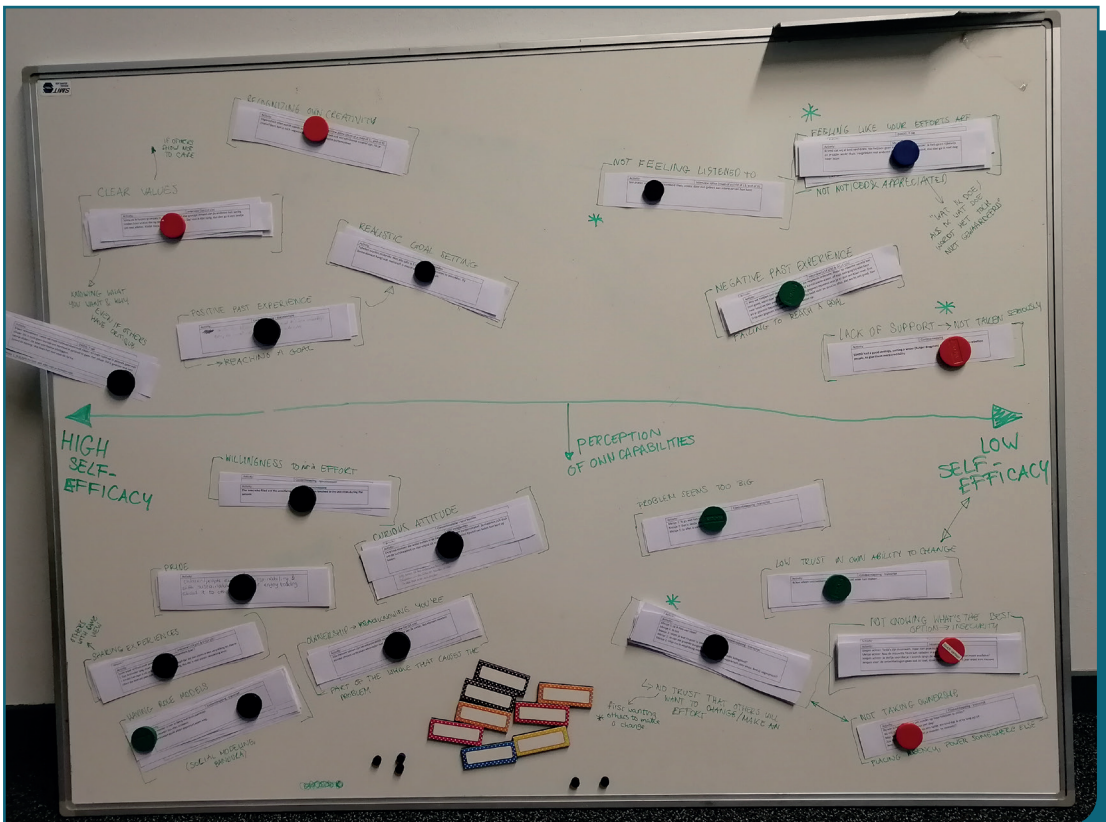
Figure 13. First setup for the data analysis

1: Children & sustainability

Q1: Which habits do children of the age 12-14 link to sustainability? How broad is their knowledge of sustainability? To what extend do views on sustainability differ from child to child?

This differs greatly from child to child. The interviews showed that some consider many areas of life, like energy use, food, transport and packaging, while others link sustainability only to things that emit smoke, for example factories, cars and motorbikes. For some children, something like electricity is a given, so if they are never encouraged to question where it comes from, they are not aware of the fact that that also has effects on the environment.

There is a difference between male and female students. The girls tend to be more mature at that age, more interested in following the news and therefore start to ask critical questions, while for boys this happens at a slightly older age. This also could be seen in the interviews, where the two boys interviewed clearly had less interest in the topic, although that could be a coincidence with a relatively small number of interviews.

The following areas of life were mentioned throughout the research: food, food packaging, preparation of food, phone/device use, transport, waste recycling, toys from natural materials, water usage (including showering), factories and skin care.

Q2: Where do they learn most about sustainability?

The children learn about sustainability in middle school (on an abstract level, the global effects) in geography lessons according to the interviewed geography teacher. This knowledge however is quite abstract, and not linked to the personal lives of the students, as they can roughly explain what climate change is during the interviews but find it harder to explain how their own actions are linked to it. There are not necessarily chapters about sustainability on the curriculum for children aged 12 to 14, so awareness around this usually happens in higher middle school classes or in additional classes.

At this age, most of their practical knowledge comes from watching the news, conversations with parents and other family members, and sometimes spending time in a different context like being a member of a girl scout group that pays some attention to survival in nature and the relevance of respecting the environment.

Q3: What is their attitude towards sustainability in those areas and is it clear where this attitude comes from?

None of the children said that it is not important to be sustainable, however some of them were quite sceptical of the relevance of a single person becoming more sustainable. The ones who were happy to have sustainable habits, often had an additional motivation, like saving money, being healthier or spending more quality time with others. Table 1 shows all the different reasons the participants have for their sustainable habits.

Participants with sustainable habits, whether their primary goal was being sustainable or if their behaviour benefitted them in a different way, were all proud of their behaviour and happy to tell about it.

Sustainability can mean something else to different people, and different habits are considered. Participants were sometimes very aware of sustainability in one area of life, and completely unaware in another. This also means that paying attention to sustainability (or thinking one is sustainable) does not automatically mean that it makes a person more sustainable, as there might be other habits that are highly polluting that a person is completely unaware of.

The attitude towards food is a complicated one. Meat is seen as something that is part of a good meal, and I noticed prejudice towards meat substitutes. This made participants less willing to change behaviour. A behaviour like showering time on the other hand was something many participants wanted to change.

Organic skincare	To treat acne, feel confident
Organic medicines	To treat conditions
Separating waste	To save money
Vegan diet	To save money
Meat-free days	Healthier
Planting trees	To climb, which is fun
Watch energy use	To save money
Travel by bike	Healthier
Use phone less to talk to friends	To meet in person, more fun
Reusing plastic waste for arts & crafts	To have fun

Table 1. Sustainable diets and additional motivations

Q4: To what extent do the viewpoints of the family influence the view of the child?

The children I spoke to in the research with a very broad awareness of sustainability of their own habits usually indicated the influence of a parent or an older brother/sister (picking up litter together, having a parent that uses natural pain remedies or recycling). The way the parent discusses this with the child has a big impact, as I also spoke to children who did not recognize some behaviours that the parents tried to teach them as sustainable.

Two exceptions are that one of the participants mentioned the influence of being a girl scout in an interview, and one of the children mentioned two Instagram accounts that she followed for skin care inspiration.

2: Sustainablility & taking agency

Q5: To what extend do children of the age 12-14 think they can influence climate change?

They all think that their behaviour has impact, although some think that their impact is too small to be significant. After the context mapping session, seeing how others might not make the same effort was demotivating for others and had a negative effect on their self-efficacy.

That made me realize that in sustainability, agency does not only depend on the personal (perception of) ability to change one's behaviour. There are people who do not believe they can change their own behaviour on a certain aspect of life (low self-efficacy) for various reasons, and others who do believe they can change their behaviour (high self-efficacy). Then in both groups, there are people who believe that changing ones behaviour is useful and relevant for the environment (having a feeling of agency on a larger scale and thus are ready to change behaviour), and there are people who do not think that the actions of one are significant (a low feeling of agency on the larger scale, making them less ready to change their behaviour).

As I have seen with the participants in this research, an additional motivation plays a big role here, as people like to justify things for themselves. If they do not have an intrinsic motivation to change,

they will justify this by telling themselves that their behaviour in the grand scheme of things will not make a significant change anyway. If something you do for yourself (your health, your finances, etc) turns out to be sustainable as well, it is interesting to tell this as one of the reasons for doing things in a certain way. These different motivations are also shown in the answer on research question Q3.

This results in four quadrants, as can be seen in figure 14. The people with both a high self-efficacy and a willingness to change behaviour are most likely to actually adopt a sustainable habit (take agency). Then the next question is: what are the characteristics of people in each quadrant, and how can they be used as strategies to help people feel a higher self-efficacy and willingness to change towards a more sustainable behaviour?

Q6 & 7: What are limitations that complicate taking agency, and what are the opposite behaviours that can help in changing behaviour?

These two research questions are answered simultaneously, as a limitation often pointed to the opposite as a strategy and the other way around. Clustering answers from participants in different situations lead to categories of limitations preventing taking agency, which can be seen in the quadrants in figure 14 and are explained below.

No intrinsic motivation vs Using sustainability as a tool to reach a personal goal

The people in this research who successfully implemented a sustainable behaviour, all saw an additional value in sustainable practices apart from taking care of the environment, as is explained earlier on page . This additional value kept them motivated, as they were doing it for themselves even if the influence on the environment would be minimal.

In many cases this benefit was the main reason to adopt a certain behaviour, later they found out that it was also sustainable. The choice of what information to provide to them could make the difference between just educating them and increasing their readiness to change habits. Values are important to consider when trying to change a behaviour, and not only the values that are a reason to be more sustainable but also the values that are a reason to choose for a less sustainable option, as they can be stronger than the values behind wanting to change. In many cases, with some creativity, there are possibilities to use sustainability as a tool to reach goals.

Have certain sustainability 'rules'/strategies they use to determine the sustainability of a habit

These strategies enable them to set clear goals and intentions

Reflect on their attempts, have an experimental mindset towards their habits

Have an intrinsic motivation to change (health, finance, etc)

Beliefs support a sustainable behaviour

high readiness to change behaviour

high self-efficacy

low self-efficacy

low readiness to change behaviour
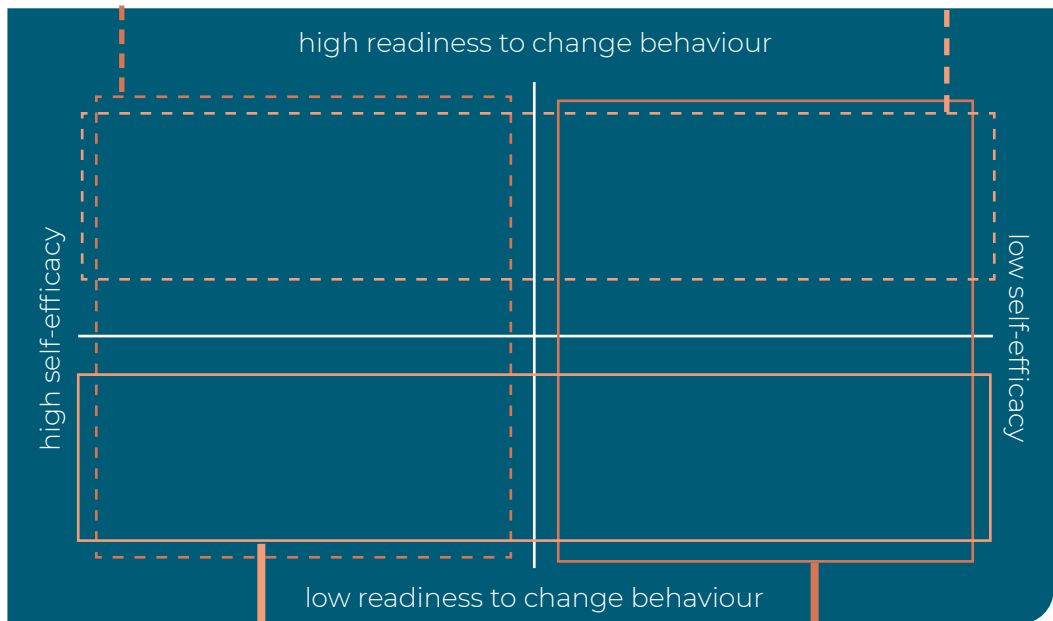
Lack of intrinsic motivation: high value in current, unsustainable habits or lack of value in sustainable alternatives

Existing beliefs

Lack of information/ information that is too complex

Lack of constructive reflection (linked to a having a realistic view on the value of existing habits)

Setting unclear intentions

Figure 14. Four quadrants and factors influencing the readiness to change behaviour and the self-efficacy in the different groups of people

Existing beliefs, prejudice vs Being curious to try new methods

If the participants take agency to create sustainable behaviours, can depend on the type of behaviour we are looking at. Depending on existing values and beliefs, different children showed a different attitude towards for example a vegetarian diet to decrease CO_2-emissions. When explaining that the most recent meat substitutes taste quite like real meat, they still were not open to adjusting their opinion. This is linked to Having social support.

As stated earlier, at this age, most of what the children know about sustainability is learned from parents and other family members as only at this age they start to looking at sources of information outside of the family. This makes it likely that any prejudice towards a certain habit is also something learned from parents, which makes it less likely for a child who wants to change this habit to receive support from the other family members. Existing beliefs in others can therefore be a limitation to becoming more sustainable.

Lack of information or highly complex information vs Having (or thinking you have) the knowledge needed

The people who were confident about their sustainable behaviour had a clear way of determining whether something was sustainable or not. For example: organic skin care is more sustainable than regular skin care.

If they actually are more sustainable following these narrow guidelines is debatable in certain situations (for example, does organic skincare versus regular skincare actually make that much of a difference regarding environmental footprint?), but their simple guidelines takes away uncertainty of not knowing what the right choice is. Even if in some situations it might be an oversimplification of all factors contributing to sustainability, this way of arguing at least motivates to make changes, and it might in most situations work just fine.

It often is unclear what is sustainable and what not. This complexity can make becoming more sustainable seem like a very daunting and impossible task.

Lack of reflection vs Constructive reflection (

When trying to change a behaviour and setting an intention, it helps to create overview of what might stand in the way in the moment the actual decision has to be made.

This requires reflection on the habit and the reasons behind behaving in a certain way. In this way, the underlying values and circumstances of a habit can be mapped and that enables a person to determine strategies for possible problems before they arise

Next to reflecting at the moment of setting an intention, reflection after each attempt to change behaviour is required, as it can help identify what exactly went wrong or right, which is useful information in the next attempt.

Setting unclear intentions vs Setting actionable and realistic goals
This relates to the previous one. If the guidelines for determining if something is sustainable are very straight-forward, it is easier to formulate goals in a way that success is easier to measure and will make it easy to formulate a strategy. For example 'eating less meat' is already more clear than 'eating more sustainably'. This however requires the information that enables a person to determine what would be a better alternative to the current situation, which in the beginning might result in an intention aimed not at changing a behaviour, but at gathering the needed knowledge to be able to do so.

Q8: What level of detail should information on sustainability be, for them to be able to use it to formulate their own strategies and take agency?

This question depends on the chosen context for the final design goal and depends greatly on the current knowledge that children already have. In general I would conclude that information should be quite detailed and readily applicable without too many translational steps in between, especially if the children are not too aware of the indirect influences of their actions on the environment

Q9: To what extend does the belief a child has about their own sustainability match how sustainable they are?

The idea that a child has about how sustainable they are does not always seem to fit with how sustainable they are. The children tend to weigh different habits in different ways, and if they are passionate about a certain area of their life that they are very sustainable in, they sometimes oversee other habits that are highly polluting.

3.6. Conclusion

I decided to focus on sustainable dinner for the design goal for the following reasons: food is a family habit, especially the evening dinner, which makes it more difficult to change as the opinions of multiple family members need to be considered. It is not just a functional habit, but food also has cultural value. For example meat production makes up for 40% of the footprint of Dutch citizens (Milieu Centraal, n.d.) and consuming large amounts do not seem to have positive effects on health (500 grams per week is the maximum recommended amount by Voedingscentrum, compared to the 735 grams we now on average eat per week), yet many of the children in the study seem to think meat is an essential part of their diet. In addition, there are many aspects of food that influence the sustainability, and an open and positive family atmosphere to try out and reflect on choices is needed.

4. Defining the design brief: dinner habits

The following chapter explains how from the context of dinner habits, a specific design goal was formulated through brainstorming about different steps that dinner habits consist of.

A brainstorm on dinner habits with two different groups provided the needed insight in all steps that need to happen before an actual dinner is on the table, and what happens afterwards.

From this overview, then one moment in the whole user journey is chosen to focus on for the ideation phase.

4.1. Brainstorm on dinner habits

Two brainstorm sessions were performed, of which one was done with 3 IDE master students and one with 4 middle school students. The goal of the brainstorm was to create an overview of the whole journey from deciding what to eat, to discarding leftovers. To structure the brainstorms, a template was used that shows the whole journey (see figure 15 below). The participants added information to this timeline, making sure that all aspects were touched upon during the brainstorm session.

The session with the middle school students also included a short idea generation session on ways to make regular meals more fun, to see what for them is special in their current habits and what they would find interesting in forming new habits.
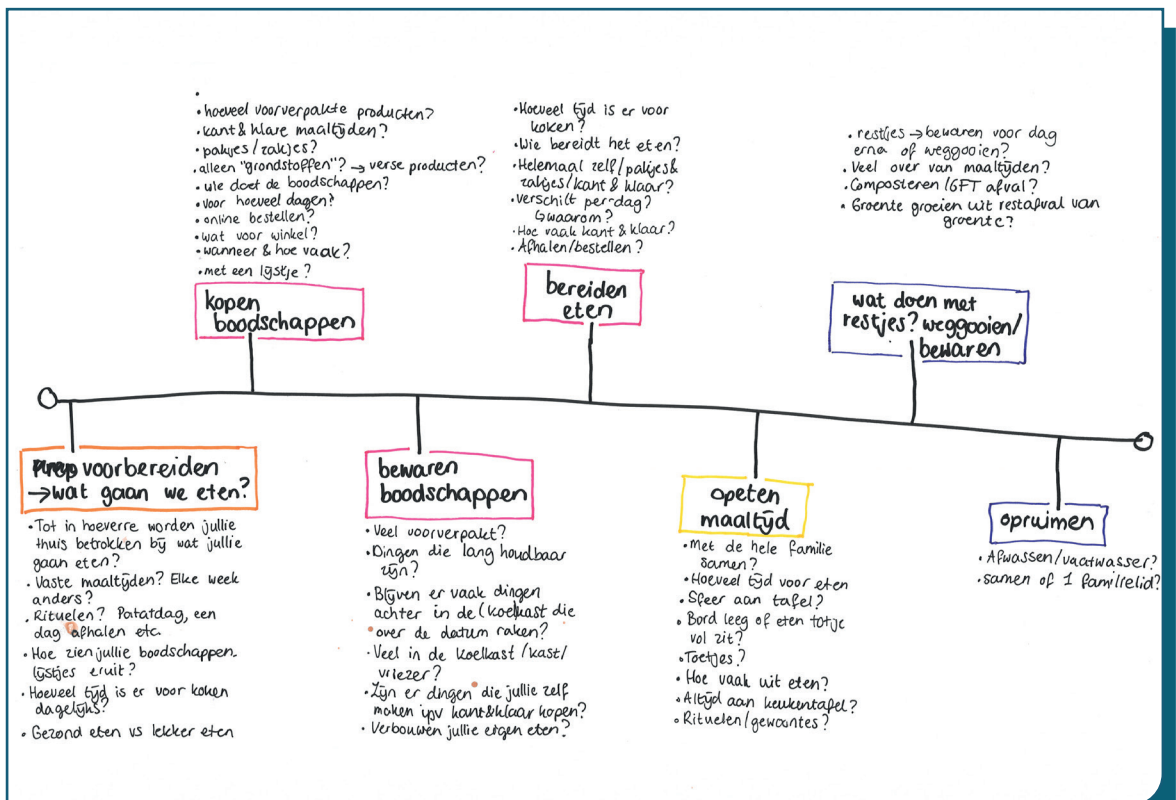
Figure 15. All aspects of dinner habits that was looked at during the brainstorms (preparation, deciding what to eat; buying groceries; storing groceries; preparing meals; eating meals; handling leftovers; cleaning after dinner)

4.1.1. Brainstorm 1: with four middle school students

In these brainstorms I became aware of the values that certain food habits have, for example the celebration of the weekend with an easy and tasty meal like pizza or fries. These habits are not just about the food – they fit in a certain atmosphere of celebration and relaxation, and often there are additional fun habits that link to the type of food.

One girl for example said that Fridays mean an easy meal, eating in front of the television watching a fun movie, while the other said that the Friday was fun because they treated themselves with a nice dinner, conversations with the family, and being allowed to stay up later than usually. As comparable in value to those type of meals, they mentioned activities like 'meeting with friends', 'celebrating New Years Eve with family and friends', or 'vacation with just the family', which indicate that for them the aspect of connecting with each other is important

Figures 16 to 19 show the four children at the location of the brainstorm, one of the filled out templates, and one of the sheets with product ideas the children came up with.

Figure 16. The children participating in the brainstorm about dinner habits

Figure 17. Activities that the children said have similar meaning to special dinners
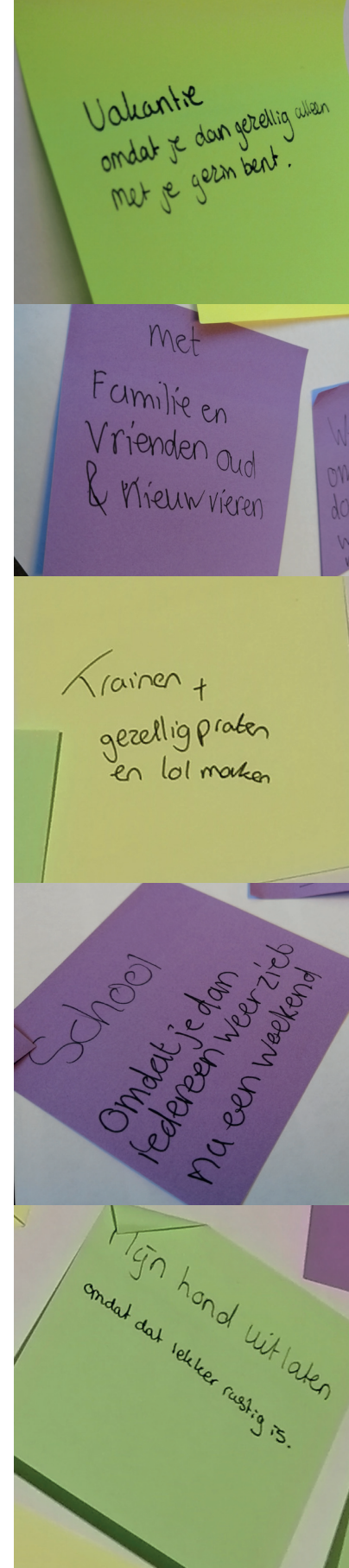
-meestal halen we op maandag de boodschappen
-mijn moeder haalt de boodschappen
-we maken een lijstje met wat we nodig hebben.
-we halen vaak de boodschappen bij de Lidl en AH.

-we eten meestal om 18:00.
-Als w mijn moeder laat thuis is kookt mijn broer meestal iets met pasta of lasagne
-we bestellen soms iets maar dan is het nooit als we met vrienden gaan eten, dan is het pizza OF chinees

kopen van boodschappen

bereiden van eten

Figure 18. Part of one of the filled out templates

● inpakken met eetbaar inpakpapier

● van de groenten groente chips maken

● Door er een soort spel van te maken Bij voorbeeld:
eet 4 wortels en 2 aardappels
Dan mag je een glas siroop.

● ongezonde dingen gezond maken

● Thee met iets lekkers na het eten.

Figure 19. Ideas the children thought of during the session to make regular dinners more special

4.1.2. Brainstorm 2: with 3 IDE IPD master students

The brainstorm with the IDE students mainly made me aware of the numerous things that could be considered when looking at sustainable eating, and the lack of transparency in the current system that makes it difficult to make an informed choice. In the last generation, we moved from going to a dedicated, specialized shop to buy groceries like meat, cheese and vegetables, to a supermarket we can buy everything in one place.

While it might be convenient, it is less clear where the food comes from, and we expect everything to be as cheap as possible. We concluded at the end of the session that the additional information on where food comes from and expert tips when buying food in dedicated shops or at the open market, can have the effect of increasing the value and appreciation for the food for the participants.

This linked to the research finding that some habits are so ingrained in the lives of people (not just children, but whole families) that the availability of something is just a given. It is unlikely that people critically think about the things that have always been there unless there is a reason to. For example, the availability of most fruits and vegetables all year around, or the fact that skincare might contain ingredients that are not good for the environment.

Next to the availability, the prices of many luxury goods/ services are extremely low due to inequality in the world and the possibility to produce products somewhere where it costs less. With this constant availability we sometimes fail to recognize how special it is to have all the luxury we have here, and to recognize that at these prices, someone or something else is paying for it. Whether it be in terms of the environment, human rights or animal rights. The result of the brainstorm session can be found in appendix E.

Additionally, the book 'Hoe gaan we dit uitleggen' (Mommers, 2019) explains how we as humans started to see ourselves as a species that controls and uses nature, as opposed as being part of the ecosystem on this earth and not only using it, but actually being dependent on it.

4.2. Design goal

This led to the intended goal of letting children have more appreciation for food, in the sense that they are more aware of where it comes from by letting them reflect on their current habits, while honouring the value that their current food habits have for them. I want the design to spark conversation in the family and challenge their beliefs about sustainability and be suggestive without being too demanding. I want the design to be supportive, not evoking any shame or guilt, and support family interaction as the children indicated that that is a very important aspect of what makes certain habits valuable.

Therefore, I formulated the following design goal:

> I want **children of the age 12 to 14 (1a)** to feel **an appreciation for food (2)** when **deciding what to eat (3)** together **with their parents (1b)**, while honouring the value that their current food habits have for them.

1a
The design will reach the family through the child, as the child is most likely to encounter new information on sustainability through school that might make them questions the habits of the family. As stated earlier, it has been shown that a child learning about sustainability has influence on the view of the rest of the family on the topic.

1b
However, food (and especially dinner) is something that concerns the whole family. By using the design together as a family, it is more likely that all family members agree or at least the motivation of all family members are clear.

2
My goal is to let them look at their food in a different way, through providing an experimental atmosphere and reflection on current behaviours.

3

As a specific moment in all the steps concerning dinner habits, the moment in which the family decides what to eat is chosen to design for. When deciding what to eat is the moment they can also decide to do things differently. In addition, it is an opportunity for conversation in the family, while many of the other steps in the process, like doing the grocery shopping or cooking, are things that (depending on the situation) often are done by one of the family members in charge.

4.3. Current and desired interaction

4.2.1. Current interaction qualities

Currently the interaction of deciding what to eat has the following characteristics:

- Individual (deciding what to eat): In many families, one of the family members is responsible for deciding what to eat, usually the family member who also is in charge of grocery shopping
- Habitual (the choice of meals): families tend to pick meals they already know, they often have go-to picks for days on which for example they celebrate the weekend or days on which they have little time
- Take for granted (food): children do not question the presence or high availability of food.
- Not in control (of sustainability): families often lack the knowledge to determine what they could to improve the sustainability of their dinner habits

4.2.2. Desired interaction qualities

Instead, I want the interaction to have the following characteristics:

- Surprising (the choice of meals and sustainability strategies): I want the families to be surprised of the many opportunities there are for improving the sustainability of the current habits without sacrificing on taste or value.
- Appreciative (of food): I want the families to change their perception on food, to see not just the value in terms of the taste, but also for example regarding the origin of food, nutrition, or cultural value.
- Connecting: To ensure the families see the value of using it, the design should provide opportunity for open conversation and connection in the family.
- In control (of sustainability): The design should provide the type and level of information that is just enough for families to learn without feeling overwhelmed about all the possibilities.

5. Ideation

The ideation process was an iterative process, moving from the research data (the strategies for agency) to formulating a version of the design goal, to thinking of ideas and back to reviewing the research data. I used different ideation methods, of which some were used individually, and others were used with help of others. From the initial design goal, I generated ideas, which then could be categorized in three design directions, all using one or a combination of the successful strategies seen in participants of the research with sustainable habits. Within these directions I again generated ideas, resulting in 70+ ideas.

From these I selected three ideas, the ones that seemed most promising as in following the strategies most directly. Of each of these I made a simple prototype to test in two families. After the test, I combined two of the prototypes as I wanted to combine the positive aspects of the two and made some improvements. This version of the prototype is used by one of the families participating in the first user test.

The following chapter explains the used idea generation methods and more specifically what they contributed to my process. Information about each of the methods can be found in the Delft Design Guide (Van Boeijen, et al., 2014). Then the three directions and concepts are presented, and how they were tested and combined. The sketches from the idea generation can be found in appendix E.

The chapter is concluded with the insights from the second round of prototyping, that serve as an inspiration for the final design.

5.1. Used ideation techniques

The following techniques were used in this part of the project. Sketches made in the process can be found in appendix E. Figure 20 on the next page shows in which part of the process they were applied.

5.1.1. How To's

How To's served to generate ideas for solutions of part of the design brief. These How To's were formulated at two points in the process: initially before formulating the different directions and reviewed once more after determining the directions and formulating the final design goal.

5.1.2. Morphological chart

To generate more ideas, I made a morphological chart. In a morphological chart, solutions to several parts of the design are listed and combined into more elaborate ideas. I used different combinations of How To's that lead to three different design directions. See appendix E for the morphological chart. The lines connect possible combinations of parts of solutions.

5.1.3. Scamper

Scamper is a tool that designers use to look at the existing ideas with a different mindset, adapting them in different ways to change/improve them. Each of the letters in 'scamper' stand for a change that can be made, for example the 's' for 'substitute', in which step you can substitute some parts of the design for something else. The scamper tool was used for 2 of the ideas in each direction to find generate a new set of ideas.

Brainstorm

with 3 IPD students
with 4 children, age 12 - 14

↓

design directions

HKJ

with 3 IPD students
individual

→ ideas

↓

morphological chart

↓

scamper

↓
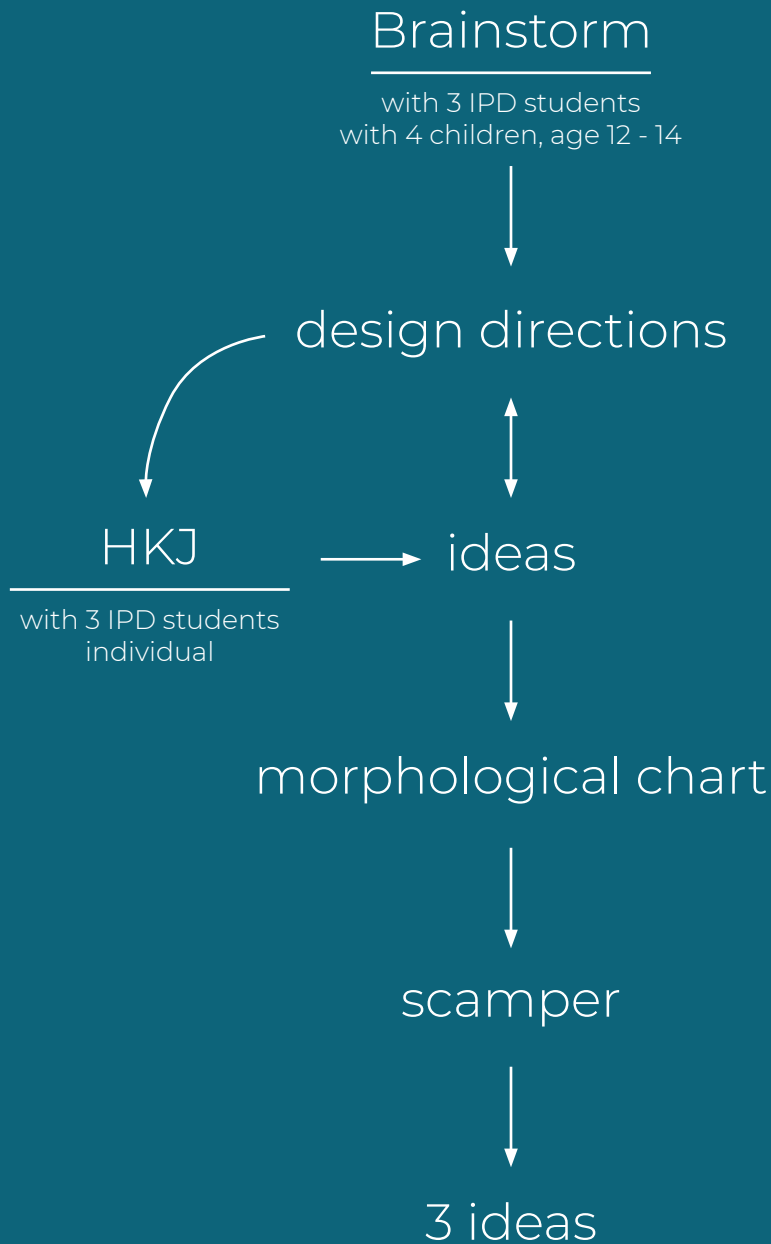
3 ideas

Idea generation methods from: Van Boeijen, A., Daalhuizen, J., van der Schoor, R., & Zijlstra, J. (2014). Delft design guide: Design strategies and methods.

Figure 20. Ideation process

5.2. Three design directions

The different ideas coming from the morphological chart could be divided roughly over three different design directions, aiming to increase the feeling of agency through a combination of the successful strategies that I identified during the research.

5.2.1. Bridging between planning & execution
In this direction, the family is supported in planning how to become more sustainable. After the 'intention' step (setting a goal), the family needs to figure out a way to reach this goal (for which information is needed), buy groceries corresponding to the new strategy, and cook in a new way, before the family can actually enjoy a sustainable meal. It prevents that after families speak out an intention, they fail to create a clear strategy, because of a lack of information, or because they underestimated the effort it takes to find alternatives for the things they know. This design direction aims to guide them through these steps. This design direction has the potential to help with the following strategies for agency that are explained in chapter 3.

- Constructive reflection: being aware of the value that the current dinner habits have to ensure that new habits can provide the same value.
- Clear information: providing only the necessary information they need to make a choice.

5.2.2. Process-based goals
The second direction is based on goals that are formulated in such a way that they focus on the effort that is put in, instead of the result. The goal is not necessarily to eat as sustainable as possible, but to consistently put in some effort to see what small changes can be made. These small changes over time will contribute to a big improvement. An example is setting a timer for 5 minutes for example in which as many improvements as possible are made to a grocery list.

- Setting realistic and actionable goals.

5.2.3. Creating a physical reminder of the intention

This last direction is aimed at giving families a tool to gather their own data base of information that is useful for them to eat more sustainably. By gathering information in one place it is easier to reference and making it a physical object that is present in the room, they will be reminded to look at their information and use it when deciding what to eat. By choosing themselves which information they want to gather, they can ensure that it is information that is useful and applicable for them.

·   Clear information. The goal is to gather information that is useful in this specific family.
·   Constructive reflection. Making families aware of what strategies work for them and which ones do not.

5.2.4. Agency: the four steps

Figure 21 shows in which steps of agency (as explained by Bandura, 1989) the design direction supports the family.

Direction 1: helps them by guiding the part in which they have to formulate a plan from their intention.
Direction 2: helps them to reflect by providing them new information.
Direction 3: guides them in reflecting so they are supported the next time they need to decide what to eat.
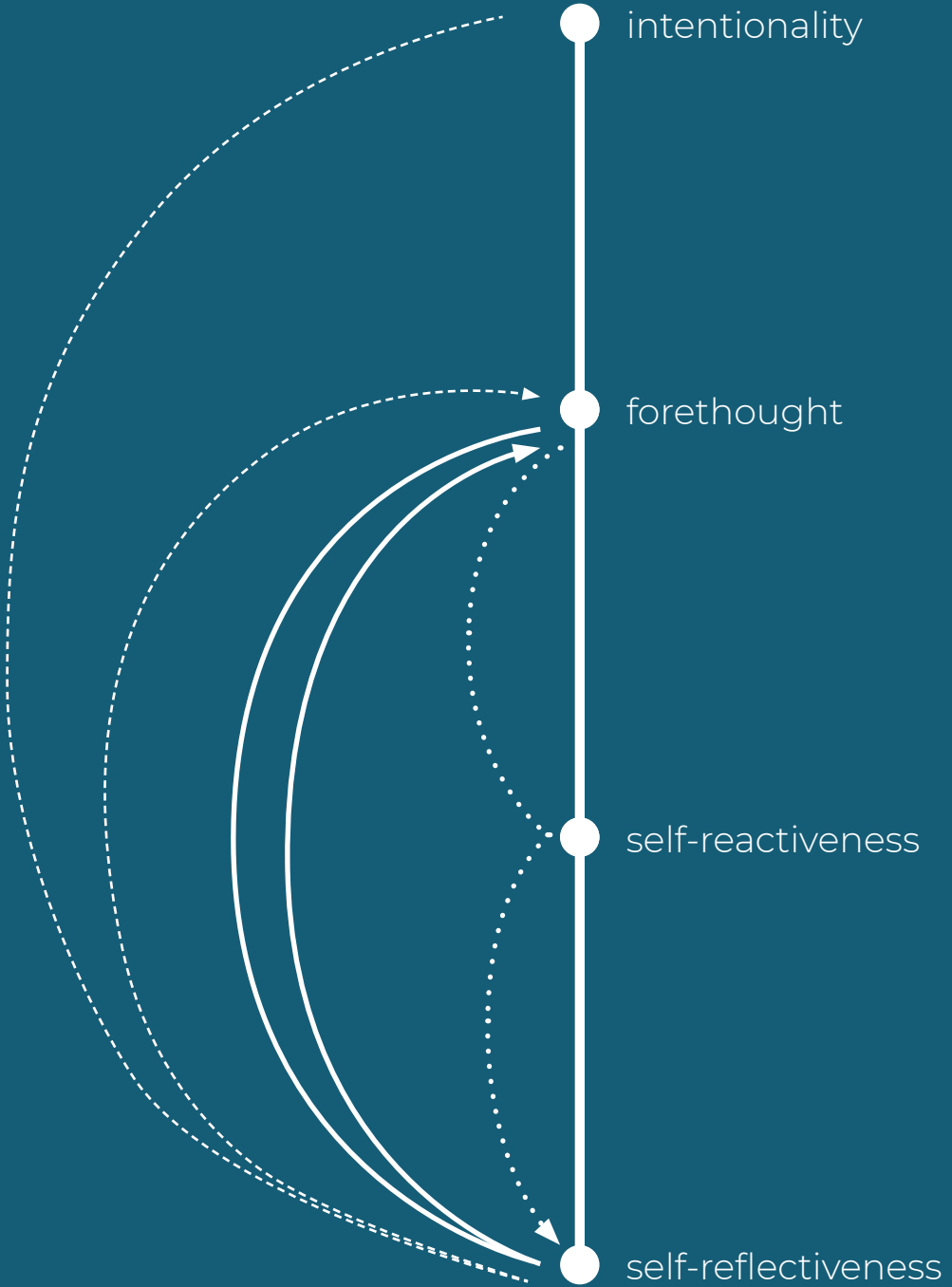
Figure 21. How the design strategies support the families. Steps
in taking agency as described by Bandura (1989)

5.3. Three concepts

This chapter presents the three concepts (one in each direction). Each of the concepts fits within one of the three categories presented in the previous chapter.

5.2.5. Concept 1: value-based decision-making

In this concept, the family decides not just what to eat, but what are the requirements for a meal on each day. There are different categories, such as 'quick', 'a treat' or 'budget'. Based on that they pick a card from the corresponding stack, which has a meal suggestion on the back, that is both sustainable as well as the other value they picked for that day (see figure 23)

Choosing in this way takes out the translation step that needs to happen between setting the intention to be more sustainable and changing the behaviour. It supports them in the following ways:
- The family is aware of the value of their current habits, and the substitute meals meet their needs regarding this value;
- The information is provided in the recipes. They will not have to wonder what is most sustainable, figuring out something else to eat, this information is all provided to them;
- The meals are surprising, not knowing what the outcome will be makes them curious.

Figure 22. Product on the refridgerator because of the magnetic backside

Figure 23. Stacks of cards, with on the backside a recipe.

The categories are the following:
- Quick preparation (for busy days with little time)
- Budget-proof (as many people assume that sustainable eating is expensive)
- Easy (as many people think that cooking from scratch is difficult)
- Nutritional (as many people think meat is necessary in a diet)
- Festive (sustainable alternatives to traditional meals)
- Treats (for on for example 'patatdag', a day on which the family treats themselves)

5.3.1. Concept 2: small improvements

This concept asks the family to change as many items on the grocery list as there are family members. The information they need will be provided in the form of a fact about items that most families frequently buy, with a corresponding tip they can use to swap that item for a more sustainable alternative.

The first step is creating a shopping list. Then there are different categories of tips, for example 'packaging', 'processing', 'storage' and more. The button on the top changes colour and when one of the family members presses the button, they get a tip in the category that the button is coloured at that moment.
This tip is used to change an item on the grocery list (see figure 24).

- The focus is on small improvements, swaps that are easy to make. Focusing on a few easy replacements does not require them to make a big change all of a sudden.
- Information in addition to the tip ensures that the family knows not only what a more sustainable choice is, but also why that is. This might help them become better at recognizing the link between other habits/choices they make and the effect on the environment.
-
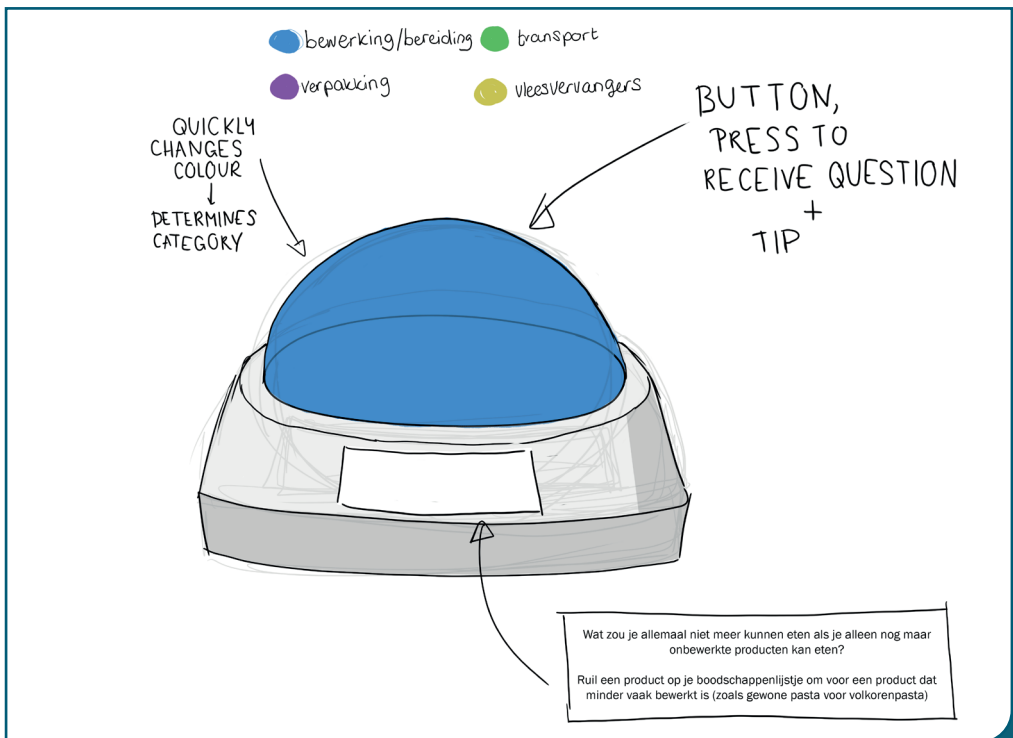
Figure 24. Coloured button, showing the tip 'Switch one item on your list for a version less processed, for example regular spaghetti for the whole grain version'

5.3.2. Concept 3: sustainable decision lamp

This concept is a lamp that projects the strategies for sustainable eating onto the wall, helping them when making a grocery shopping list. These tips can be written down as a way of reflecting on the current habits, identifying where improvements could be made. The information is written onto a transparent sheet, which can be placed in a small projector that can project it onto the wall.

Then the next time they make a list for grocery shopping, they can turn on the lamp to see all the strategies they already know about as an encouragement. (see figure 25)

- The focus is on collecting information in one, easy to access place.
  - In addition, the information is gathered by the family, ensuring that the information is actually applicable for them.
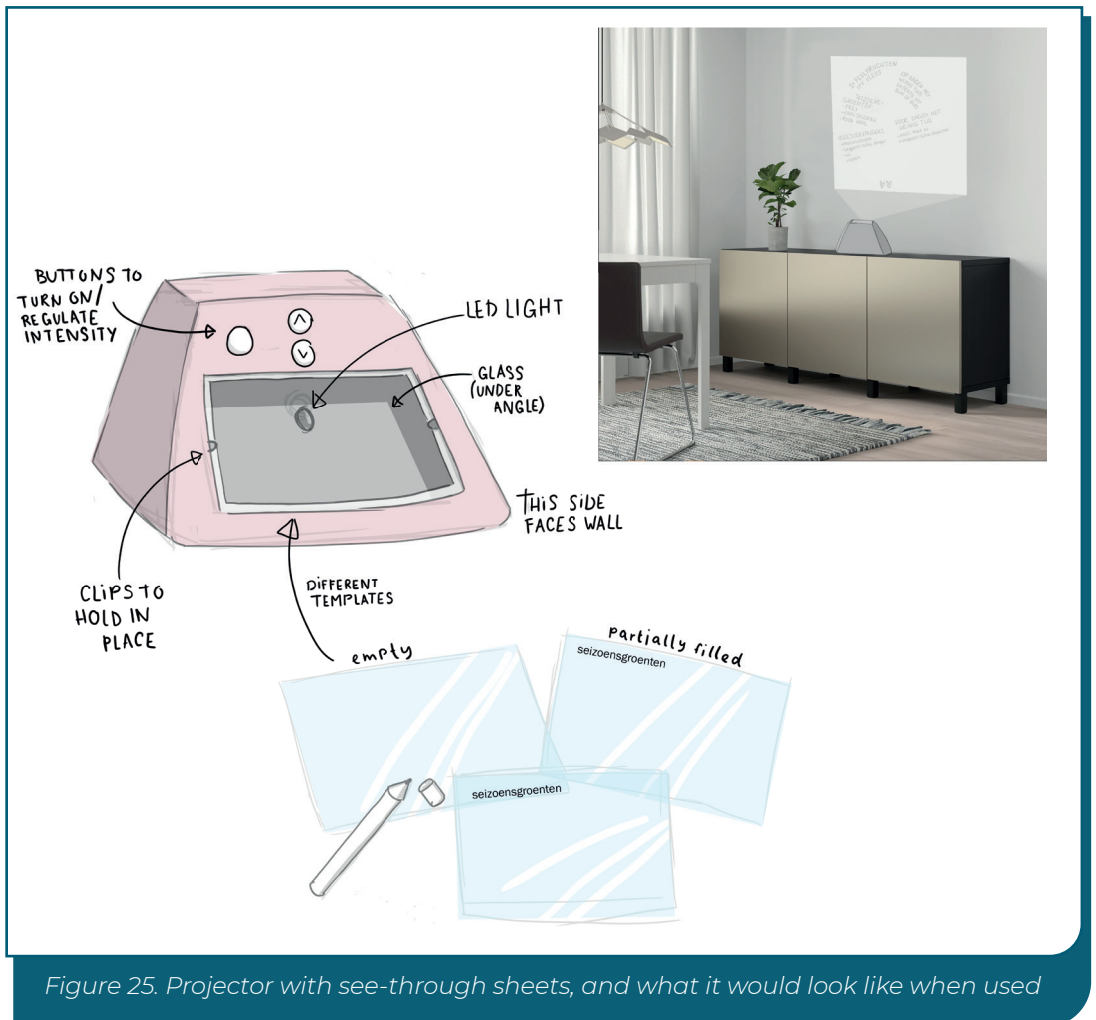
Figure 25. Projector with see-through sheets, and what it would look like when used

5.4. Concept validation - iteration 1

These three concepts needed to be validated to decide between the directions. I was mainly interested in how families would react to the different types of information, which is why I decided to test that in the first prototype. Secondly, I was interested in how well they fit with the qualities of the intended interaction.

First, I will explain the research questions I aimed to answer in this round of prototyping, then the test setup is explained and afterwards the conclusions are presented.

5.4.1. Research questions
The questions and my assumptions for each question are the following:

Intended interaction characteristics

Q1: Which of the prototypes fits best with the characteristic 'Surprising'? I expect that the first two prototypes (value-based decisions and small changes) will be most surprising because of the new information that is presented. This is something that the third prototype does not do.

Q2: Which of the prototypes makes them feel most appreciative of their food? I expect that prototype 2 (small changes) will make them most appreciative as the tips are very specific.

Q3: Which of the prototypes makes them feel most aware of the sustainability of their food habits? I expect that prototype 2 will make them most aware of their current habits because of the high detail in the provided tips.

Q4: To what extent do the prototypes support family interaction (conversation, equal input in the conversation by all family members) during meal planning? I expect that the third prototype will promote most family interaction as it is something that they receive the least information on, which will require them to form a strategy for use of the prototype.

Agency:
Q5: To what extent do the participants feel in control? The assumption is that the participants will feel least in control with prototype 1 (value-based decision) as they are not free to choose their own meals. They will feel most in control with prototype 2 (small changes) as they can change their own grocery shopping list.
Q6: To what extent do they think using the prototype would have an influence on how sustainable they eat? I assume that they will feel that prototype 1 (values) has the biggest influence as those meals might be most different from what they usually eat, whereas the others are more about adapting the meals as they are.
Q7: To what extent does the family believe in their ability to succesfully use the prototype to be more sustainable? I expect that the information in prototype 2 (small changes) will help them the most, while in prototype 1 (value-based decisions) they will eat more sustainably but maybe will not necessarily know what actually is sustainable about it. I expect the participants to use the information provided in prototype 2 in the use of prototype 3 (sustainable decision poster).

User friendliness
Q8: How easy are the prototypes to use, and how willing are the families to use the prototype on a weekly basis? I expect that the families are most willing to use prototype 2 on a regular basis, as it is quite structured yet does not require them to make very sudden changes in their diet.

5.4.2. Prototypes

The prototypes are all paper prototypes. This had practical reasons (ease of prototyping and possibility for a short iteration time) but also had a strategic reason. The product in the end has to reach the family via the child. The child does not have a big budget, nor would I want them to spend their money on such a product. That means they will have to convince their parents to buy a certain product first before they will be able to use it.

To make this first use threshold lower, I wanted to test the prototypes in the most minimal way – a version of the product that conveys the information I want it to, in a way that it could be downloaded from the internet, printed and cut out. If the use of this free download is a positive experience for the family, they might be more willing to buy a dedicated product.

Figures 26 to 28 show the paper prototypes used in this test. The cards were printed at the size of regular card set (58 x 88 mm) and the poster was printed on A3 size paper.

Figure 26. Cards from prototype 1. Text is on one side, and meal recommendation on the other side
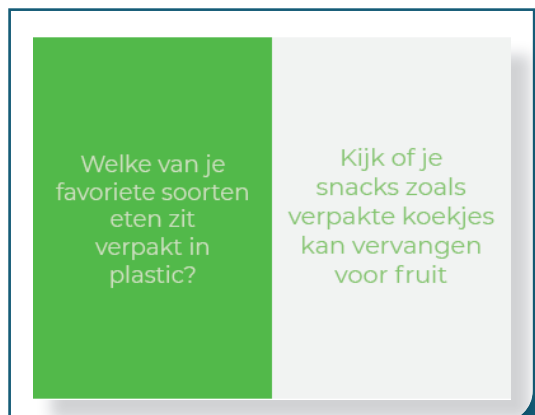
Figure 27. Card from prototype 2. Greeen side shows a fact, the grey side a tip to improve the shopping list
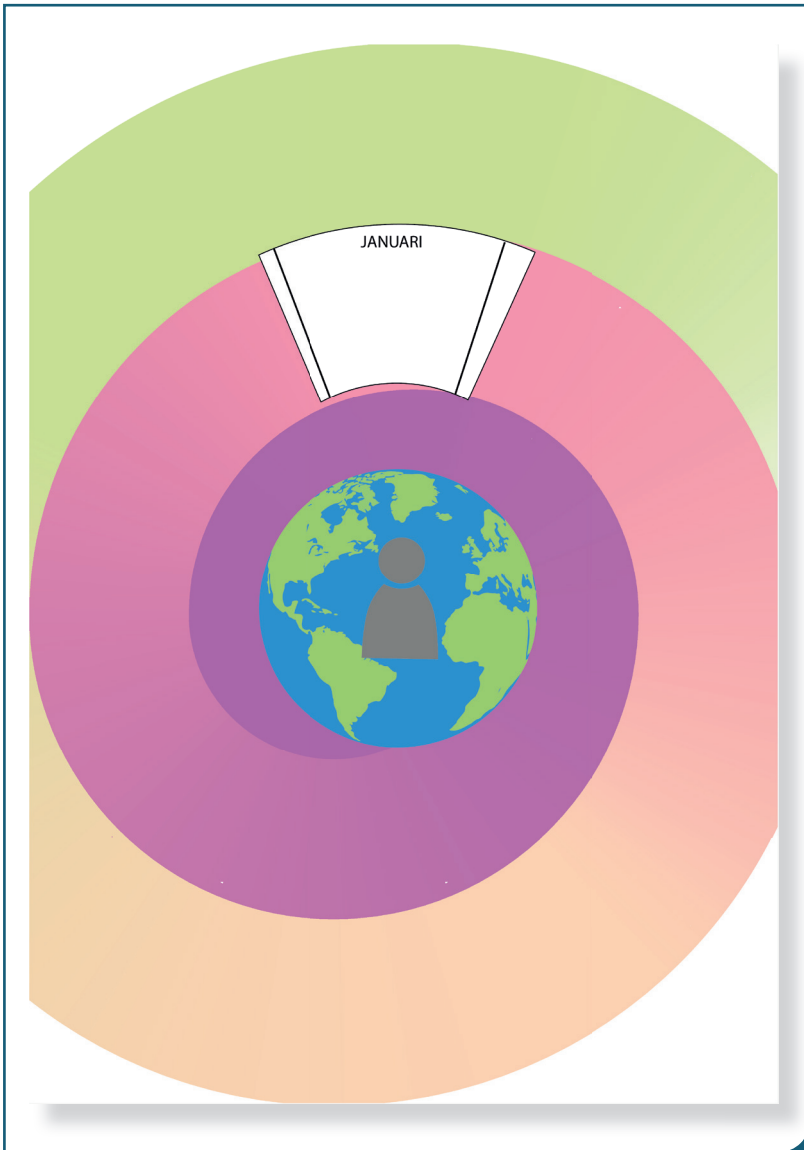
Figure 28. Poster from prototype 3. The white part is cut out of the poster, below a circle is placed with the months that can be turned according to the current month

5.4.3. Test setup

The first prototypes were used by two families for the first test. The families performed a task with each prototype. After the use of each prototype, the families individually filled out a short questionnaire, and after the final prototype the family individually made a comparative questionnaire.

The tasks they performed were the following:

- Prototype 1 (figure 30): For each day of the week, think of what is important for you on that specific day. Pick a card from the corresponding pile. Do this for each day of the week. Turn the cards to see a meal suggestion.
- Prototype 2 (figure 29): One of the family members picks a card from the pile and answers the question that is on the front. Then turn the card, and use the tip on the back to change one of the items on the shopping list (provided by me). Take turns until each of you has changed one ingredient.
- Prototype 3 (figure31): Together, think of all small things you might be able to do more sustainably when it comes to eating dinner. Write them on the poster. Then, using your own sustainable strategies, all change one of the items on the shopping list.

The order of the prototypes was the same for both families. The reason for this was that I could not assume that the participants already had knowledge ready to use for the third prototype, so I wanted to let them use prototype 2 first so that they could use the information they received as inspiration in the last prototype. The paper prototypes, script for the test, and the questionnaires can be found in appendix F.
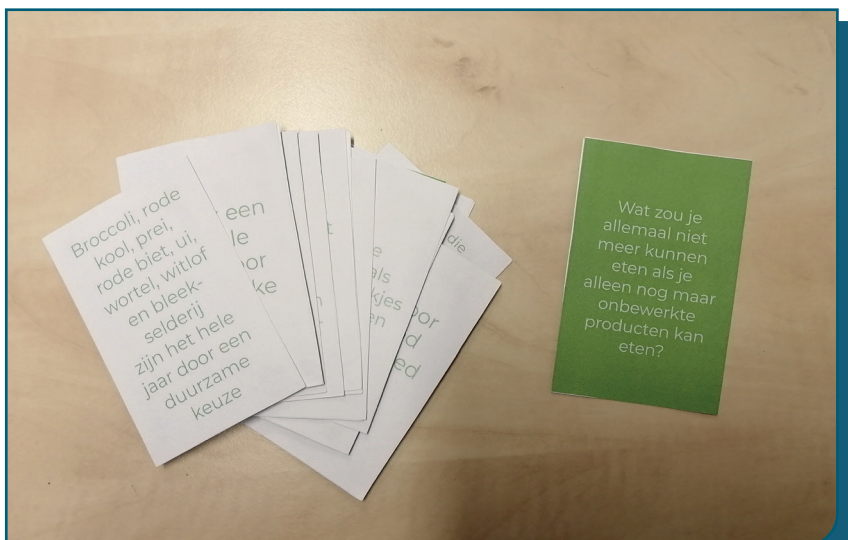
Figure 29. Prototype 2. Green side asks a question and the grey side a tip to improve the grocery shopping list.

Figure 30. Prototype 1, Grey cards show the categories and the others the recipes
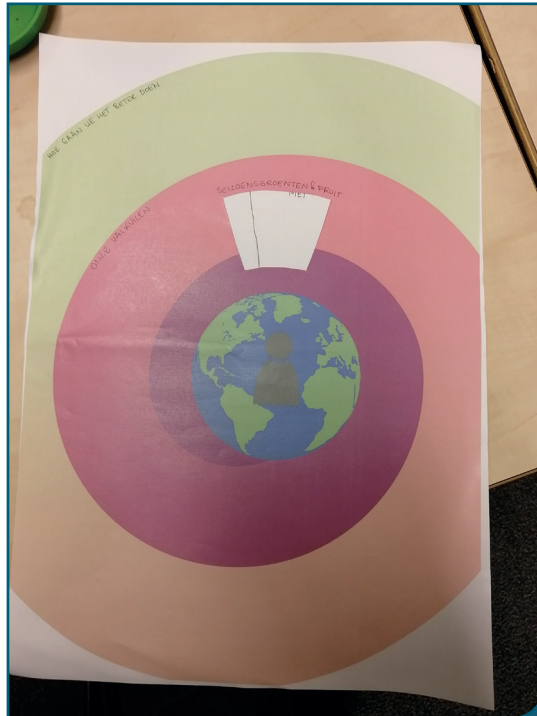
Figure 31. Prototype 3. Poster with turning window

5.4.4. Participants: characteristics of the two families

Both families had a clear favourite, but it was not the same prototype for both families. That is why the results are presented per family for clear overview. As both families responded very differently to the prototypes, here I shortly present some characteristics that were possibly of influence on how they rated the prototypes.

Family 1
Mother, father, daughter of 12 and a son of 18 years old.

Type of dinner: Sometimes typically Dutch, also more international dishes (or at least Dutch interpretations of) (Italian pastas or pizza, oriental, Turkish, Mexican)
Method of deciding what to eat:
Together, twice a week
Who does the groceries: the mother
Who cooks: usually the mother, on days when the mother works, the oldest son cooks

Family 2
Mother, father, son of 12 years old, a daughter of 14 years old. (Daughter had to leave when testing the second prototype)

Type of dinner: traditional Dutch dinners
Method of deciding what to eat:
Mother decides, twice a week
Who does the groceries: the mother
Who cooks: the mother

Table 2 on page 66 shows the results for both families, and also shows the big difference between the opinions of the two families. The next pages present general remarks, and how the different prototypes scored for each of the intended interaction characteristics.

General remarks
Family 1 enjoyed using the first prototype the most. The connection between the front and the backside of the cards in prototype 2 (small changes) was not always as clear. Sometimes the family was confused because the front of the card already seemed to point in a certain direction of something to change in the grocery list, after which the tip turned out to be about something different. They already were used to using some of the tips, even though it might not be out of a sustainability point of view (for example buying dried herbs to make sauces instead of buying prepared sauce).

In control (intended interaction)
While I expected the family not to feel very agentic with the first prototype (value based decisions), they still said that they felt agentic. They indicated that picking a category meant that they could choose a recipe that fit with that day, and not knowing what is on the back is part of the game.

"If I pick a card, it's normal that I don't know what's on the back. Does that make me feel powerless? No. I can always pick a different card." - father

They did not rate the effectiveness of the changes they made in prototypes 2 or 3 very high, so the changes might be too small for the participants to feel that it was significant. Prototype 3 (poster) did not make them feel in control as they did not completely understand what they were supposed to get out of it, so the activity of writing strategies down felt pointless.

Surprise (intended interaction)
The family was most surprised by prototype 1 (value-based decisions) in terms of recipes. On the other hand, the information in prototype 2 (small changes) were in some cases also surprising as it made them look at food from a different perspective.

"I keep talking about that card with the explanation of the canned vegetables. That was really something I had never thought about in that way!" - mother

	family 1			family 2		
	1	2	3	1	2	3
feeling most in control	x					x
most appreciated	x					x
willing to use more often	x					x
surprising	x					x
made most aware		x				x
easiest to use	x					x
most sustainable	x					x

Table 2. Example of the cards

Figure 32. Mother asking the son 'Well you cook on Wednesdays. What do you think, would this be doable for you?'

Connecting (intended interaction)
The second and third prototype evoked most conversation on sustainability. This was in prototype 2 (small changes) because of the new information they started looking at from a different perspective. Prototype 3 started conversation but was not necessarily connecting them, as they all saw a different way the poster should be used, because of which they discussed more on the layout and purpose of the poster than they did about food.

Aware (intended interaction)
The family indicated that prototype 2 made them more aware of the sustainability aspect, as it provided them with new information, while in prototype 3 (poster) they had difficulty writing down sustainability tips for themselves. Prototype 1 (value-based decisions) did not ask them to think that much about sustainability.

[when talking about oliebollen, which have to be fried] "Well. It would seem oliebollen are unsustainable. But last time, we brought the sunflower oil to the waste point for recycling. So is it actually that unsustainable then? [...] Funny to think about things like these, it is often more complicated than you would think!" - father

"Fries from the airfryer are sustainable" - daughter (12)
"Why do you think? - mother
"It's less fat" - daughter (12)
"And potatoes are made in Holland" - son (18)

5.4.6. Results family 2

General remarks
This family did not enjoy prototype 1 (value-based decisions). It was very different from their usual eating habits that the meals just did not seem appealing to them (except for the oldest daughter). While family 1 disliked prototype 3 (poster) the most, this family found the third prototype most valuable as it made them realize how much there is they do not know.

In control (intended interaction)
As the family did not enjoy the recipes in prototype 1 (value-based decisions), they did not feel in control. Prototype 2 and 3 made them feel more in control as it would give them the opportunity to eat like they are used to. The information however did make them a little uneasy, and they twisted some of the information to make it suit their own views better and regain some control.

"Cows are not good for the environment. So it wouldn't be right to let them live, then they keep polluting." - father

Surprise (intended interaction)
The recipes in prototype 1 were suprising, but not in a positive way. The same holds for the sustainability facts in prototype 2. They felt aversion towards vegetarian cooking, and because of their beliefs on for example the nutritional value in canned vegetables, they were not willing to believe some of the information. Prototype 3 was surprising to them as it let them see what they did not know.

"Well I like the idea of it, but the recipes I don't like at all! It does not seem unappealing actually... It doesn't. It just isn't my type of food. I would not want to get this each day." - father

Connecting (intended interaction)
Prototype 1 was not helping the family connect. Actually, it created some division as the father and daughter indicated that the mother would never be able to prepare the recipes, in the case of the father to distract from the fact that he was not so willing to try them out.

"I don't think it would turn out well if you would try to cook these. [...] Do you see yourself cook something like balsi.. balsamici vegetables?" - father
"I don't think you would ever cook these. I would eat it! But I doubt if you would ever make these." - daughter (14)

During the use of prototype 3 (poster) they indicated that this was something they could be more aware of. Generally, the father was most vocal about his opinions on sustainability and quite dominant in the discussion, and in some moments it showed that not all family members have the same opinion on sustainability.

"Of course you wouldn't ask me or [daughter] what we think of these meals. You know we wouldn't have a problem with [vegetarian food]!" - mother to father

Aware (intended interaction)
The family indicated that the third prototype made them most aware of what they could do differently, even though prototype 2 (small goals) gave them more different tips. This might also be because they were not alwaysopen to either believing the information on the cards, or being willing to try the recipes in the other prototypes.

"Well such a poster, it would definitely help in making us more aware. If it would make us do things differently is another question. But it would make us more aware for sure." - father

Later the father also indicated that he was sceptical of the relevance of sustainable eating, as he said to have heard different opinions. They do however believe that climate change is real, and I am not aware of any research claiming that eating meat is not contributing to greenhouse gas emissions. This might suggests that he might be more comfortable staying unaware, as that means not having to change his behaviours, or it could mean that it is difficult in some cases to judge the validity of sources of information.

5.4.7. Conclusion
Below the research questions are answered. These are then used to choose one of the concepts and improve this concept for a new user test.

Intended interaction characteristics

Q1: Which of the prototypes fits best with the characteristic 'Surprising'?
The first prototype fits best with the characteristic 'Surprising', however not always in a good way. This depends on whether the taste of the family fits with the recipes on the cards.

Q2: Which of the prototypes makes them feel most appreciative of their food?
If the family is ready to change their behaviour, the second prototype provides most understanding in the reasoning behind certain sustainable measures. However, appreciation can also come from liking the meals in the first prototype.

Q3: Which of the prototypes makes them feel most aware of the sustainability of their food habits?
These were prototype 2 and 3, for one family because of new insights through the presented information, for the other family because they realized how much they do not know when they used the third prototype.

Q4: To what extent do the prototypes support family interaction (conversation, equal input in the conversation by all family members) during meal planning?
All prototypes promoted family interaction, however they had a different effect on the type of discussion the family had. The recipes for one family resulted in a discussion because not all family members were equally excited about them. The prototype made this difference in perspective clear, and while it might not result in actually cooking one of the meals, it could be a first step in maybe several conversations that would be necessary before the whole family would be ready to change their diet. The information in prototype 2 resulted in conversations around beliefs/prejudice regarding certain habits for both families, but the tone of the conversation was different. In one family it led to conversations on an array of different habits, where the other family sometimes had a hard time believing the information.

Agency:

Q5: To what extent do the participants feel in control?
All prototypes made the participants feel in control, however for the first prototype it depends on whether the family finds the recipes appealing.

Q6: To what extent does the family believe in their ability to succesfully use the prototypes to be more sustainable?
Prototype 1 seemed realistic to use, however it is important that the other family members trust the cooking skills of the family member who cooks most.

Q7: To what extent does the provided information in the prototypes help the family to become more sustainable?
The information in prototype 2 was most insightful, however this only leads to a realization on what they can do differently if they believe the information and are ready for change. Otherwise the information can be confronting, or as seen in the test it can happen that users question the validity of the information. Some information also led to a realization of the complexity of sustainable eating, which seemed to lead to an increase in awareness but a slight decrease in their feeling of self-efficacy.

User friendliness:

Q8: How easy are the prototypes to use, and how willing are the families to use the prototype on a weekly basis?
The first family would be willing to use the first prototype, but also because they were curious what the recipes would be like. The second family would only use the third prototype, but also indicated that it would not necessarily mean a change in behaviour.

While prototype 1 (value-based decisions) and 3 were the preferred two prototypes, I decided to continue with prototype 1, and improve based on the remarks of the second family about the available meals. This is because both families were not able to write down many strategies, even after using a prototype that revolved around readily applicable tips. Additionally, I want to use the information in prototype 2 on the cards of prototype 1, as the information shows to have potential to help families create awareness and/or start a discussion (see figure 33). In this way, the information can lead to a new awareness about food and sustainability, while the recipes still give them a feeling of self-efficacy by providing a sustainable solution for the 'problem' they have just become aware of (arrows 2 and 4 in figure 33).

Figure 33. The effect of different aspects of the prototypes on the feeling of agency in the participants
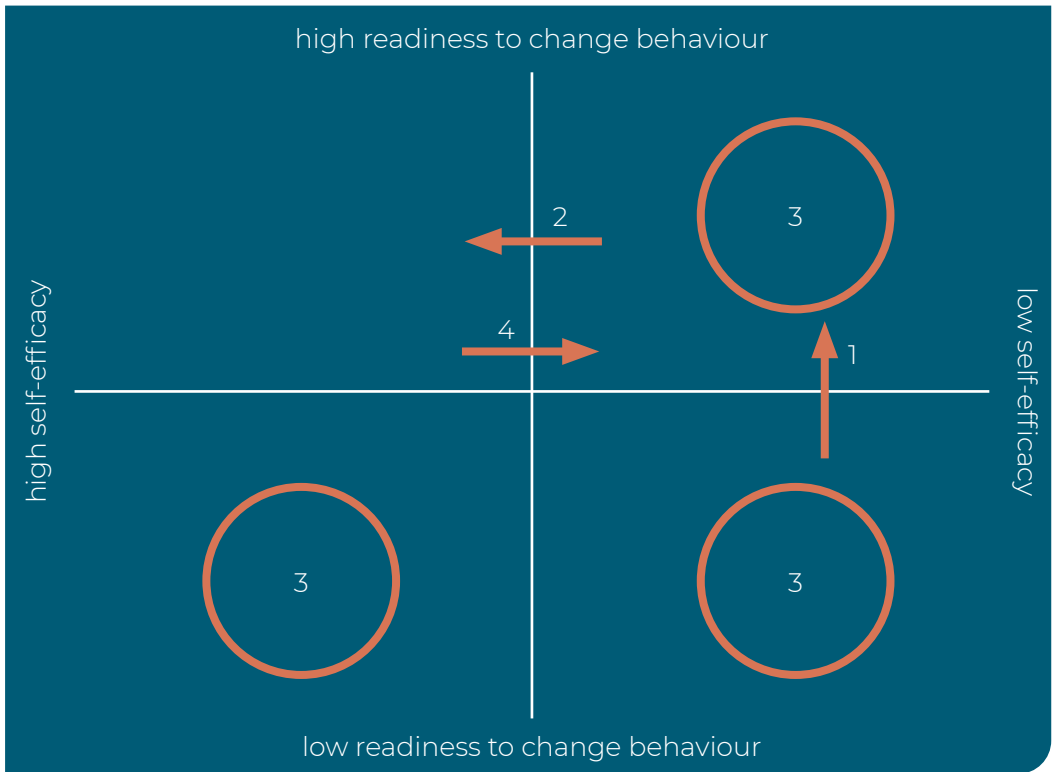
1. Recipes, *if they sounded appealing to the family*, lead to higher readiness to change behaviour as they indicated to want to try them out. Thus, the family has to be either open to try out new recipes or they have to be in line with their current diet

2. Recipes lead to a higher feeling of self-efficacy in the whole family, *if other family members believe in the cooking abilities of the family member that most often cooks dinner*. In this case too it would help if the recipes have seem familiar

3. Information (facts) lead to an awareness or insight, *if the family members are open to believing the infomation,* but did not necessarily immediately result in a decision to change dinner habits. Applicability of the information is important, however awareness in itself is valuable too. The information needs to be presented as a fact, to ensure people will not doubt if the information is valid

4. Information (facts) can lead to a decrease in self-efficacy, as they can lead family members to question other habits. This however is a first step in awareness of sustainability, and and opportunity for discussion.

5.5. Concept validation - iteration 2

The goal of the second test was to see if prototype 1 and 2 were integrated properly, and if the product is as easy to use in practice as the first test makes it seem.

5.5.1. Improvements to the concept
The following improvements were made in the design after the first user test:
- A QR code on the card leads to a webpage where the recipe can be found
- Information as a conversation starter is added to the card (see figure 34). This information is no longer exclusively on sustainability, but also on the origin of ingredients, the nutritional value or eating habits, to see if this has an effect on the appreciation of food.
- The budget, easy and festive categories were removed as the participants did not pick them and there are no holidays in the period of testing. These were replaced for 'traditional' to be able to include typically Dutch meals, in a sustainable way.

In addition, the prototype is closer to the original concept (see page 81) in the following ways:
- The cards will be magnetic like the original concept shows. In the middle between the front and back of the card, a layer of magnetic foil (see figure 35) was pasted so that the cards can be placed on the refrigerator with the meal idea presented to the front.
- A template with the days and cut-outs for the cards is included, so it is easy for the family to keep track of which meal they had planned for which day.
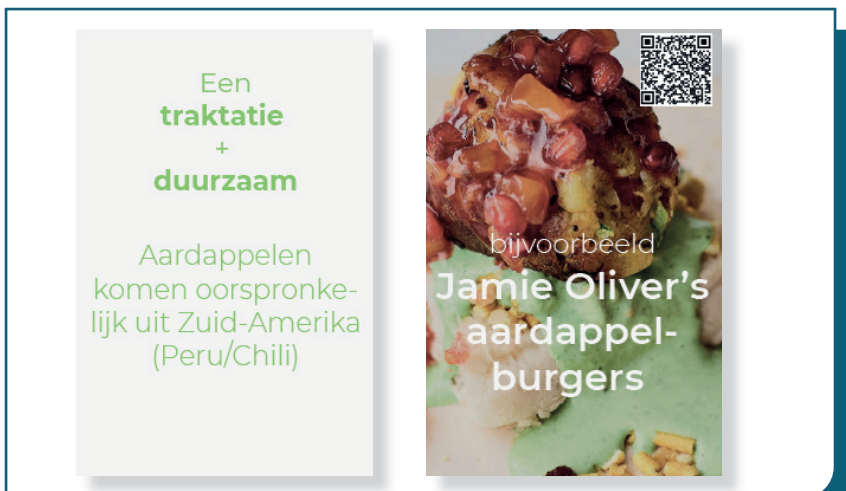
Figure 34. Example of the cards, front & back with QR code

Figure 35. Magnetic foil, with a glue layer on one side
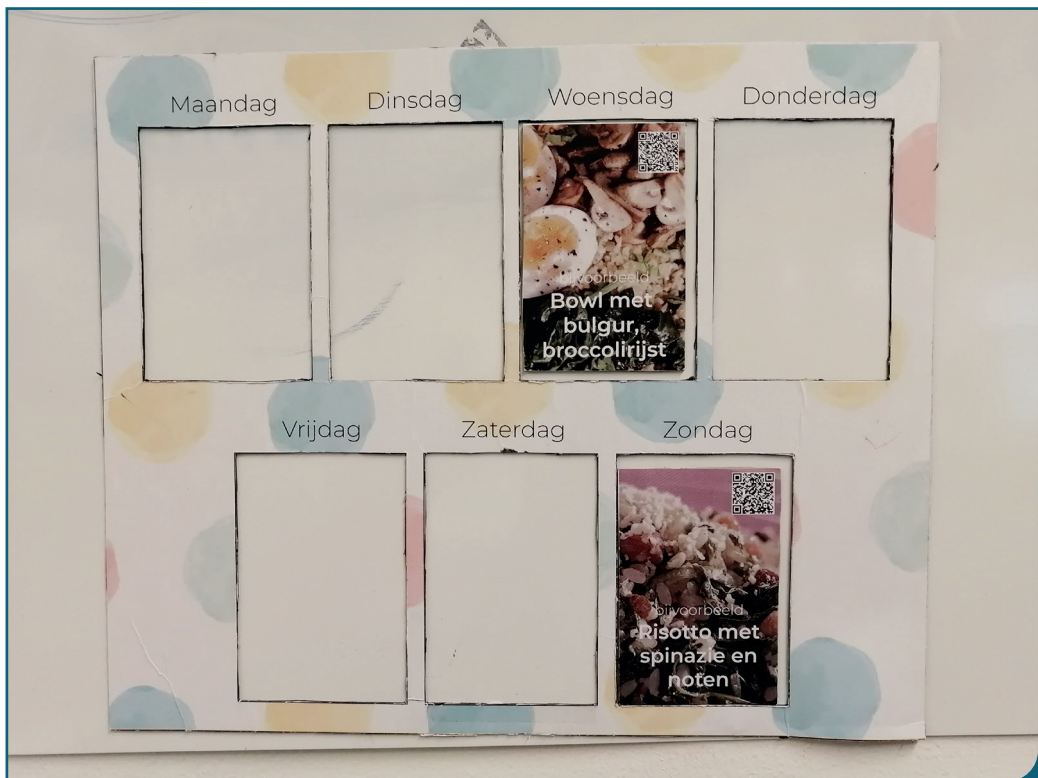
Figure 36. Template, on a magnetic surface with two of the cards
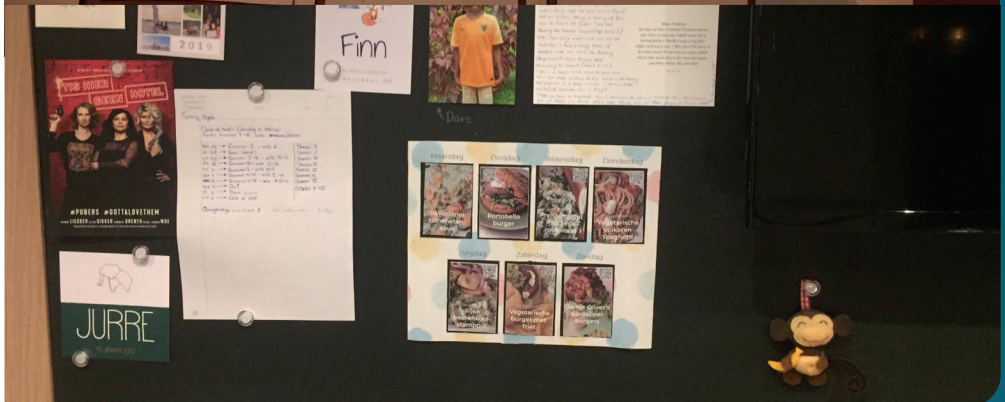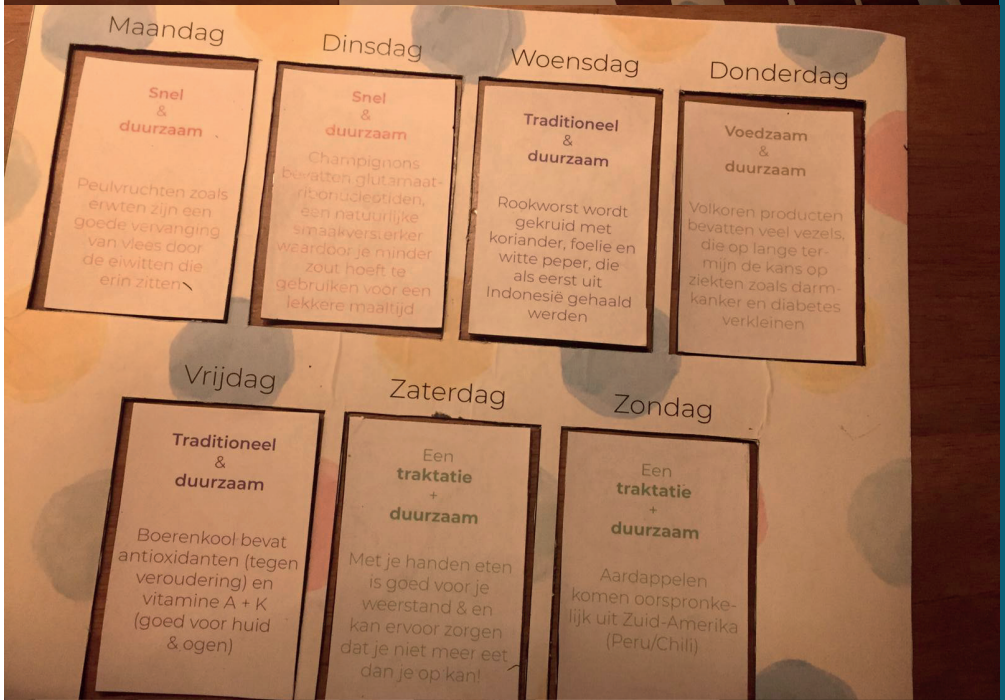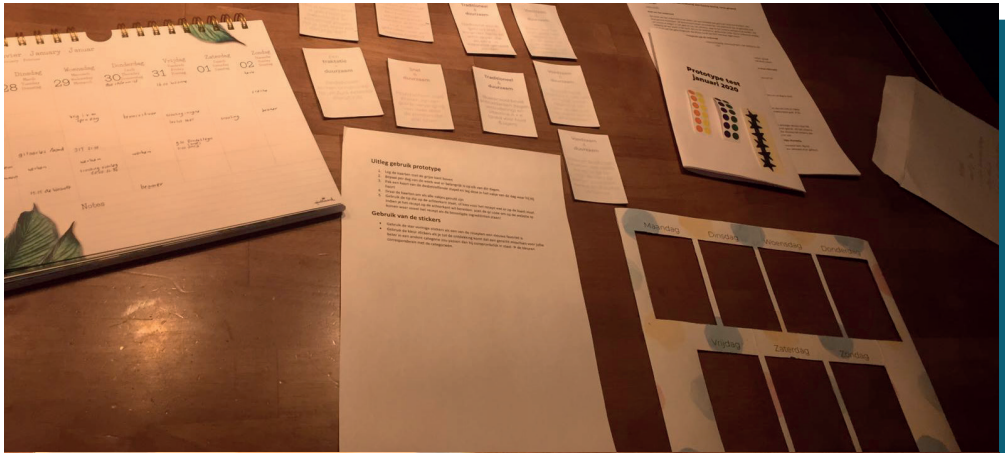
Figure 37. Top to bottom: The prototyping package, the categories chosen by the family, the prototype on their chalkboard

5.5.2. Research questions

I wanted to answer the following questions with this prototype:

- Do the recipes fit well with the category they are in?
- If the family decides not to follow the prototype on certain days: what are the reasons for this?
- If the family decides to follow the prototype: how would they describe their experience?
- How willing would they be to use the prototype again?
- What do they think of the meal ideas?

5.5.3. Test setup

The new version of the prototype is used by one of the families for a week. I delivered the prototype on a Friday, in an envelope with instructions, a small booklet with some short questions every day about the use of the prototype and space for comments, the stickers they could use, and consent forms. See figure 37 for a picture of the prototype & other materials provided to the family.

When delivering the prototype, I asked them to sometimes send some pictures of the use of the product, for example after determining what they would eat, or after preparing one of the meals. In addition, we agreed on a time for the final interview. The interview guide for the final interview can be found in appendix G.

5.5.4. Results

The family is used to determining what to eat on Sundays (see figure 37). They then tried to follow the plan they came up with throughout the week.

The family ended up eating a vegetarian meal on three of the five days they used the prototype, while they usually eat meat with every meal. The father and son complained a little after two vegetarian meals, even though in the previous test they both indicated that they see no problem in eating vegetarian. Overall they liked the recipes, they said they tasted good and indicated that they would like to repeat one of the recipes and try one they did not get to yet.

Beginning of the week the family still had some left-overs from the weekend, which they first wanted to eat. That is why on day one they chose to ate something different from what the prototype suggested.

One of the recipes included vegetarian 'rookworst'. However, they noticed that the price difference between regular rookworst and vegetarian one was quite large, so they chose to buy the regular rookworst. Figure 38 shows how they used the booklet and a picture of the meal they prepared. All other entries in the booklet and pictures of their meals can be found in appendix G. They used one star sticker for the mashed leeks. This recipe actually asked for cauliflower, but the amount was less than a whole package. Therefore, they decided to eat it with carrots because they did not want to throw away half a package. In the supermarket the mother did think about buying frozen cauliflower (it was a tip she had seen in the previous test in prototype 2), but the supermarket she was shopping at, did not sell it.

The QR code worked well to guide the user to the website with the recipe. The information on the cards was not read as it disappeared as soon as they turned the cards.

For one of the recipes, the QR code did not work as I forgot to add the right link to the website. This made it difficult to buy the ingredients and on top of that they had little time to prepare dinner that day, even though it was a recipe for a day with little time (the portobello burger). They however still made a variation on the recipe by making it a regular vegetarian burger and added a cup of soup, in which the choice for the vegetarian burger was intentional.

5.5.5. Conclusion

The following factors limited them from precisely following the meal plan:

- Left-overs from days before;
- Price difference between their usual choices and vegetarian alternatives;
- Availability of ingredients;
- The use of half of a vegetable in a dish, or in the case of precut vegetables half a package.

In the following ways the prototype helped them eat more sustainably:

- They kept one meal vegetarian even though they could not follow the precise recipe.
- The prototype kept them aware of sustainability throughout the week, even if they could not precisely follow the meal plan, although this was mainly the responsibility of the mother as she did the grocery shopping.
- Trying out new recipes was surprising (for example adding almonds as a topping).

Interaction qualities:

- After picking cards and turning them, they looked at the left-over cards and replaced some, if those recipes were more appealing to them. Reason was the taste of the children, they were not interested in couscous or bulgur as this was not familiar to them. The parents here agreed to pick a different card instead.
- The family discussed during the week what they consider to be meat replacements. Legumes or nuts for example, they considered a replacement in terms of nutritional value but not in terms of taste/structure of meat. In addition they discussed their opinions on the meals.
- The information on the cards was not read. In the explanation for the prototype nothing was explained about the fun facts. Therefore the facts did not have the effect of starting a conversation about their food habits as I expected it to have.
- The family showed to use their creativity when they could not precisely follow the recipe. However, maybe not every family would behave in the same way.

The following problems (or potential problems),
should be considered in the final design:
· The information should be more clearly visible, for example
by being on the same side of the card as the recipe, for it to
be seen and have the effect of a conversation starter.
· There should be a way to deal with half used vegetables, for example
by matching with other recipes using the same ingredients for the
day after, or only having recipes that use up the whole vegetable.
· For meat substitutes it might be good to give a specific
brand to ensure they find a good substitute (comparable
in price for example), or give some alternatives.
· The family did not understand they could paste stickers onto
the cards, so they pasted them in their booklet. Reason for this
is probably that the stickers were attached to the booklet for
the test as I was afraid that they would get lost otherwise.
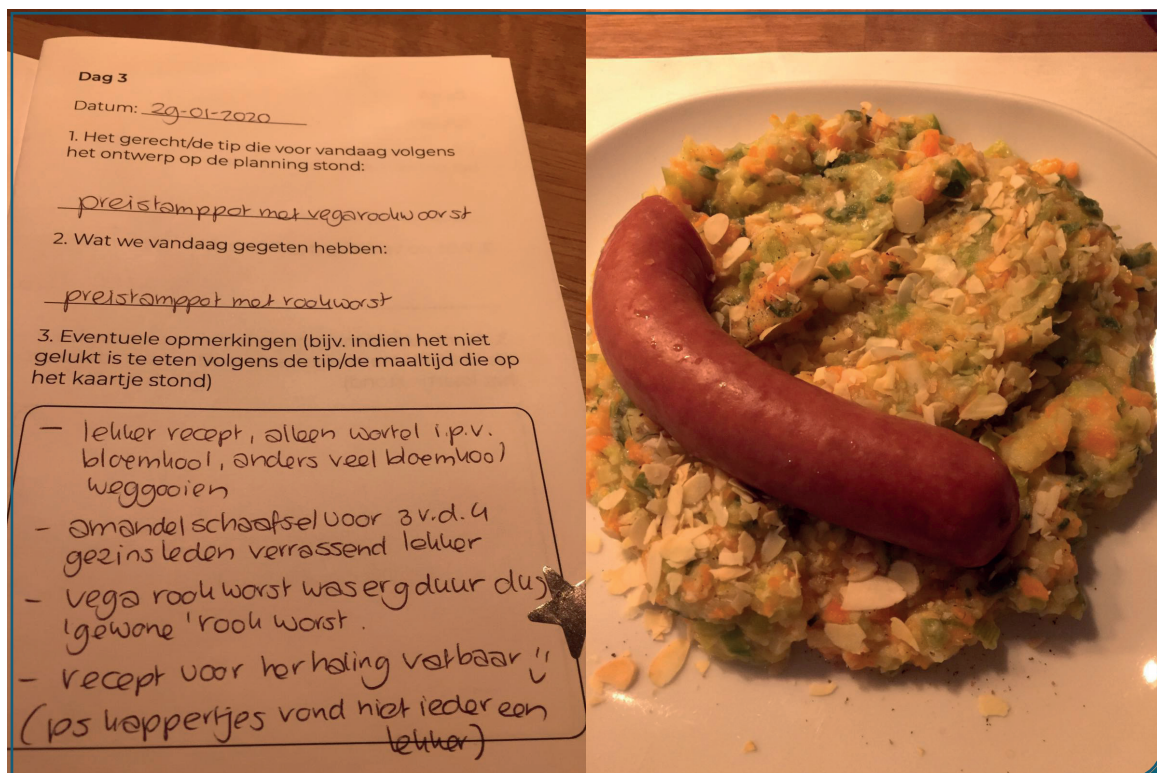
*Figure 38. One of the meals prepared by the family
and the changes they made to the recipe*

6. Final design

The implementation of all findings of the user tests shown in the previous chapter, leads to the final design presented in this chapter.

First, the different aspects of the design are explained, as the design consists of both physical cards and an application. The different parts of the design have different intended effects on the user.
Second, the use steps involved in using the product can be seen. A Dutch translation of these use steps are used in the user test to determine whether the explanation is clear for the user.
The chapter is concluded with the wireframes of the application.

This chapter shows all aspects of the design by using one example meal. More examples can be found in appendix H.

6.1. The design: 'Food for Thought'

'Food for Thought' is a set of magnetic cards, helping families discuss sustainability when deciding what to eat for the days to come. The design supports them by helping them identify what important qualities are for meals on certain days, instead of what they want to eat. This in turn will give them a meal suggestion that meets that value and is sustainable (for example: both quick and sustainable).

Since this can be different on different days, they have different stacks of cards they can pick from for different days. Helping them be more sustainable by bridging between the 'intention' and 'self-reactiveness' phase (the strategy is provided by the cards), shows sustainability as a tool to reach other goals. It also ensures that sustainability for them does not have to mean they need to sacrifice their existing traditions, like a weekly 'patatdag' to celebrate the weekend: the design has a category specifically for those kinds of days.

In addition, the meal suggestions take away the insecurity of not knowing what is most sustainable, by giving concrete meal suggestions of which the user can trust they are sustainable options.

The design helps families eat more sustainably by:
1. Bridging between 'intention' and 'self-reactiveness';
2. Using sustainable eating as a tool to reach certain value;
3. Providing information in an actionable way.

The cards provide sustainable recipes, which needed to be selected for the prototype. The following question is: what can be considered sustainable? For the overall sustainability of meals for this project, I considered the following aspects:
- Mostly vegetarian, with different meat substitutes (legumes, nuts, tofu, soja, vegetarian/vegan versions of meat).
- Means of transportation of ingredients.
- For vegetables: preferably grown in the Netherlands in open field, or grown in a different country in open field and transported by boat. This means that per season, ingredients can change.
- Packaging: less packaging is preffered, otherwise packaging of materials that can (and are) recycled efficiently (in the Netherlands, might be different in other countries).

More elaborate explanation on this can be found in appendix H.

6.2. Components

6.1.1. Meal suggestions + application with ingredients and recipes
The design consists of 21 different cards, in four categories. Additionally, empty cards could be used by the family to add their favourite meals to the card set. The categories all address certain misconceptions people tend to have about sustainability:
- Quick. 15 minutes or less to prepare, counters the belief that more sustainable meals take much time to prepare.
- Treats. Meals that are fun, for example for the weekend. Countering the belief that meals without meat are tasteless, or 'missing something'.
- Traditional. Typical Dutch meals, for example mashed potato and kale. These meals usually have meat in them or as a side, and this category shows that these meals can taste good without the meat too.
- Nutritional. Meals for days with exercise, sports, or family members with physically demanding jobs. Counters the belief that more plant-based meals are missing important nutrients by making sure these meals are full of protein.

Then there are additional categories, which are not part of the main card set but could be bought as an addition:
- Festive. Cards with sustainable versions of dishes usually made with Christmas, Easter or other holidays. Includes barbeque recipes and 'gourmet' recipes.
- Budget. Recipes for 2,50 euros or less per person.
- Other cuisines: for example, Italian cuisine, Indian cuisine.
- Expansion pack with additional recipes for all categories.

The cards show the category on one side, and the recipe on the back (see figure 39). The QR code on the card leads to a mobile application, which provides the family with the ingredients and recipes they need to prepare the meals. Some of the ingredients are coloured, which indicates that they can be swapped for others by swiping right and left. The colours indicate how sustainable the ingredients are (green = the most sustainable of the alternatives, red = the least sustainable of the alternatives). See figure 39. The application can also be accessed through opening from the device, in which case the user sees the grocery shopping list as the first screen.

The back of the cards (the side with the category) is magnetic, and can be placed on a magnetic surface like the refridgerator. For the other meals, see appendix H.

Scan the code to see the app

bijvoorbeeld
Portobello burger

Portobello burger

Ingredienten (4 pers):

4	Portobello's
1 el	milde olijfolie
300 g	winterpeen
1/2	citroen
1	rode ui
100 g	Violife Greek white
4	Hamburgerbroodjes
200 g	hummus rode biet
50 g	baby spinazie

Zet op boodschappenlijst   Naar recept

Portobello burger

Ingredienten (4 pers):

4	Vegetarische hamburgers
1 el	milde olijfolie
300 g	winterpeen
1/2	citroen
1	rode ui
100 g	Violife Greek white
4	Hamburgerbroodjes
200 g	hummus rode biet
50 g	baby spinazie

Zet op boodschappenlijst   Naar recept

Swipe the coloured ingrediënts to see alternatives. The colours indicate the sustainability of the alternatives compared to the original ingredient.

Figure 39. Explanation of the use of the product

6.2.1. Conversation starters

The previous test showed that the fun facts on the cards did not have the conversation starting effect I thought they would have, or at least not in the short time span of the user test. However, they still talked about what they liked or did not like about the recipes or the sustainability aspect of it. Even though this might indicate that the information is not necessary, I still decided to include it in the last prototype. The type of information is mainly about sustainability, as it was in the first user test in prototype 2 (small goals, see figure 40 for an example of a card), or current common beliefs about certain types of food.

The reason to include it even if the previous test might suggest it is not necessary, is the effect that the information had in the first prototype. Even if the family members did not always agree with what was on the cards, it did make them discuss it, which might be an important first step to becoming more open to certain ideas through being exposed to them. It could also make them aware of certain prejudices which might not always be based on facts ('if we eat canned vegetables we will live 10 years shorter').

To ensure that it would prompt them to start a conversation, the information is now formulated as a statement/fact, after which a question is asked (if possible/relevant) about the habits or the perception of the family.

To encourage the family to read the conversation starter, it is placed at the side that would be visible if the meal plan is placed on a magnetic surface. Additionally, the family is motivated to look at them as they are a bit hidden, and the front of the card can be opened. I expect that the family will be curious what is underneath, which will encourage them to look at the information. To ensure they see that there is a layer underneath, a small cutout in the corner shows the colour of the paper underneath (see figure 41)

Ook de bereiding van eten thuis zorgt voor energie-verbruik en dus broeikasgassen. Welke apparaten gebruiken jullie thuis voor het bewaren en bereiden van eten?

Groente uit blik of uit glas heeft geen koeling nodig tijdens vervoer of bij jou thuis

Figure 40. A card from the first prototyping round, which served as a conversation starter

Figure 41. The card that can be opened to see some additional information. The cutout in the corner shows there is something underneath the top layer.

Text visible inside the card:

bijvoorbeeld
Portobello burger

Vlees veroorzaakt 40% van de klimaatbelasting door voedsel van de gemiddelde Nederlander.

Hoe vaak eten jullie vlees per week?

6.2.2. Week planner

The week planner shows the days, and can be used to structure the cards and remember which recipe the family is planning to eat on which day (figure 42).

Maandag Dinsdag Woensdag Donderdag

Vrijdag Zaterdag Zondag

Figure 42. The week planner

Food for **Thought**

1. Put the cards down with the coloured side up:

<15 min   >20 g protein   Dutch

| Snel & duurzaam | Voedzaam & duurzaam | Traktatie & duurzaam | Traditioneel & duurzaam |

2. For each day, choose a category that suits that day, and pick a card from the stack:

| Maandag | Dinsdag | Woensdag | Donderdag |
| | Snel & duurzaam | | Traditioneel & duurzaam |

| Vrijdag | Zaterdag | Zondag |

3. If you have a card for each day, turn them upside down and place them on a magnetic surface.

Snel & duurzaam

bijvoorbeeld **Portobello burger**

4. Open the card to see some more information:
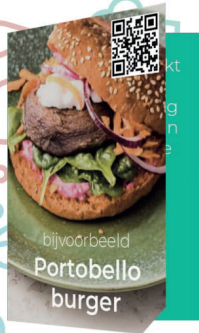
Vlees veroorzaakt 40% van de klimaatbelasting door voedsel van de gemiddelde Nederlander.

Hoe vaak eten jullie vlees per week?

bijvoorbeeld
Portobello burger

5. Scan the QR code to see the recipe and ingredients:

Portobello burger

Ingredienten (4 pers):

4	Portobello's
1 el	milde olijfolie
300 g	winterpeen
1/2	citroen
1	rode ui
100 g	Violife Greek white
4	Hamburgerbroodjes
200 g	hummus rode biet
50 g	baby spinazie

Zet op boodschappenlijst   Naar recept

6. Swipe to see alternatives for certain ingredients:

Portobello burger

Ingredienten (4 pers):

4	Portobello's
1 el	milde olijfolie
300 g	winterpeen
1/2	citroen
1	rode ui
100 g	Violife Greek white
4	Hamburgerbroodjes
200 g	hummus rode biet
50 g	baby spinazie

Zet op boodschappenlijst   Naar recept

Portobello burger

Ingredienten (4 pers):

4	Vegetarische hamburgers
1 el	milde olijfolie
300 g	winterpeen
1/2	citroen
1	rode ui
100 g	Violife Greek white
4	Hamburgerbroodjes
200 g	hummus rode biet
50 g	baby spinazie

Zet op boodschappenlijst   Naar recept

Food for
thought
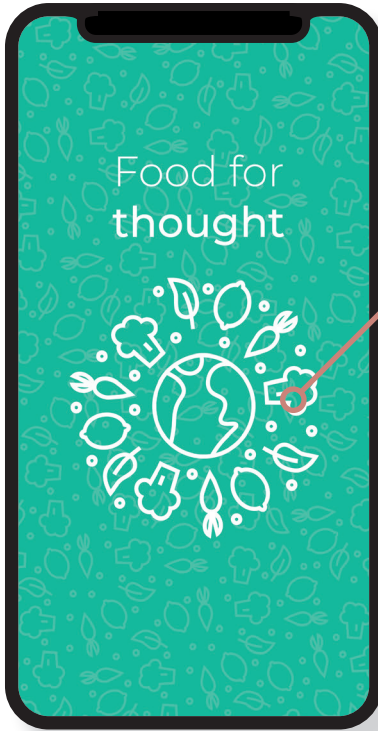
*turns round
while waiting*

*When opened from
scanning a QR code,
the user will see screen
2 after loading. When
opened from the
mobile phone, the user
will see the grocery
shopping list, screen 7.*

loading screen

2

*select the right
number of family
members*

*close box by
tapping*

**Portobello
burger**

Ingrediënten   4

4   Portobello's

! Swipe naar links en rechts
om alternatieven te zien voor
de gekleurde ingrediënten

Tik hier om te sluiten

1   rode ui

100 g   Violife Greek white

4   Hamburger broodjes

200 g   hummus rode biet

50 g   baby spinazie

Zet op
boodschappenlijst

Naar
recept

ingredients

swipe coloured ingredients for alternatives

3

Portobello burger

Ingrediënten ⊖ 4 ⊕

4	Portobello's
1 el	milde olijfolie
300 g	winterpeen
1/2	citroen
1	rode ui
100 g	Violife Greek white
4	Hamburger broodjes
200 g	hummus rode biet
50 g	baby spinazie

Zet op boodschappenlijst   Naar recept

ingredients

4

Portobello burger

Ingrediënten ⊖ 4 ⊕

4	Portobello's
1 el	milde olijfolie
300 g	winterpeen
1/2	citroen
1	rode ui
100 g	Violife Greek white
4	Hamburger broodjes
200 g	hummus rode biet
50 g	baby spinazie

tap to go to screen number 7

tap to go to screen number 5

Zet op boodschappenlijst   Naar recept
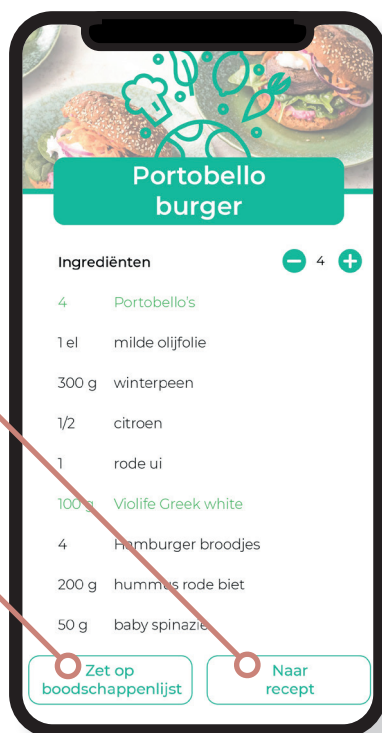
ingredients

5

empty the list

tap meal for all
ingredients

boodschappen

Maak ongedaan   Wis alles

Portobello burger

Vegetarische
volkorenspaghetti

Tofu met cashewnotensaus

Rijke boerenkoolstamppot

grocery shopping list

6

undo

remove a
whole meal

remove one
ingredient

boodschappen

Maak ongedaan   Wis alles

Portobello burger

Vegetarische
volkorenspaghetti

Tofu met cashewnotensaus

300 g   rijst

100 g   gezouten cashewnoten

1   citroen (schoongeboend)

5 el   zonnebloemolie

1 teen   knoflook

100 ml   kokosmelk

1 el   lichte basterdsuiker

grocery shopping list

recipe

6.4.1. Marketing

The product could be put on the market in collaboration with a supermarket. This would make it possible for the user to order the ingredients online. The exposure of their shop might be a reason for supermarkets to want to collaborate.

7. Validation

This chapter aims to validate whether the design has the intended effect on the users (in this case a family).

First I show the research questions for this last user test, then the prototyping method and how the prototype differs from the design. After that the test setup, results and the conclusion are presented.

The results of this user test, combined with conclusions drawn earlier in the report, are combined in the discussion of the used research methods and recommendations for redesign in the next chapter.

7.1. Research questions

The focus of this validation was mainly on the decision moment, and how the qualities of this moment are compared to how families usually decide what to eat. More specifically I wanted to look closer at the communication and what part of the design is initiator of certain conversations.

I wanted the user test to answer the following questions:

Impact of the design on the interaction quality 'connecting':
Q1: To what extent does the design evoke conversation about current dinner habits, and how is it different from the way they usually talk about dinner habits?
Q2: If conversations are started when using the design: what triggers/inspires those conversations?
Q3: How does the tone of the conversation change during the use of the design, regarding sustainability?
Q4: Do all family members contribute equally and on their own intitiative to the discussion?

Other interaction qualities:
Q5: What do they think of the recipes, and how do they relate to what they usually eat? To what extent do they consider the design to be an improvement of their way of deciding what to eat and why is that? This is important to know as the previous tests showed that their taste has an influence on how they rate the design as a whole.
Q6: To what extent are they surprised by the design and what aspect of the design is surprising to them?
Q7: How much do they feel in control of the sustainability of their dinner choices when using the design?
Q8: To what extent do they feel an appreciation for food? Is there a change in perspective for them in the way they look at food?

7.2. Prototype

The prototype consists of different parts, prototyped in different ways.

7.2.1. Cards and week planner
I prototyped the cards by printing the file for the cards onto paper and attaching to magnetic foil. By using foil with a glue layer (see figure 35), the side with the recipe and the conversation starter could be attached to the magnetic foil. For the side with the category, I used double-sided tape, as glue turned out not to adhere well to the magnetic side in the previous test.

The week planner consisted of just one side, which could easily be placed on the magnetic foil and cut out with a small knife.

The differences between the cards in the prototype and the original design are the following:
* There are no empty cards that the family can use to add their own recipes.
* There are only 9 cards as opposed to the 21 cards I expect would be a good starting point. The four standard categories are used, and in each category there are two cards apart from the category 'nutritional' which has three.

The recipes were selected from the Allerhande website, as they already categorize their recipes in different ways which made it easy to select them

7.2.2. Application
For the application, I used Axure software. This enabled me to make a functioning prototype of the app with the ingredients and recipes. The following functions were implemented in the prototype:
* Opening upon scanning the QR-code on the cards.
* Swiping to see alternatives for certain ingredients (also in different colours). A pop-up box explains how to swipe to different ingredients, disappears when touched.
* Moving from the ingredients page to the recipe when touching the button.

The following functions in the design were not implemented for this prototype:
* The possibility to add all ingredients to a shopping list after picking alternatives for certain ingredients
* The pages can now only be seen in a webbrowser, as opposed to in an actual phone/tablet application
* Recipe should be adjusted based on selected ingredients, which was not implemented in the prototype.

Figure 43. The category side of the card

Figure 44. The recipe side of the card

Figure 45. Corner showing the layer underneath

Figure 46. The conversation starter: some information and a question

Figure 47. The whole set, cards and week planner

7.3. Test setup

The prototype was tested by 3 different families:
- A couple with one child of 12 years old. Never decide what to eat together. The mother decides and does the grocery shopping, father and daughter can however decide which of the meals they want to eat on which day. Their diet is very varied.
- A single dad with two children, a girl of 12 and a boy of 14 years old. Are with their father half of the week, and the father does the groceries and decides what to eat. They usually eat Italian or Mexican dishes, often the same ones every week.
- A couple with two children, one of 6 and one of 11 years old (a little younger than the target group). The mother usually decides what the family will eat, and she prefers typical Dutch food (sometimes macaroni or nasi) and they do not know much about other cuisines.

As the goal was to analyse difference in communication between the usual way of deciding what to eat versus when using the prototype, I tested this first stage of use, so sitting together and deciding what to eat.
The test consists of three parts:
- A short introduction, followed by some questions on their current habits and a questionnaire they could complete together while discussing. The topic of these questions was mainly the sustainability of how the currently eat, whether they actively take measures to be more sustainable, and the way they decide what will be cooked the coming days.
- Use of the prototype, for which they only received the prototype and the explanation that could also be found in chapter .
- An interview on the experience of using the product, of which the answers could be compared with how they usually decide what to eat.

The script that was followed can be found in appendix I. The total duration of the test was approximately one hour, the test was recorded on video and conducted at the home of the family.

7.4. Results

The results differed from family to family, depending on the characteristics of their current diet and their openness to trying out new dishes and ingredients. Therefore, the results are first presented per family, and afterwards combined in the conclusions

7.4.1. Family 1

This family has a very varied taste in meals. They eat typically Dutch meals a few times a week, but regularly try out different cuisines. For them, health is an important quality of meals and they indicate to watch their sugar intake, try to use fresh ingredients and watch their portion size. Currently they have one meatless day, which is partly because of sustainability reasons and partly to limit calory intake.
The mother decides what they are going to eat, does the groceries and prepares the meals, apart from one day on which the father cooks. The father and daughter get to pick which of the meals for which the mother has bought ingredients, they want to eat on which day. They never discuss sustainability of their habits.

Communication
This family never talks about sustainability, which is why the parents were surprised by how much their daughter knows about it. During the user test it became clear that the family sure is interested in eating more sustainably, and they agreed on most topics. While the daughter initially indicates not to want to eat vegetarian 'rookworst' as she does not like 'vegetarians', later she indicated to be interested in the vegetarian burger with fries, so this depends on taste of the specific vegetarian recipe. The mother is not in favor of meat substitutes like that because of nutritional reasons.

"Why are you laughing at me?" daughter (12)
"I'm not laughing at you, I just like the way you answer these questions! You know more than I do!" - mother

They had an open attitude towards the information that was presented to them, and they reflected on how that translated to their current habits. For them, the recipes mainly led to an insight in how to differently prepare meals to make them more sustainable or the use of specific ingredients, while the information and questions was more educational on how big of an impact certain habits have on the environment. This actually led to a discussion on how the value of food has changed over the last period. The mother participated more in the discussion than the father, maybe because she spends more time planning and preparing the meals of the family. The daughter participated on her own initiative.

> "If you want sustainable meat, you should go to a farm, buy half a cow and cram it in the freezer." "That is how it used to go, meat for 2 months". […] "we have a very different life now. TV takes up so much time, we used to be more deliberate with food. […] everything has to be faster, ready-made, and let's make sure we spend as little time in the kitchen as possible!"

Agency
The family feels confident they could eat the meals in the meal plan. The mother mainly appreciates that they contain lots of vegetables and often do not require the use of a meat substitute. They actually asked for some of the recipes to try themselves. Next to sustainability, they see personal value in terms of nutrition and variety in their current dinner habits. The information inside the cards they found educational, and they showed to apply the information later in the user test when they decided that regular cheese could be switched for mozzarella to decrease the environmental impact.

> "Or we use mozzarella instead of regular cheese! We've seen in the other card that that is more sustainable!" - mother

Surprise

The surprise for this family mainly came from the information inside the cards, and the recipes. What was surprising for them in the recipes was the fact that they recognized ingredients and meals that they are used to eating, but in a slightly different way. The daughter also indicated it was very educational.

"Yes we always make kale with bacon and 'rookworst' but of course you can make it any way you want!" - father

Appreciation

They indicate that the design helps them look at food in a new way, making them aware of sustainability and how they could adapt the recipes they currently often prepare without adding a meat substitute. They also talked about how dinner habits changed and how their current lifestyle influences the value food has for us.

User friendliness

They found both the card set and the application easy to use, although they said they would like to have more cards to keep it interesting.

7.4.2. Family 2

This family eats typically Dutch meals for most days. The only exceptions are dishes like macaroni, spaghetti and Chinese, which are in the Netherlands usually adapted to Dutch taste. They eat meat with every day with their meals but say that the portions are not necessarily big. The mother decides what the family eats and does the groceries and prepares the meals. The father indicates to be interested in a bigger variety of meals, which does not sound so appealing to the mother. "No culinary cook. [...] You can't handle much new" The family never talks about sustainability, and although they can name some habits that are sustainable, they are a little unsure of what sustainable eating means.

Communication
This family is not used to discussing sustainability of dinner choices, apart from that the father would be interested in more variety in meals 'not a culinary cook'. For them the recipes were a big part of the conversation as there was an ingredient the mother really does not like, as well as ingredients they are unfamiliar with. In addition, the information on the cards was a reason for discussion. The conversations however were more on a general level of reflecting on current behaviours without intention to do something differently, where the first family started thinking immediately of what they change.

Agency
At the beginning of the test, the family is unsure of what sustainable eating means. Initially the mother is a bit hesitant she would be able to cook meals like suggested by the prototype, after which her husband reminds her that the recipes are not necessarily difficult to prepare. She agrees but adds that she would be able to eat that way 'if they would commit to it' which indicates that that is a choice that they would not automatically make. The alternatives in the application for them had an additional purpose next to indicating the sustainability of the different options: they could use it to see what type of ingredient the unfamiliar ingredients were an alternative for, making an assumption of what it is.

"Well, 7 days in a row! That's quite something" - mother
"Yes but I think for some, they don't necessarily take long! I think as long as you have the ingredients!" - father
"Yes. If we have the ingredients, and the recipe is clear to follow, and we would commit to it." - mother

Surprise

For them the recipes themselves were most surprising, as they were very different from what they typically eat. Some recipes sparked the curiosity of the family members, for example kale as the children had never eaten that as the mother does not like it, or tofu or portobellos because they are unfamiliar ingredients to them.

Appreciation

The design creates appreciation for food in the sense that it is educational, which is important for them as the mother is a teacher. It would be educational for them not only in the sense of sustainability, but also because of the ingredients that are new to them, of which they indicate they would look up what they are and how they are sustainable compared to alternatives.

"What is a portobello?" - son (11)
"I don't know, I think a type of bread?" - mother

User friendliness

The mother sees great value in being able to add all the ingredients to a list, as she indicates that it would be a hurdle to both have to go and look for recipes as well as having to write a grocery shopping list. They say that the design would have value too during preparation of the meals as well as during dinner, as the unfamiliar recipes could be a conversation starter, and the cards could be used during dinner to remember which information related to the meal.

"Well I wouldn't go searching for recipes, like my mom does, thinking oh what kind of sustainable dinner will we have today. That takes an hour!" - mother

7.4.3. Family 3

This family describes their diet as 'uncontrolled', 'slightly unhealthy' and 'varied'. The children have quite a varied dinner as their parents are separated and both their parents prepare different types of meals. They say they eat mainly Italian, Mexican when with their father, and that he often prepares the same meals. The father buys the groceries, determines what to eat and prepares dinner. They never discuss sustainability, and even have no idea of what it would mean to eat sustainably.

Communication
The family never discusses sustainability, so both the recipes and the information in the cards were interesting for them. Two of the family members (father and son) have the opinion that eating meat is the way it is supposed to be, while the daughter and the father's partner are more open to for example vegetarian dinner. While the son is very vocal about what he thinks about a vegetarian diet and that meat is the 'main dish of the main dish', through discussion it becomes clear that he would actually not have a problem with a meatless day, and mentions that one of the recipes actually sounds interesting to him.

> "I would never want to be vegetarian. That is such bull****." - son (14)
> "Well these are all vegetarian variations on recipes,
> so you could … [add meat]" - father
> "I won't stop eating meat." - son
> "No that is okay, you already said, every day
> has to be meat." - partner of father
> "Well not every day, but…" - son

Meat was often a trigger for discussion, and the discussion fully started after they finished using the prototype, so it is unclear which part of the prototype inspired these conversations most. The son was quite loud, and in some cases his sister tried to say something but was not heard by the rest of the family. Her opinions were also not as strong which is why the comments of her brother attracted more attention from the father and his partner.

"That you would feel sorry for the animals, I don't understand. [...] It is supposed to be like this, people eat animals. I don't see the problem" - son (14)
"I share that opinion. I wouldn't say it as bluntly, but..." - father

Agency
While they are interested in for example the tofu with cashew sauce, they do not believe that it would make a difference if they would stop eating meat and that climate change is an unsolvable problem, however the partner of the father thinks they have to start somewhere.

"It's an almost unsolvable problem" - father

Although the recipes are very different from what they are used to and the father indicates that they contain ingredients he usually does not buy, he does believe that he can prepare them but that for him the barrier is mainly that he tends to go for the same meals over and over if he is buying groceries. The children agree that he tends to make the same thing often, and the son indicates it would work well on days on which the father has no idea what to cook. A personal value in using this design thus would be that it would bring more variety in dinners, and the recipes that seem appealing to them, they would be willing to try even if they are vegetarian.

"This can work. Normally I do the groceries on Saturday and then you think, I'll buy this for that day and this for that day, so then you also have a plan, but you always end up with the same, what they say, the same things you already know" - father
"We always eat kind of standard stuff with you" - son (14)

Surprise
The surprise came in this family mostly because of the difference between how they eat currently, and the meal plan they ended up with. It made them realize how much they fall back on the same recipes. Additionally, they were surprised by the type of conversations that followed the use of the design.

Appreciation
The appreciation for this family was mainly in seeing how they could consider sustainability when looking at what they want to eat. They had no idea what it means to eat sustainably before starting the test, and thinking about it in this way did not only make them aware of for example the impact of animal products on the environment, but it also showed them how looking at it could inspire a different way of eating and more variety in dinners.

User friendliness
They see value in this design for a big part in situations where it is difficult to decide what to eat. They would like to see more cards, and they experienced some trouble swiping in the application.

> "This would be useful for example on a day like last Saturday, that you say 'I don't know what to eat', then you just pick one of these cards and you know" - son (14)

7.5. Conclusion

Family 1 sees next to sustainability also health as a motivation to eat sustainably. They were surprised by how they can alter what they currently often eat without adding meat lookalikes to make it more sustainable, and asked for the recipes used in the test. Family 2 is content with the way they currently eat. They do not see a personal benefit in it. While in the beginning they are unsure of what it means to eat sustainably, they believe they can eat sustainably at the end. They have not spoken out the intention to actually eat differently from what they currently do. The third family is not necessarily content with the way they currently eat, however, that has more to do with the selection of meals than the sustainability. For them, the prototype lets them discuss sustainability while also showing them what a sustainable diet is and additionally, they get inspiration for things to eat that they are not used to. Even though they are in principle not in favour of vegetarian food, they are still willing to try if the recipes sound tasteful.
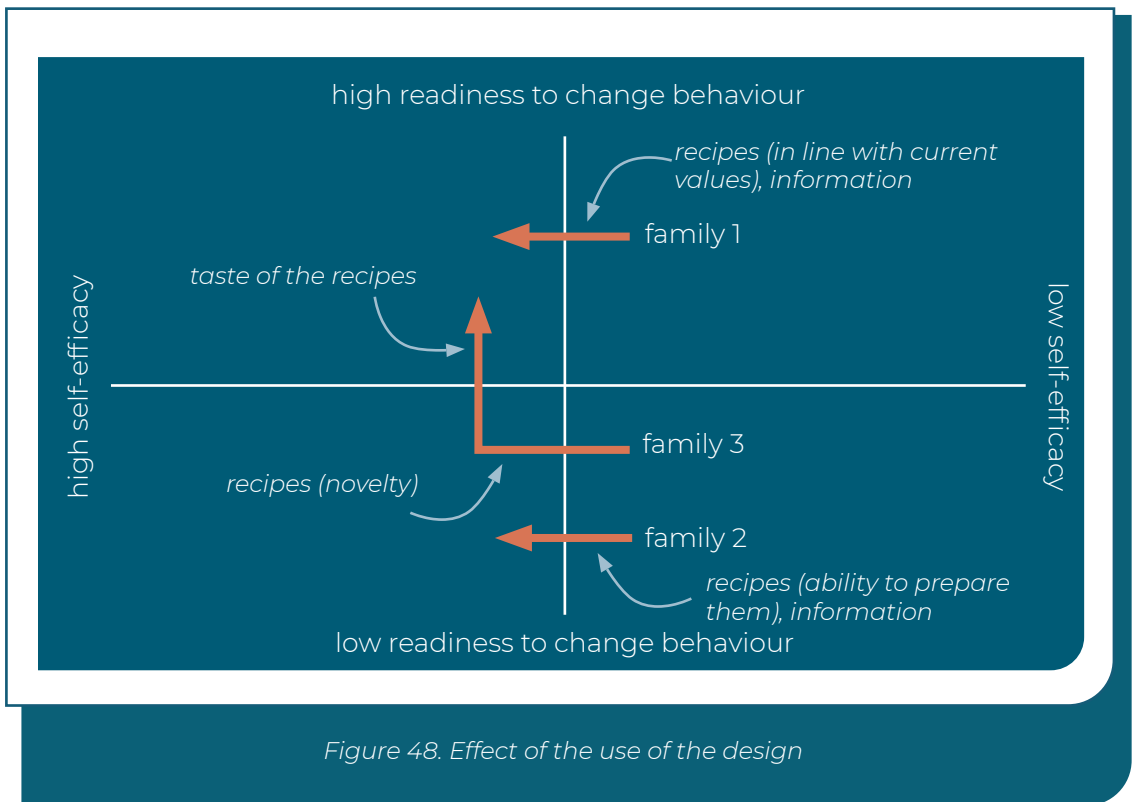

Figure 48. Effect of the use of the design

Interaction quality 'connecting'

Q1: To what extent does the design evoke conversation about current dinner habits, and how is it different from the way they usually talk about dinner habits?

None of the families is used to deciding what to eat together, additionally they also do not discuss the sustainability of their dinner habits. The use of the design resulted in conversations around both sustainability as the current dinner habits.

Q2: If conversations are started when using the design: what triggers/inspires those conversations?

The type of meals on the cards resulted mainly in conversations around the current dinner habits and how these new recipes are different.

More in-depth conversations were sometimes triggered by the recipes themselves, but more often followed the questions provided with the information in the cards. The cards with a question generated more discussion than the card with just a fact (as the cards with just a fact were sometimes just read without elaborating on the information).

Q3: How does the tone of the conversation change during the use of the design, regarding sustainability?

Two families indicated to be open to try the recipes, one family because they thought they would be tasteful and healthy, the other family because they thought it would be a welcome variation to the current diet. These families had more in-depth conversations around the meaning of meat for them, and the reasons they had/did not have for wanting to eat meat. The other family only talked about sustainability on a more general level, less related to their personal habits.

Q4: Do all family members contribute equally and on their own initiative to the discussion?

Not all family members contribute equally, they do however on their own initiative. The family member in charge of the groceries and cooking often had a stronger opinion, or a dominant family member could be limiting for the others to voice their opinions.

Other interaction qualities

Q5: What do they think of the recipes, and how do they relate to what they usually eat? To what extent do they consider the design to be an improvement of their way of deciding what to eat and why is that?
Two of the families indicated that the recipes are quite different to what they are used to. For one family the cause is that they mainly eat traditional Dutch dishes, while the other family is used to eating 'uncontrolled' and 'slightly unhealthy' as they described it themselves.

Two of the families indicated to be interested in the taste of the recipes. They were, for this reason alone, already curious about some of the recipes. In the third family half of the family was interested, however the family member in charge of meal preparation and grocery shopping was less willing to try out the unfamiliar recipes and ingredients. They consider it to be an improvement to their current way of deciding what to eat as it is educative, shows new ways to prepare meals, and prevents them from deciding on beforehand that something is difficult to prepare or from falling back on the same meals they always eat.

Q6: To what extent are they surprised by the design and what aspect of the design is surprising to them?
The recipes are surprising, in some cases because of unfamiliar ingredients and in others because it was a familiar ingredient or dish that was used in a way that was new for the participants. For two families the information in the cards was also interesting and educative.

Q7: How much do they feel in control of the sustainability of their dinner choices when using the design?
The recipes gave the participants mainly a general idea of what sustainability is. The application showing the ingredients was a way for the participants to determine if it would be feasible for them to prepare the meals. They agreed that it would be feasible, however, if they were willing to try to prepare the recipes, depended on their taste, if the recipes were healthy or if provided some variation to the current diet. Again, the participants showed that an additional personal benefit helped in their motivation to want to eat differently.

Q8: To what extent do they feel an appreciation for food? Is there a change in perspective for them in the way they look at food?
Providing a recipe based on a value was appreciated by the participants, who indicated that it would help them pick recipes they otherwise would not pick, give inspiration or showed them novel ways to prepare familiar recipes. If the recipes seem appealing, even the most stubborn meat eaters showed to have interest in vegetarian recipes.

8. Discussion and recommendations

In this chapter, I will discuss the limitations to the research done for this report, and how those could have affected the research outcomes and therefore the design.

The recommendations show opportunities for future research within this project and for application of the research outcomes in different ways.

Here I will discuss the limitations of the project
process and the design outcome.

Study participants are mainly female.
A big part of the research was the context-mapping session which
was performed at all girl's scout group. Therefore, females were
overrepresented in the study which might affect the research outcomes.

Limited generalizability
Many of the research activities were performed with only a small number
of participants. Even though the methods used seemed to have certain
effect, larger sample sizes are needed to generate significant data.
Additionally, all participants originated from a small geographical area.

The following recommendations could be used
for further research on the topic:

Visual style
I have not done any research into what the most suitable visual style for
such a design would be. It could be researched if the visual style of the
current design is suitable for the age group, or if it is maybe too childish.

Additional user testing over a longer period with a larger sample
The last version of the prototype has not been tested for a longer
period, only the first part of the use in which the families determine
what to eat was observed. A longer test would be necessary to see if
the application is practical to use, but also to see how the use changes
after having used the product for a while. It might be that families find
a few favourites, after which they do not use the product anymore.

Market
Research into the market for such a design was not in the scope of this
project and was therefore not researched. One possibility is to promote
it in combination with a supermarket, enabling users to maybe collect
the cards, however, if this is realistic has not been researched.

Costs and production method
A suitable production method and the corresponding
costs of producing the card set and developing the
application have not been looked at in this project.

Different age group
The target group of this report were children of the age 12 to 14.
However, at a slightly older age, they might respond differently
to the design. Especially if within a family there are more children
of different ages, it might be good to research how they interact

with the design and what their experience with it is.

Explore the possibilities to use used strategies for different types of behavioural change.

The design showed to be a powerful tool to help families discuss the topic of sustainability and help them change behaviour. The two methods used to do this, asking questions and giving concrete recipe ideas to bridge between intention and action (providing clear information). Bridging between intention and action could be used to encourage diet changes with a different objective (diets for allergies, cholesterol, diabetes), or in other contexts where a behavioural change requires a certain amount of research and planning (for example an application that shows you which days are good days for cycling so you know immediately on which days you will have some extra exercise without having to check the weather forecast)

The information as a conversation starter could be applied to any situation where discussion on a certain topic is desirable. The goal does not necessarily have to be that the user changes their opinion on the topic, oftentimes talking about it is a good first step in becoming more open to different perspectives. Asking the right questions about the reasoning behind certain beliefs can be a powerful way to let them reflect on what is behind their beliefs.

Iteration to improve equal contribution

Another iteration could help solve the problem of equal contribution to discussions. The family members concerned most with the groceries and cooking often had the clearest ideas and opinions on certain topics as well as practical ideas for the concept. This sometimes led to other family members not having much room to voice their concerns or opinions. An extra design iteration could be helpful to see if a solution for this problem can be found.

9. Conclusion

This chapter explains whether the design reponds well to the design brief and if the design evokes the intended interaction qualities.

The goal of this project was to help minors of the age 12 to 14 to take agency in developing strategies to decrease environmental impact in their home environment, as the world-wide strikes for climate justice show that this is a topic that they care about. Next to striking, they can have an influence by communicating with their caregivers as they can vote and decide which companies to support with the way they spend their money.

Agency is 'the capability to effect change in themselves and their situation through their own efforts' (Bandura, 1989). Taking agency happens in four different steps (not necessarily always followed in this direction): setting an intention, forethought (planning), self-reactiveness (executing the plan), self-reflectiveness (reflecting on how this went). Self-efficacy is closely linked to agency, as it is 'the belief one has in their ability to influence events that affect one's life and control over the way these events are experienced' (Bandura, 1994). The research phase of the project showed that in sustainability, a combination in readiness to change behaviour and the feeling of self-efficacy determine whether a person is willing to move towards more sustainable habits. A lack of intrinsic motivation and existing beliefs regarding sustainable habits or the value of current habits limit a readiness to change behaviour. A lack of information, highly complex information, a lack of constructive reflection, and unclear intention setting limit a feeling of self-efficacy.

Sustainability of food depends on many factors. Additionally, food and habits around dinner have a cultural value that needs to be preserved when changing food habits. The following design goal was formulated: I want children of the age 12 to 14 to feel an appreciation for food when deciding what to eat together with their parents. I want to help them decide on sustainable meals while providing an atmosphere for open discussion and honouring the values of their current food habits. I want the interaction to have the following characteristics: surprising, appreciative, connecting and in control. This design goal and the intended interaction characteristics were the inspiration for the ideation phase of the project. The result of this ideation phase is the design 'Food for Thought'.

Food for Thought is a card set, with an application, that can be used by families when deciding what to eat for dinner. One of the identified problems when taking agency, is not setting a clear goal and not making concrete plans to realize these goals. Food for Thought helps families to pick meals based on limitations or values on certain days of the week. There are stacks of cards for different values. On the back of the cards there are recipes that fit with the value they chose. By giving them a concrete meal idea, the family does not need to formulate a plan (forethought), because of which they are helped in bridging between setting an intention and self-reactiveness. In addition, facts and questions related to the meal on the card provide food for thought for the family

and can be used to learn from each other what food means to them.

I validated the design in a user test with three families to see if the design evokes the intended interaction. The families were surprised, mainly because of the recipes and the conversations the design evoked. These conversations were sometimes on what the family could do differently in terms of sustainability, in other situations it was a comment on the variety/type of meals or about a certain belief or association to a term like 'vegetarian'. The design increased appreciation in different ways for different families, for example by showing them how they can adapt their current recipes, or by providing inspiration for new types of meals to change up their current diet. Next to sustainability, the design provided the values 'health' and 'inspiration', which in addition to the taste of the recipes made families willing to try them out. All families said it was either educative, perspective changing, or both and they believed they would be able to follow such a plan; not all families were however as willing to change their current way of eating as not all families saw a clear personal value in it.

While the families never discuss sustainability or dinner habits and the use of the product lead to conversations on differing views, now often there was one family member who was not participating as much as the others. The cause seemed to be if the family member is concerned with the groceries or cooking, or if there is one other family member who is more dominant in the discussion. This could still be improved upon. In addition, additional research on the market, visual style, acceptance of the design in different age groups and a longer user test could be valuable to further improve the design.

This method of bridging between intention setting and self-reactiveness was useful to let the families look at their food habits differently and proved to be both educative and easy to implement. It gives children the opportunity to have open conversation with parents, and helps them work together for a more sustainable future.

Maandag

Dinsdag

Woensdag

Donderdag

bijvoorbeeld
Ravioli met tuinerwten-saus

bijvoorbeeld
Jamie Oliver's aardappel-burgers

Rijke boerenkool-stamppot

Vrijdag

Zaterdag

Zondag

bijvoorbeeld
Portobello burger

egetarische urger met friet

egetarische volkoren spaghetti

Tofu met cashewnoten-

Maandag

Dinsdag

Woensdag

bijvoorbeeld
Ravioli met tuinerwten-saus

bijvoorbeeld
Jamie Oliver's aardappel-burgers

Tofu met cashewnoten-saus

Vrijdag

Zaterdag

Zondag

bijvoorbeeld
Portobello burger

egetarische urger met friet

egetarische volkoren spaghetti

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