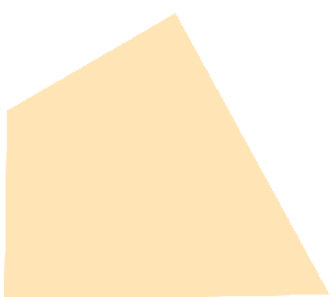






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# Introduction

In this semester our team started to work on a project that would stimulate a healthy home. For us a healthy home is a place where people live happy and healthy together or alone. We see it as a place where people make well considered choices about their life and lifestyle. These choices can be about healthy eating or sleeping patterns, making right financial decisions and for example living more environmentally friendly.

For our project we wanted to create a better awareness about recycling. We believe that in a healthy home the inhabitants need to be involved in making right environmental decisions. That is why we created Bloclé, an innovative, educational and active game, that creates awareness about recycling among children. Bloclé will teach children about recycling through using different waste products that can be linked to one of the four recycling categories.

With choosing a young age group, children between the ages 6 till 10, we hope to have a long term influence on their recycling habits for the future. Because when you learn to make right recycling choices when you are still young it will be easier to keep doing this when you get older.

# Project Goal

Creating awareness about recycling is one of the most important factors to let children begin to recycling. Our goal is to come up with a plan to make children aware of how to recycle their waste products in the right way in a fun and playful way. To achieve this, we focused on the two following goals within our project:

JOYFUL - The best way to make children learn something is game based learning. When we come up with a fun and active game our target group will become more eager to learn about recycling via this way.

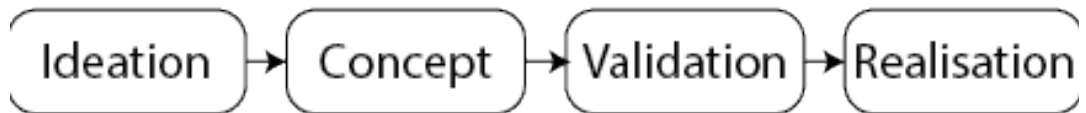
EDUCATIVE - Our main goal in this project is to make children aware of recycling methods. That is why it will be very important that our user group is able to show that they learned from the game.



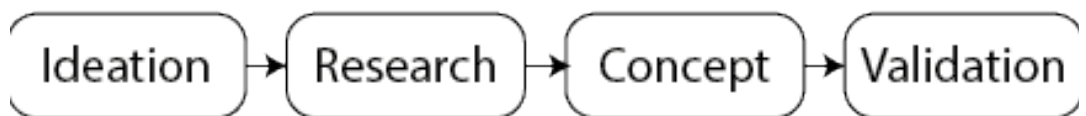
# Process

In order to make an overview of our process throughout our design process we created a visual that showed the steps we took and key words that clarifies what was done during the particular step.

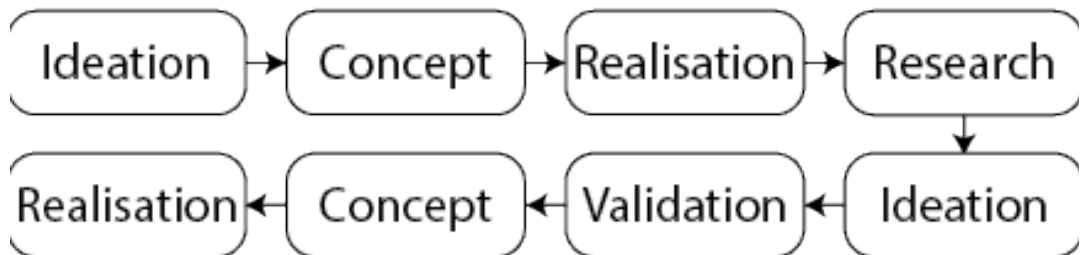
## Iteration 1: Pressure Cooker



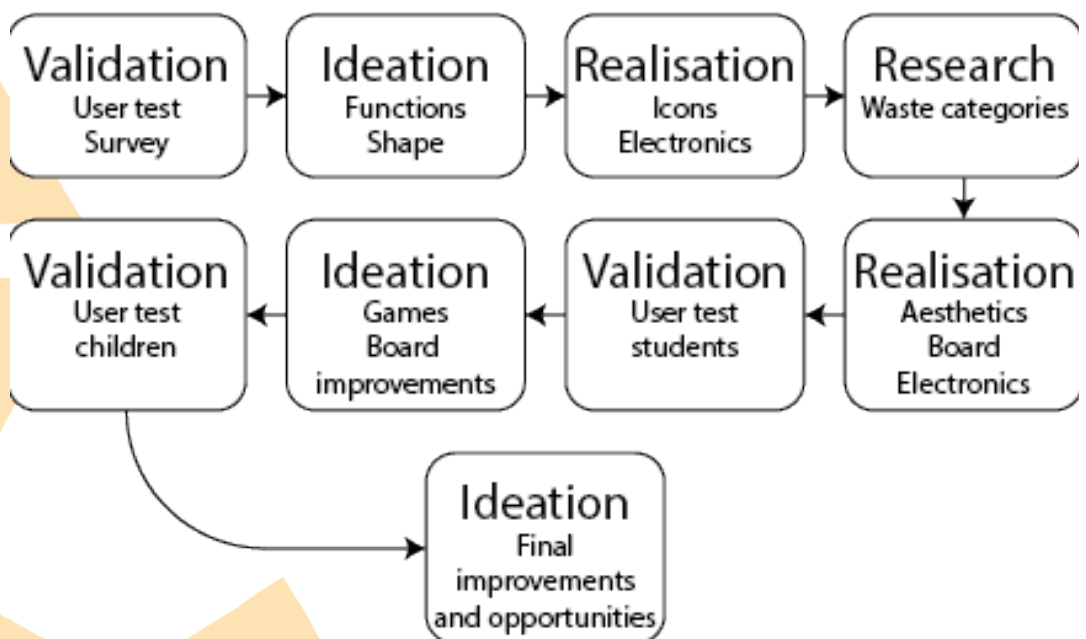
## Iteration 2: Preserving food



## Iteration 3: Recycling among children



## Iteration 4: From demo day to demo day



# Iterations

Throughout project 1 we went through multiple iterations in order to optimize our design. With prior knowledge obtained through From Idea to Design and User-Centered Design we knew the basics on how to approach the multiple iterations.

## Iteration 1 Pressure Cooker

The first iteration of this project was part of a pressure cooker, the pressure cooker helped us following a design process within two weeks, this meant that quick decision making and execution was required. The goal of this iteration was to get to know which obstacles you can stumble upon and what steps need to be taken throughout a design process. This starting iteration could give us a concept that could be used for the whole project.

Our approach was to keep the concept close to our own interest, we made this decision because we had prior knowledge on the subject and had relatives in the target group. This saved us time on the part of research. Which was very useful considering we only had two weeks to come up with a final concept.

The iteration started with the target group, the target group was people that were starting their retirement, aged >65, with the goal of resourceful ageing. We did some research on the problems of this age group and discovered three main problems, health, social and financial problems. The last one, financial problems, interested us the most, this was due to the fact that we saw an opportunity to create a simple device for this problem. This choice was also made because we did not have a lot of knowledge on health and we found out that social problems were hard to be solved within two weeks.

The result of this iteration was a lamp that gave insight in the financial situation of the user. The user could have an overview of their monthly budget. When we were reflecting on our final outcome we came to the conclusion that finance is a difficult topic, it deals with privacy and is susceptible to fraud, especially with elderly. Not only was our topic difficult, but the target group as well. We saw that within the age group there were a lot of differences of capabilities.

Both these discoveries made us start our process over again with a new iteration



## Iteration 2 Preserving food

Our second iteration started with one topic, sustainability in houses. We started with brainstorming and came to a more specific topic, sustainability in the kitchen. In order to come to a concept we used the random links approach. This approach consisted out of two lists, objects and actions. With a random number generator two items of the list were combined and with this object and action a concept should be created.

For example, we got a fridge and noticing when food is expired. Our quick concept for this combination was a lid that could be put on an item of food, when the item of food was almost expired a notification would pop up on the fridge to remind the user to consume the product.

This process was useful, we did not come to a good concept, but discovered that a kitchen tool that was sustainable was difficult and not part of our interests. This was a quick way to make decisions about a concept.



## Iteration 3 Recycling among children

After our second iteration we still continued with the theme of sustainability, however we took a step back and looked at what was interesting to us within this theme. The conclusion of this step back was that we were going to focus on a different age group, children. This choice was made due to the fact that we wanted our concept to have a long-term impact. The decision was made to form a game for children to learn about recycling. With some research a game is one of the best ways to learn for children.

In order to create a fun and educational game for the children we had multiple brainstorm sessions. Multiple ideas for games were produced, for example an active game outside for children or a game on a bin in order to recycle correctly. The game outside was a good option because not only would children learn about recycling, but also be active and increase their social skills, due to the fact that this game would be in the middle of the neighbourhood. However, due to the fact that this game would be performed outside it did not fit within the theme healthy homes. The second idea of the bin had also potential, it could learn kids throughout the day and would not be a big hassle. However, the fact that this needed kids to play with waste would not make the game hygienic. So we passed on this idea as well.

An idea that was more suitable for the theme healthy homes was the concept of a puzzle for recycling. The puzzle consisted out of one main block in the centre that lead to four directions with each direction representing a recycle group. The idea was to have multiple waste items of the category that were pieces of the puzzle. If the user would place these pieces in the correct direction the puzzle would eventually be completed.

The next thing we did was to combine the good parts of these ideas. We took the fact that a game could be active and improve social skills and we took the part to work with items of waste. Apart from that we stuck to the concept of the puzzle, but we noticed that this limited us to one game, so we knew we had to adjust this. This formed a great direction for our concept. We decided to make this our project for the midterm demo day.

We created a game that consisted out of four categories of waste, organic, PMD (plastic, metal and drink cartons), other recycling methods and residual. With these four categories we could cover as much categories that were present within a household and still keep it simple. With these four categories in mind we started to develop a design for the game. The first design that we came up with was a hexagonal board with multiple hexagons as play blocks. The choice for this shape was made because we could create a symmetrical board and due to the fact that we had multiple blocks, we could play multiple recycling games with this board. The fact that we wanted to let the kids be able to play the game on their own made us choose for electronics to be integrated into the game. The idea was to be able to check if a waste item fit in which category. With this function kids could learn themselves and other games could have an interactive core.

For the prototype that we created for the midterm demo day we decided to only show the aesthetics of the concept because we were still trying to find out how the electronics had to be integrated into the game. We decided to create the prototype from cardboard, with cardboard we could create a strong prototype for the demo day that represented our idea well.

For the icons that were part of the blocks that showed what kind of waste it was we chose to use copyright free icons from flaticon.com. We chose to use these icons because we did not have the time to create icons ourselves yet and this wouldn't have contributed to the feedback of the midterm demo day.



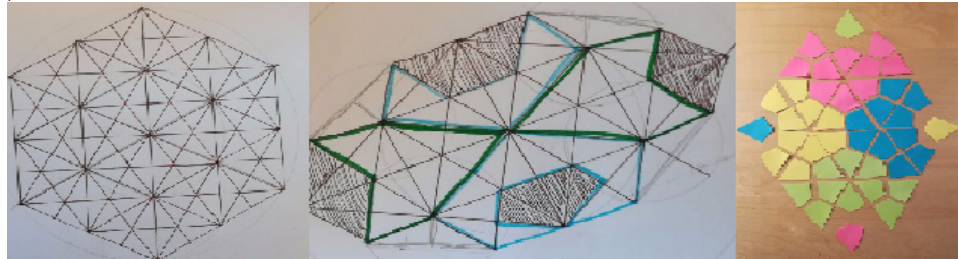
# Iteration 4 From demo day to demo day

After the midterm demo day we got useful feedback about our concept and design process. We could improve multiple things, but the core of our concept was good. Some parts of the feedback was that the blocks could fit in the board in different directions, the categories were not clear, some waste items were in the wrong category and that multiple icons could be interpreted different.

We divided the problems in three main problems in order to come to a final design. Frans focused on the electronics, Maartje made designs for the aesthetics of the board and Tygo focused on designing the icons of the blocks. Our approach was to create ideas of your own part and than request peer feedback.

The electronics were a struggle overall. Without going into the technological details, it didn't took long to be able to check one block at a time. To make the game more fluent however the goal was to be able to check multiple blocks at the same time. Even with help from professors, multiple iterations, approaches and weeks of work this was never accomplished. When the user tests were getting closer, the goal had to be forfeited to and we had to continue with the acknowledged bug.

The core of solving the problem of the board was to create a block that could fit in only one direction, the board would be create around the blocks. What can be seen is that first the shape of a rectangle was chosen, however, this caused that not all blocks could fit in all places of the board. This was because the blocks were not symmetrical, so we needed a different shape. The second choice was the shape of the kite, this form was symmetrical and could only fit in one way. This tackled both problems, so we decided to stick to this form. Considering the board, we desired a form that was symmetrical as well. So we made a couple of forms and decided based on our personal preference.



For the icons we used the outcome of the user test we conducted at a hockey club with kids aged 7-10. This user test was focused on the clarity of the icons and the knowledge of products. This user test made sure we could solve these problems and don't make the same mistake twice. This user test and the prior research can be found in the appendix. The approach we used for the creation of the icons was as follows, first we sketched the icons that we wanted on paper, with multiple sketches of one icon in order to find the best one. When we decided which icon was the best a picture of the sketches was made and inserted into illustrator. With the use of the sketches the images could be digitalised. At first the images were only linear, so no colour, in order to create a similar style throughout the icons. After the linear icons were finished, colour was added to make the icons more lively and clear. The colours were later adjusted due to the results of a later user test at a primary school, for example a bucket of paint, due to the colour brown, the bucket could be interpreted as a suitcase when turned around.



After we solved the three problems an overall user test was conducted as PCB de Windroos in Alphen aan den Rijn. This user test was used for multiple validations of our concept and prototype. After the user test some minor adjustments were made in order to finalize our prototype for the demo day.

# Overall Result

In the end of the project there was a functional prototype which could be used to play the game. The prototype focussed on the aesthetics and the functionality through the electronics. The main goals for the aesthetics were the unique icons and the form and style of the board itself. The electronics are implemented in every block and category and therefore the game was playable.

In the main game the players have to be the first to complete their own category. Every turn they have the opportunity to collect two blocks and through feedback given by the board the players will be able to see if the decision made was correct or not.

The specific rules are explained in the following video:



The game was eventually tested with the projected target group once everything was completed and the responses were remarkable. The tests took place at a primary school in Alphen aan de Rijn called "PCB de Windroos". The children between 7-9 participated in the user test and they were enthusiastic. They enjoyed playing saying things like "Can I play again?", "I really want to win" and "When is it in the store so I can buy it?". The first possible problem that the children might've found it boring was overcome. The second problem would be that they didn't learn anything from the game, but this wasn't the case. Even though the improvement in knowledge was small, it was there. This creates an extra strength of the concept. Bloccle is an entertaining educative game, which can be played multiple times, since not everything is learned after the first few rounds played.



# Conclusion

In the beginning of this project we didn't really know what to expect. This is the first full project for Industrial Design and therefore everything was more or less new. We did have the basic knowledge considering the process through From Idea to Design and how to interact with a user through User Centred Design, but this was the first time we would need to implement this knowledge in a proper project and a product of our own.

Naturally this project wasn't smooth sailing. Within our group there were some problems which had to be overcome. First of all one of our group members left after the first week, leaving us with three enthusiastic members, but we would have to work hard to fill this gap. After that there were two main periods during the project where there were some difficulties with the communication.

The first one was in the middle of the first quartile. The problem at the time was that we weren't motivating each other to go on in our research and work. This mainly caused Frans to collapse in motivation which is something that could've been prevented if we were more clear in our communication. Not only in the organisational aspect of it, but also being critical towards each other if something felt wrong and more importantly complementing each other if something was correctly or outstandingly executed. Frans did step forward, we talked about how we felt about the first few weeks and corrected our thought process where needed. We were a different group than we experienced in previous projects, namely we were more quiet and more introverted. Once we came to this conclusion the teamwork improved drastically. Meetings after that were much shorter and we focussed more on individual tasks, next to communicating when needed. For our group it was a more appropriate approach.

In the second quartile everyone had their own task, but the communication was lacking. Nobody really knew what the others were doing and therefore progress was being held back. We could've achieved more if we coordinated more validation user-tests and maybe contact an expert. Since we didn't communicate well we didn't know what was needed and therefore we might've missed some opportunities there, but it wasn't as crucial as the first one.

The main issue we had with the validation was the difficulty of making an appointment with a larger group of children. We took the opportunity when we were able to, but it wasn't easy. We immediately started contacting primary schools after the midterm demo day, but in the end we were only able to make a last minute appointment for the final user test. We learned that if we wanted to do user tests with children we have to start contacting schools, sport clubs etc. almost directly after the target group turns out to be children.

On the positive side however, the activities and learning moments we did execute were useful and inspiring for further improvement in these areas. The user tests for example, especially the research validation with children as the final user test with Blocle, were really useful. Reflecting on them there definitely are improvements possible in the questions that we would like to ask and the approach to the test itself, but the question that created the user test was answered.



There are a few future possibilities for Blocle. We started with two games both with a different difficulty. When the children were playing, we noticed that even for the older kids within our target group found the “easier” game already difficult enough. Therefore we dropped the more difficult game for this target group. Next to that it was noticeable during the user tests with students that even the young adults didn’t always know how to recycle. We did play the more difficult game with them, but there might be an opportunity to expand the target group to older children and maybe even teenagers. The challenge here would be to perfect a more difficult game that is still appealing to the teenagers.

Next to this opportunity there are some possible adjustments that makes the use of the product easier. Nearing the end of the project we noticed that NFC-chips might be the solution to an easy and quick sensing system for the board. A few icons might have to be adjusted visually and there are some cases where it is clear what the icon means, but unclear where it should end up. An example would be paint. According to “Milieu Centraal” a paint container must be thrown out with the residual waste but paint itself must be recycled due to its chemical components.

# Reflection Frans

The project had an interesting start for me. I was sick in the first week and with the holiday right after I found it difficult to find my position in the group. The direction in which the group had gone in the pressure cooker wasn't appealing to me at all and luckily for me the group didn't like the subject either. I almost immediately recognised within the group that I had to organise and take the leader role upon me sometimes.

During the first quartile I had a period where I lacked motivation to continue working. For me it is extremely important to get feedback and impulses from others. Without it and without seeing much input from the other team members I slowly started to get exhausted. After having this feeling for a week or two I finally spoke up, which, for introverted me, is something that takes some courage. I'm happy that I did, the working environment improved and I know that I should speak up immediately in the future now.

Throughout the project I was the technological person in the group. I created the electronics from the start and basically had to do this on my own. The electronics were my main focus for the second quartile. I quickly found out how to read a single block at the time, but to make the game more fluently I wanted to be able to read multiple blocks at the same time. Without going into too much detail I went through around 8 different approaches to the problem but in the end they all failed. I called for help from outside sources multiple times, but when the user tests were coming up I had to call it off and continue with this bug. Since I had invested this much time into it I was quite depressed not succeeding in this challenge. Although I eventually did not succeed in solving the problem I did learn about different electronic elements as a relay and how to work efficiently with arduino.

Next to that I focussed on the user tests. The first user test, which validated the assumption that children knew something about recycling but not everything, was solely done by me. This was one of the main learning points for this project. Doing them was fun and its importance was clear to me during this project. After this first user test I focussed on the prototype as mentioned above, but also creating the board itself. I learned how to laser cut so that the board could be completed on time and in a neat way. I took the responsibility of finishing the prototype before the usertests upon me since it was, at least to me, the most important aspect of the project. Making sure it works and that the assumptions were correct. The user tests were successful and therefore I had accomplished my goal.



Overall this project has learned me how to work in a team, how to cope with and solve personal problems, how to make sure that certain activities can continue even if something went wrong in the preparation and how to create a functional and aesthetically pleasing prototype. I have learned some basic skills and how to implement the previously learned knowledge into a project.

For future projects I would like to improve my organisation skills outside of the group. Meet with experts, set up more validation user tests and be more upfront during the presentations. Next to I want to lead the report next time so that I am able to tell what should and what shouldn't be in there. This one was quite stressful and I want to be able to surpass this feeling.

To what did I contribute?

- Electronics
- Code
- Prototype midterm
- Poster midterm
- Style layout midterm
- Prototype laser cut
- Prototype implementation electronics and tests
- Validation user test
- Research waste categories
- Student user test
- Final user test
- Video demo day/report
- Writing report: Process, Overall results, Conclusion

# Reflection Tygo

Before Project 1 I gained some knowledge about a design process through the courses From Idea to Design and User-Centered Design. In earlier projects I was especially focused on the execution of prototypes and ideation. I was not a leader in a group, which I thought I was when I started when design processes. At the start of the project I had the goal for myself to create a full functioning prototype.

I had to adjust to the format of the project in the first quartile because in previous courses we were guided a lot and this project had a lot of freedom, which I noticed to be hard because I never did something like it. Due to the freedom I had difficulties with keeping my ideas compact, everytime I had an idea I always thought of another thing I could do. With the help of my teammates we got more to the point with ideas.

The cooperation of this team had its ups and downs, which was different from my different experiences with my project teams. However, I think that due to the fact that the cooperation did not always go well I learned more about different visions of people. The only downside to this was that we lost time in order to communicate our actions and plans than actually work on improving the concept.

Apart from the fact that the cooperation did not go well before the deadline I realised that I didn't really work on my personal developments. In my personal development plan I set some goals for myself, but I didn't put in the work to reach this goal. My biggest pitfall throughout the first quartile was my time management and then especially in the weekend, I would push back my work to sunday night and the quality of my work would drop drastically.

I knew my approach to the project needed to be changed in order to create a successful project. When we made new plans for our team I decided to focus on the design of icons, my design abilities and qualities to work with illustrator were not that great. This cost a lot of time to learn and to create quality for the project, however, eventually I started to learn more and work more efficient.

Apart from designing I didn't really focus on users and user tests, so I knew I had to improve on this as well. I decided to be in charge of our big user tests. I first contacted my old school and some teachers but this didn't work out. I realised that it was harder than I thought, so I expanded my field of searching, which brought me in contact with an old friend of my brother that became a teacher, which resulted in a user test.

The fact that for some parts of this project my motivation wasn't that high didn't make it useless. I improved on my personal and group development in different aspects and also improved on some parts I was already good at, for example pitching. Overall I think this project was successful, but due to the fact that I didn't put in enough work in the first quartile it could have been better. For future projects I would like to improve my planning skills and especially sticking to this planning, I also want to improve more on the technology part of a prototype instead of only the aesthetics, this would help learn me more about the final prototype.

Research  
Prototyping  
Ideation  
Creating blocks midterm prototype  
Writing draft report: iterations, overall result and demo day feedback  
Pitch midterm demo day  
Designing all icons final prototype  
Organizing user test  
User test  
Adjusting prototype after user test  
Writing final report: iterations, layout and pictures.

# Reflection Maartje

In the beginning of this project our teamwork was not very efficient. We all had problems with finding motivation and therefore had difficulties with spending a lot of time on the project. This luckily changed when we all started to notice the inefficiency of our work. With the help of the meeting skills session our meetings became more structured and more efficient. So we ended the first quartile of this project good and met our expectations.

The last quartile I had some personal problems which caused that I was not able to spend as much time on the project as I would have wanted. This caused the process to again be less efficient, since the work of three sometimes needed to be done by two. We also did not meet regularly which caused us to get behind on our schedule, although I found this difficult to mention because this was partly because of me. Although I could not contribute as much I managed to keep updated and I made sure I was always aware of the steps that needed to be taken. This did learn me how important group meetings are, to share information but also to make sure you are all on the same level.

During the last quartile I worked on the design and making it both functional and aesthetically pleasing. I came up with a new design for the blocks and the board. And to make sure the prototype would also look really good we decided to learn how to laser cut. I think it is very valuable that I learned how to do that now and I will definitely use this again in other prototypes. I also became better at working with Photoshop and InDesign because I made the report structure and the poster for the final demo day. This is again is a necessary skill to increase as a designer, since the deliverables you need to have need to look professional.

This project was also the first project where I conducted user tests. I noticed that we could get very valuable information and also gain insights of our prototype that we would not have gotten without those user tests. I also found out that you really need to look into how you ask certain things to your user. Because sometimes they can interpret it in a different way or you do not get a truthful answer. While eventually also testing with children we discovered that without asking them any questions we discovered lots of things and that they say things without thinking, like that they think it is a really cool game and that they want to play it again. I learned a lot from this and I found out that I really like working with of designing for a user. Which is something I want to keep doing throughout my study.

In this project Frans did all the electronics. Because that is how we divided the tasks. However since I am not really experienced with this I would like to do that in a next project. Since this is also a very important aspect of our study and without the electronics in your prototype you are not able to show correctly how your design is going to work.

I hope that I am able to spent more time on the next project. Because that was the main reason for me that the project did not go very smoothly. In next projects I will definitely meet more often and I will try to set deadlines for each week so we will prevent ourselves form getting behind. I also want to be more present in group meetings, since I know I can take more initiative now and then. And because I often have a clear idea of what I expect from a project or I have more ideas than I am sharing right now. And despite all the circumstances I am really glad with what we achieved during this project.

To what did I contribute?

- Research
- Prototype
- InDesign Draft Report
- Writing Draft Report: Introduction, Project goal, Process.
- User manual for Midterm Demo day
- Shapes of board and blocks
- Finalizing prototype
- User test (everyone contributed)
- Posters Demo day
- Writing Final Report: Introduction, Project goal

# Appendix

Plastic, Metal and cartons	Organic	Other recycling methods	Namely...	Residual
Preserving cans	Plants	Small devices	Container wecycle	Deodorant
Aluminum	Coffee	Large devices	Hand in at store	Paint containers
Sodacans	Cork	Packaging glass	Glasbin	Diapers
Metal lids	Shells	Clothes	Textilebin	Different glas
Drink cartons	Bones	Shoes	Textilebin	Pillow filling
Hard plastic	Peels	Textile	Textilebin	Dirty clothes
Packaging plastic	Ground	Energy-saving lamps	Container at store	Baking paper
	Pruning waste	Batteries	Container at store	Photos
	Small wood	Cleaning products	KCA	Greasy paper
	Leftovers	Paint	KCA	Wallpaper
		Medicines	KCA/pharmacy	Stickers
		Books	Paper	Styrofoam
		Magazines	Paper	Packaging chemical waste
		Paper towel	Paper	Chips bag
		Enveloppes	Paper	Blister strips
				Tea

This is part of the research of icons that fit in the categories (Source: Milieu centraal, retrieved from: <https://www.milieucentraal.nl/minder-afval/welk-afval-waar/>)

Age	8	8	7	8	9	9	9	9	9	10	10	9	9	9	10	8	8					
Gender	M	M	M	M	M	M	M	M	M	F	F	F	F	F	F	F	F	Total	M	F	7-8	9-10
Orange	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	94%	89%	100%	83%	100%
Battery	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	100%	100%	100%	100%	100%
Alluminium	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	94%	89%	100%	100%	90%
Plastic bag	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	100%	100%	100%	100%	100%
Avocado	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	94%	89%	100%	100%	90%
Balloon												x	x	x	x			22%	0%	50%	0%	40%
Newspaper	x			x	x	x						x	x					33%	44%	25%	33%	40%
Tea					x													5%	11%	0%	0%	10%
Cup	x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	89%	78%	100%	100%	80%
Glas	x			x	x			x		x	x	x	x	x	x	x	x	72%	44%	100%	67%	70%
Milk carton	x				x					x	x			x	x			33%	22%	50%	17%	50%
Camera	x		x	x	x	x		x	x	x	x	x	x	x	x	x	x	89%	78%	100%	83%	90%
Chips bag			x					x				x	x			x	x	33%	22%	50%	50%	30%
	Unclear icon																					

Results user tests on icons

