Master Thesis

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COLOPHON

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Children's mobile screen use: An intervening loyalty campaign

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PREFACE

Before you lies the thesis “Children’s mobile screen use: an intervening loyalty campaign”. This thesis has been written as part of my graduation from the Masters programme “Design for Interaction” at the Delft University of Technology. From March 2019 up to the end of Augustus 2019, I was researching, designing and reporting for the purpose of this thesis.

I would like to thank my colleagues from UNGA for their collaboration on this thesis and for offering the possibility to learn from their expertise in the field of loyalty campaigns. In special my company mentor D. Thomassen and the complete design team for keeping me inspired and bringing the project to the a higher level.

Also I would like show appreciation my supervisors from the university, Chair dr. ir. G. P. Pasman and mentor Msc. M. A. Gielen, for their guidance and expertise on this dissertation.

I hope you enjoy your reading.

Joris Janbroers

ABSTRACT

Nowadays, growing up is quite different from what it was before. Around the globe the larger part of children engage in inordinate time looking at screens (Bucksch et al., 2016). The smartphone enables children to have more screen time, leading to negative consequences. Nevertheless, children still prefer this type of entertainment due to the entertainment values they get from the use.
This thesis examines how a loyalty campaign can intervene with a negative consequence of mobile screen use while utilizing the positive entertainment elements amongst children aged from six till twelve years.

Fourteen problems of smartphone usage accompanied with their consequences are found by literature research. These problems are presented to parents to gauge their opinion on this objective data, forming a first design goal: "Design a playful loyalty campaign that stimulate the engagement of children in active play by utilizing the entertainment values of a smartphone, to spark ones creativity." Interviews with children accompanied with their parents examines more details on the first design goal. What boundaries need to be set with regard to the context? Which entertainment values of digital play are important to children? What is the influence of the touchscreens' low threshold usage on active play? And finally; What is the influence on a child's creativity? As a conclusion to this research, a new design goal is formulated: "The tactilization and experience of digital entertainment. In order to bring a connection between digital and 'real world' concepts and make them accessible to children." The following criteria to this goal form the basis of evaluation for the concepts:
The concept should…
… educate on the subject of food
… be able to be played alone.
… support playing together.
… contain a part of simulation during the play.
… involve the exploration and discover of new elements.
… involve experimentation without social consequences.
… create play which is mostly focussed on a central tangible/touchable object integrated with digital entertainment.
… be able to be played during daytime.
… does not involve any online contact with strangers
… let children experience an unknown real world phenomena.
… not be able to be played without a physically present object.
… can be played without the use of a mobile device.
… has a high level of collect-ability.
… is valuable when only a few gifts are received by the user.
… involves creating something.

The result, called "Body Builders", is a concept in which children learn about nutrients that come from food. 20 3D characters standing for nutrients can be collected. Together with the application, these characters will come alive and the child will experience what these, previously unknown nutrients, do to your body. User test shows, that the concept brings an intertwined combination between digital gaming and tangible play. In contrast to current mobile screen use, this concept balances between real and digital play by utilizing the play experiences children like.

TABLE OF CONTENT

PART 1: ASSIGNMENT

This part will describe the assignment of the project. It sets the goal for the research and gives a first exploration of the topic.

1.1 INTRODUCTION

Nowadays, growing up is quite different from what it was a few years before. Around the globe the larger part of children engage in inordinate time looking at screens (Bucksch et al., 2016) at a rate of almost six hours a day (Washington Post, 2015). One medium that enables children to have more screen time is the smartphone. Usage could lead to several issues and negative consequences for the child. Examples are myopia (Het Parool, 2018), social problems (Verywell family, 2018), sleeping problems (Novick, M. B. et al, 2018) and online safety.

Although there are consequences, children still use smartphones for entertainment purposes. Sending out a WhatsApp, scrolling through social media, and watching videos of influencers, all activities kids like to do.

During this project, I worked together with UNGA on a loyalty campaign that tackles a negative consequence arising from this excessive smartphone use. Yet the positive aspects need to be persevered since they form the fun factor to children.

1.2 AGE RANGE

The age group of the children is set from 8 till 12 years. Within this age range, children develop the need to possess a smartphone and eventually do receive their first device from their parents. The average age of first smartphone possession is 11,7 years, but decreases every year (KPN, 2017). So within the frame from 8 till 12 years, parents lose their control over their children's phone usage. The parents' influence on the regulated use gets lost and therefore various concerns arise from the parents' side.

1.3 ASSIGNMENT AND APPROACH

Research has shown that there are several issues regarding mobile screen use of children. This is an overarching problem causing a long list of negative consequences. Resolving the bigger picture might be undo-able within the given time-frame and removing children completely from their screen is not a realistic goal in this nowadays era. Therefore, the essence of the problem forms the focus of the project and the design goal. To clarify, where in this big field of children's screen-use is an opportunity for a brand loyalty campaign to resolve or convert a specified sub-problem? This offers an opening for a playful intervention, resolving the smaller issue that is achievable within the time frame of a graduation assignment. The assignment is stated as it follows:

> *Design a playful loyalty campaign focused on children that intervenes with a negative consequence but utilizes positive entertainment elements which arise during the usage of mobile screens.*

So first up, a sub-problem needs to be found that gives this opportunity. What do parents think are the main issues and what are their concerns regarding the bigger problem? Are they mostly concerned about their kids playing less outside? Do they notice sleeping problems? Would they prefer to have more direct social contact with their kids? These are just some examples of where the focus could be laid upon.
Also, what do children mostly like about screen entertainment and what does their use really look like within its context? What are their favourite activities on the phone? The positive aspects, the fun factor, of screen-use should not be cancelled out, since it is the raison d'être why children prefer this above any other type of amusement.
To find all of this, research is conducted during the first weeks. This results into the specified focus on the long list of problems, concluding in a design direction.
After this problem definition, ideation leads to a concept. This concept is prototyped and evaluated with users during the final phase of the project (conceptualization). All together this results in a well-founded design concept proposal for UNGA. See the image below for a schematic overview.

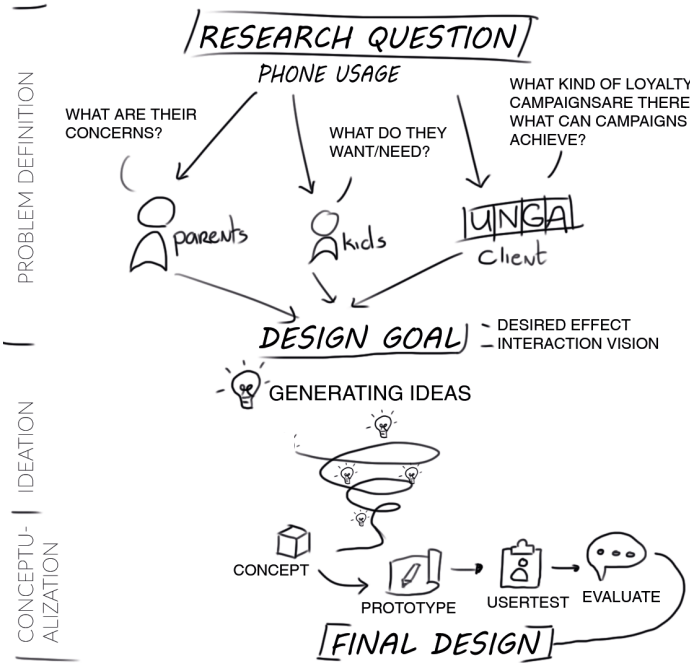

Figure 1: Project planning


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HET IS EEN VOGEL!

PART 2: INTERNAL ANALYSIS

In this part UNGA is analysed. This serves as the basis for the further research and the concept development.

2.1 UNGA

UNGA is a loyalty campaign specialist based in Amsterdam. They design, produce and sell campaigns for clients. These clients are retailers from all over the world, such as supermarkets, gas stations or whoever could be interested in the campaign. Selling a campaign to a possible client is done by pitching and convincing the retailer. If successful, the retailer will implement the campaign into their stores.

2.2 STAKEHOLDERS

The goal of a loyalty campaign is to make customers loyal towards the retailer. As a result, the customer wants to come back to that retailer and do future purchases. UNGA, the retailer and customer together form the first 3 stakeholders.

UNGA has its specialization in creating loyalty campaign involving toys for children. The children are therefore the end-users of the products. This adds the 4th stakeholder to the picture. See the image below (figure 2) for a schematic overview of the stakeholders.

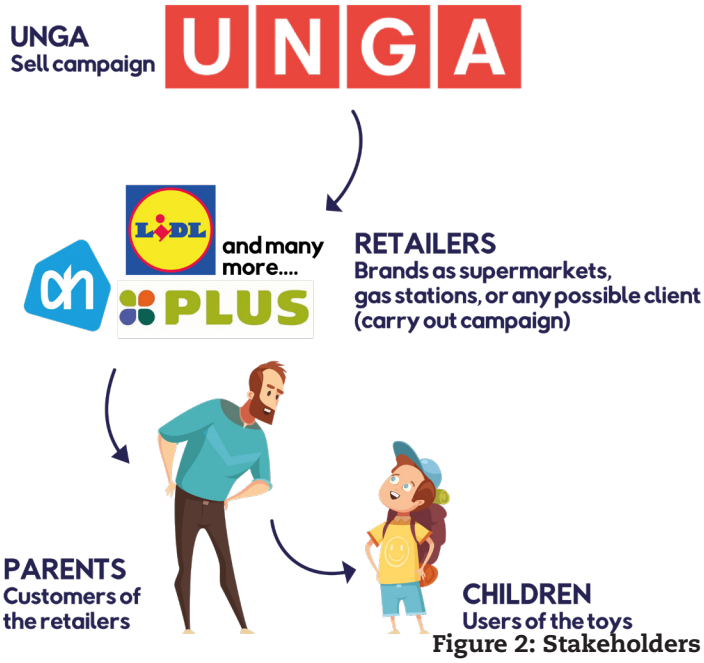


Figure 2: Stakeholders

Supermarkets have their own requirements regarding to the campaigns they want to carry throughout their stores. A campaign needs to fit at least within one of 4 themes which make it a saleable campaign. These categories are: food, physic activity, create and family bonding. Being an educator on these subjects will increase loyalty from the customers side against that retailer. Therefore it increases the sell-ability of the campaign itself. The categories are now explained in more detail.

2.2.1 Food

The most prominent category for a supermarket loyalty campaign is 'food'. Within this category several angles of approach can be found to address this subject.
For example a campaign could promote healthy foods and its positive effects, inform about the origins of products or be themed around the cooking process of food.

2.2.2 Physic activity

A second category often seen in loyalty campaigns is physic activity. For example, a stickers collection of famous soccer players.
This category is frequently depending on current events such as the FIFA World Cup, the UEFA Euro Championship or any other sports related happening. So most often this category more serves as a thematic packaging to the campaign.

2.2.3 Create

Another thing that is doing well in loyalty campaigns is the ability for children to express themselves. A free give-away that supports 'doing' and let children work to create something is a plus to loyalty campaigns.

2.2.4 Family bonding

The last category in which a loyalty campaign could fit is family bonding. Dinner time is seen as one of the most binding activities that a family has during the day. Therefore it is an important result a supermarket is aiming for. A loyalty campaign can support this feeling with integrating the ability to play together or function as a conversation starter.

2.3 LOYALTY CAMPAIGNS

2.3.1 Types of campaigns

There are different types of loyalty programs for a retailer. A campaign could offer the customer rewards immediately ("instant reward") or after you have filled up your savings card with stickers ("stamp and redeem"). Also an hybrid option is possible where the two options are combined.

Since the products are free give-aways all merchandise need to be easily, read cheaply, producible. This forms the main restriction in the design and concept development of UNGA's toys. A stamp and redeem campaign offers a bit more room to higher costs, because less products are given away.

In addition to the kind of campaign, a license can be added. This means that a brand will be connected to that campaign. Costs will increase, but familiarity of the communication materials do have a positive impact on the customers. An overview of some license partners can be found in figure 3. A scheme of the different types of loyalty campaigns UNGA has, can be found in figure 4.

Figure 3: Partners

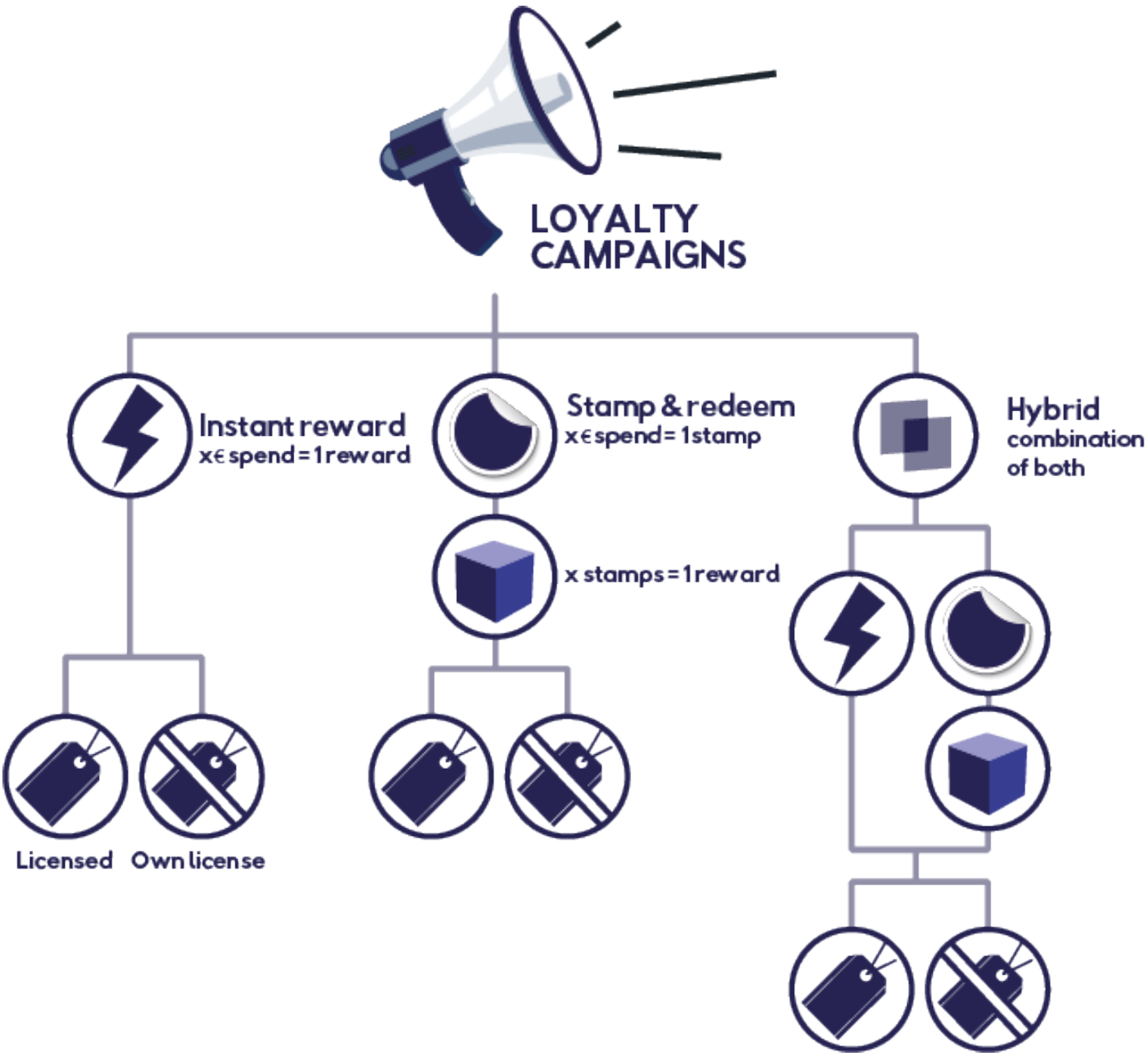


Figure 4: Loyalty campaigns

2.3.2 Successfactors

TwinQ, a Dutch research agency commissioned by UNGA, did a analysis into the success factors of a collectors campaign for kids. The conclusion was the image below, offering an overview of core elements that bring a campaign to a success. These factors are used during the formulation of criteria for concepts later on in this thesis.

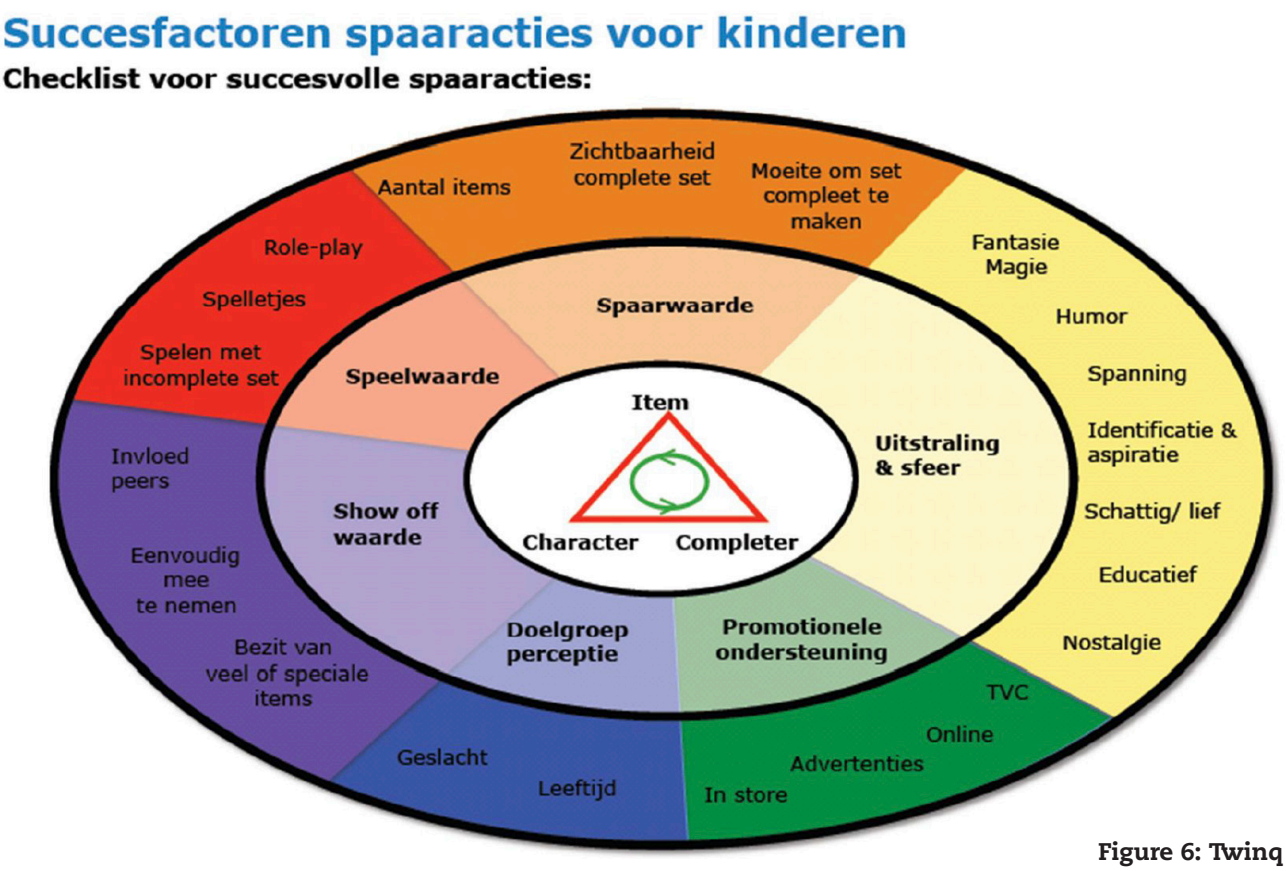


Figure 6: Twinq (2018)

2.3.3 Previous campaigns

Now given are two examples of campaigns from UNGA's portfolio. It clarifies the different types and what successfactors are used.

Disney originals

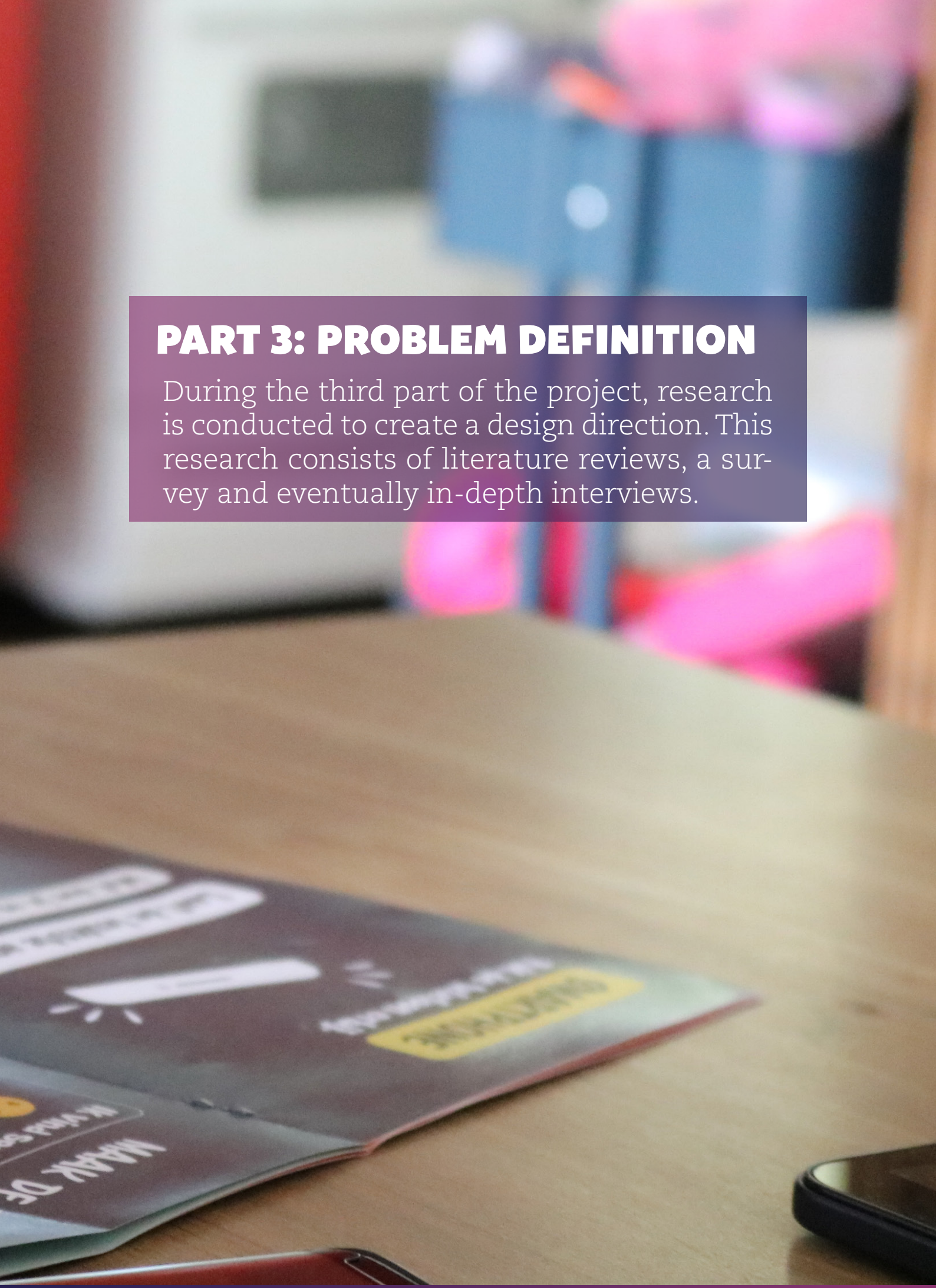
A campaign with a high level of nostalgia. The client, Albert Heijn, offered 6 characters to collect. When spending €15 worth of groceries, the consumer will get one sticker. Saving up to 6 stickers enables the person to choose their own Disney Original character.

Figure 5: Disney Originals (Picssr, 2019)

Little garden

Little Garden, comparable to the Dutch equivalent “Moestuintjes”, are miniature seedling pots that offered playful and involving collectables to children. When spending an X-amount of money at the supermarket, customers received one random kit. In total there were 24 different gardens. Not only did the Little Gardens offer a collectable to children, the campaign gave a playful and educational experience to children. The kids were able to grow their own herbs, vegetables and flowers supporting the conversations about healthy food and the origins of products.

Figure 7: Little Garden (Little Housewife, 2016)



PART 3: PROBLEM DEFINITION

During the third part of the project, research is conducted to create a design direction. This research consists of literature reviews, a survey and eventually in-depth interviews.

3.1 OVERVIEW PART 3

In figure 8 below a schematic overview of part 3 can be found.
With the use of literature and other media, a list of problems is generated (1). These problems are proposed to parents by a survey. From this, the most important concern(s) which parents do experience can be filtered out (2) to create a first direction for the design goal. By interviewing a variety of parents together with their children, their main needs, likes and thoughts about smartphones are mapped out(3). All together this forms the design direction (4). With this part 3 is finalized and part 4 (ideation) is started.

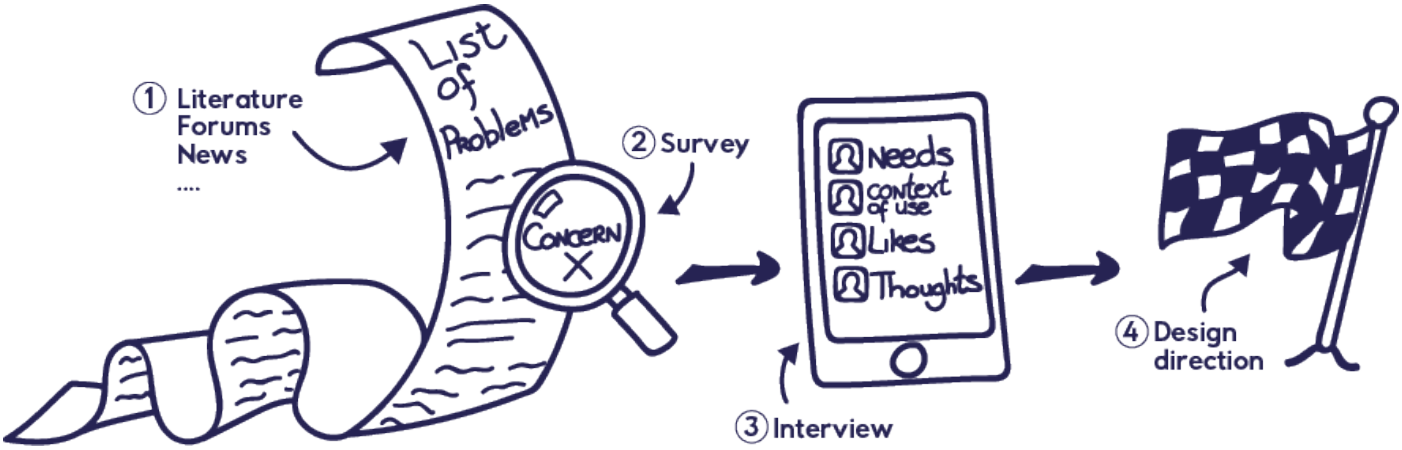


Figure 8: Overview part 3

3.1 LITERATURE RESEARCH

A lot of literature has been written about consequences that may result from the use of smartphones among children. To get an overview of all of these problems a literature research is conducted.

3.1.1 Objective

The aim of this research is to have an exploration of all the different problems that occur when kids are using a smartphone and the consequences that they bring. It forms the basis for specified boundaries to research further. But first of all, the problems need to be discovered. Therefore the research question is as follows:

What are the negative consequences that could occur from the problems when a child uses a smartphone?

3.1.2 Method

To answer this research question, desk research is conducted. First, the problems of smartphone usage are explored by looking at blogs and news articles. These are verified by cross-referencing them with literature. This leads to a well-supported base for a list.
Analysis of the list is done by mapping the out problems in a mind-map and making connections between them.

3.1.3 Results

The results of the literature review can be found in *Appendix 1: List of problem support*. This is a list of 14 problems. All of these problems are applicable to children aged 8 till 12 years and could be of importance for the later design direction.

A mind map is formed. This mind map is shown in *figure 9: Mind map of problems* on the next page. From the mind map, it can be noticed that 3 main clusters are formed. The physical-, mental- and social health consequences are forming the main pillars to the map, creating a fit for every negative consequence. In the middle of the image, different causes of consequences are shown and interplay between factors are illustrated by drawn lines.

3.1.4 Conclusion

14 problems were found with regard to smartphone use in children. These problems have various consequences, which can be subdivided into the categories of physical-, mental- and social health categories.

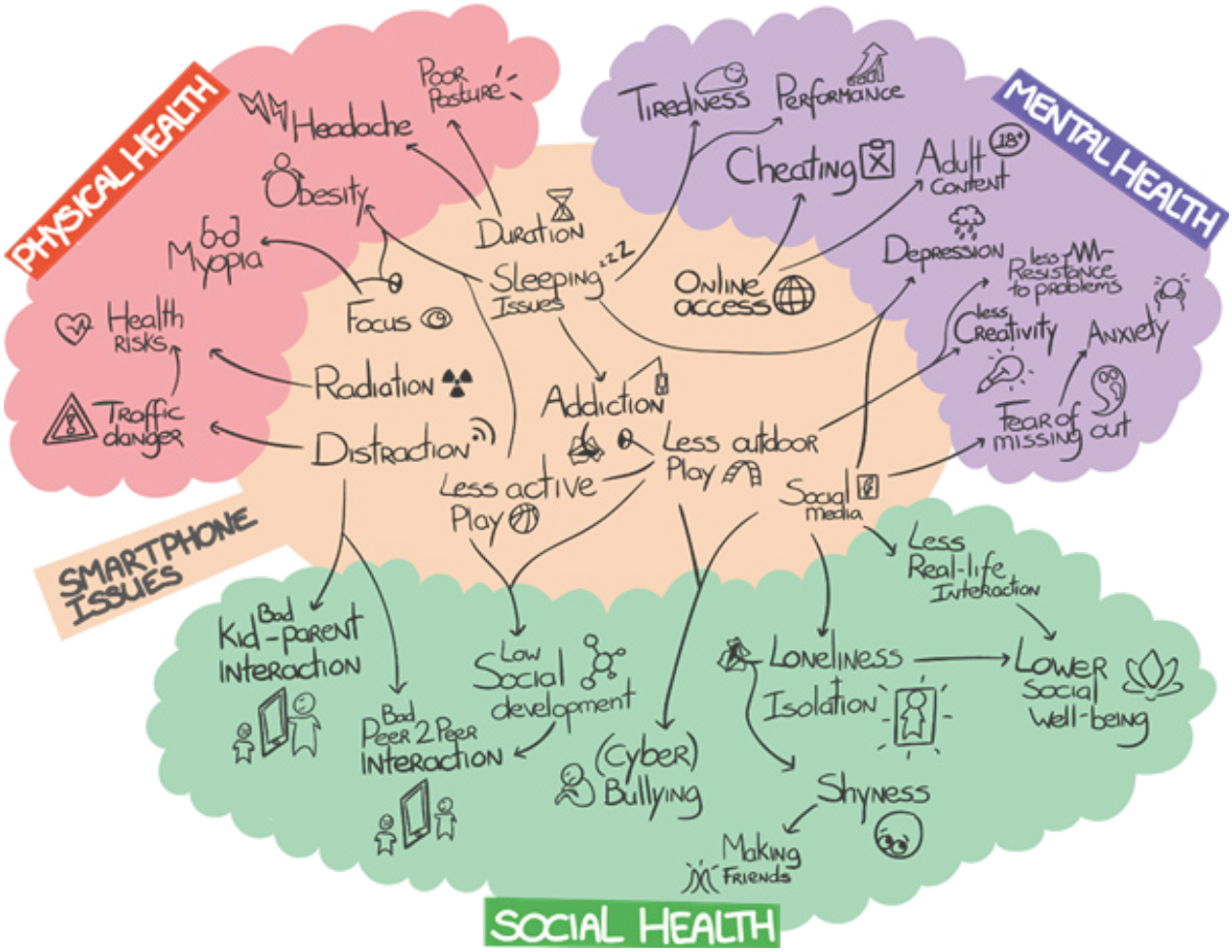


Figure 9: Mind map of problems

3.2 SURVEY

A survey was distributed among parents to gain better insights in how they consider the topic of smartphone usage among their children and the 14 consequences arising from that. The outcomes of the survey are analysed and translated into different opportunities for the design goal.

3.2.1 Objective

To get a subjective look from the parents at the objective data from the literature, the problems were presented to parents from the applicable age group of children. The main goal of the survey is to gather insights on parents' experiences which will result in different opportunities for the design goal.

Therefore the main research question is formulated as follows:

What are the problem experiences of parents regarding their kids and smartphone usage?

For this the following sub questions are formed:

Where are the parents' main concerns, with regard to their children and the smartphone usage?

Why do parents have these as their main concerns?

In what degree do parents recognize problems among their children?

What other problems do parents experience with their children, in relation to smartphone usage?

A sub goal of the survey was to gather personal data of parents that might be of use in future research.

3.2.2 Method

To answer the research questions a survey was distributed. The questionnaire can be found in *Appendix 2: Survey*. The questions were based on the objectives of the research and the literature review. By offering open questions at the end of the survey, the parents can give an additional explanation and further details on their opinions. As closure to the survey, the respondents were able to leave their personal information for future research purposes.
Distribution is done via different channels throughout social media and acquaintances. Only respondents with children between the age of 8 till 12 years are used for analysis. Other respondents were filtered out.

3.2.2 Results

In total 145 parents participated in the survey. The raw data of it can be found in *Appendix 3: Survey results*. From the results several insights were gathered divided by the topics as used in the survey. Below, the insights are given accompanied with the results applicable.

The results are divided by the categories as formulated in the survey, accompanied with its data. Please note for the bar diagrams that:
1 = Strongly disagree - 5 = Strongly agree

General statements

Parents believed that they themselves and their children use the smartphone too often. (figure 10 and 11)

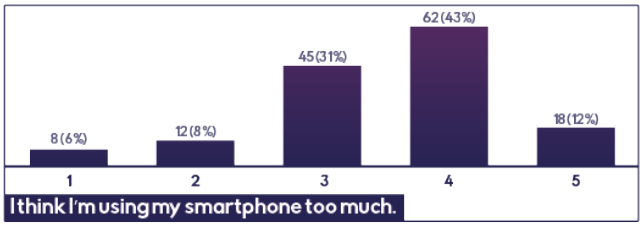


Figure 10: Results survey (a)

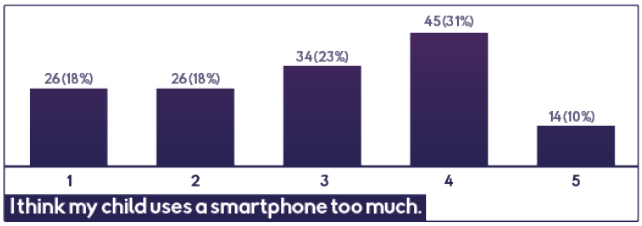


Figure 11: Results survey (b)

Parents were divided when it comes to the influence of the smartphone on their child. (fig. 12)

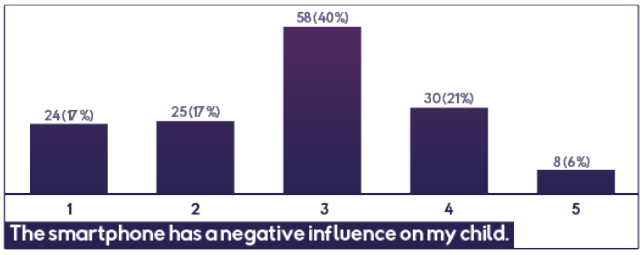


Figure 12: Results survey (c)

Sleeping behaviour

Parents believed that sleep quality is important to their children (23%), but they do not indicate that they experience issues with this. (fig. 13)

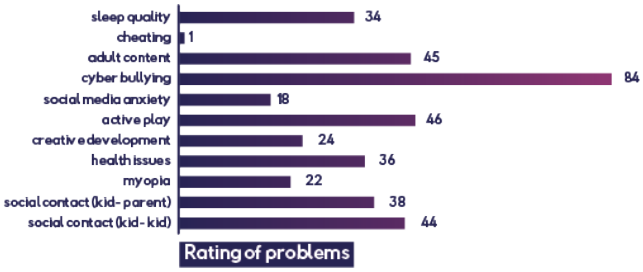


Figure 13: Results survey (d)

> Enough sleep is important for everyone. It results to improvement on a lot of areas.

Online access

Parents were not concerned that their children commit fraud in school. Although literature says this is a problem teachers are facing. In the parents' quotes some explanations are given that children do not take their phones to school. (fig. 14)

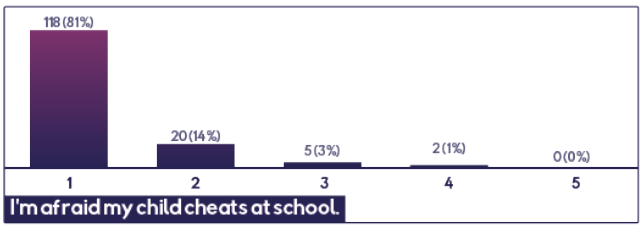


Figure 14: Results survey (e)

The opinion of the parents was divided when it comes to adult content concerns. They argued that there is a lack of control on what their kid does on the smartphone. (fig. 15 and 16)

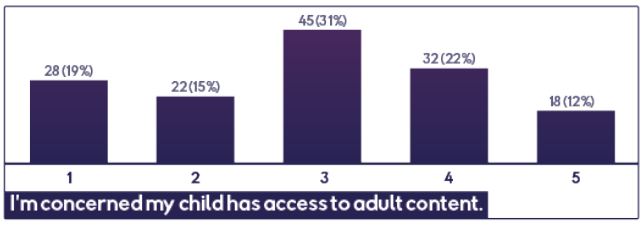


Figure 15: Results survey (f)

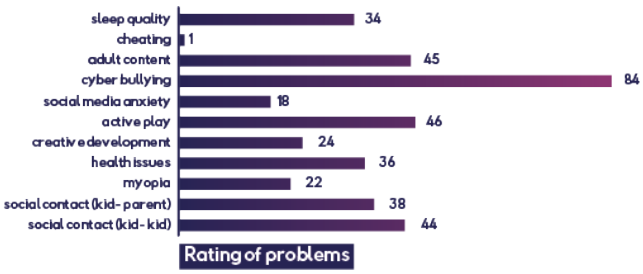


Figure 16: Results survey (g)

> Not everything they see through their smartphones can be controlled.

Social media

Parents were not concerned about the social media use of their kid.

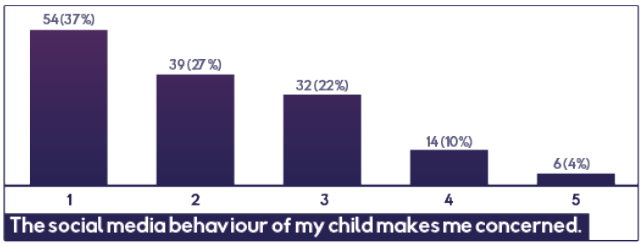


Figure 17: Results survey (h)

On the other hand, they had worries about cyber-bullying that takes place through social media. (fig. 17, 18 and 19)
A given reason for this was that this issue cannot be controlled by the parents.

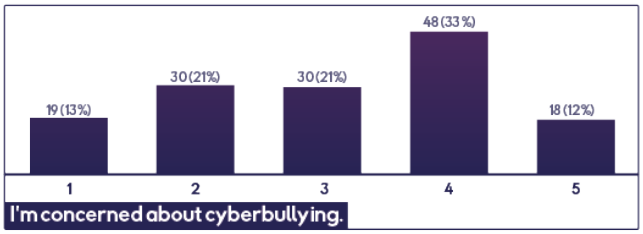


Figure 18: Results survey (i)

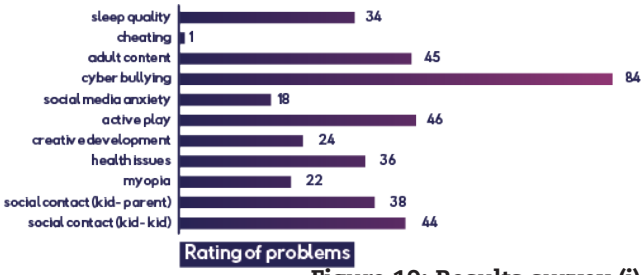


Figure 19: Results survey (j)

> My granddaughter already has a lot of experience with bullying via online contacts.

> I chose cyberbullying, because it is not visible.

Active play

A majority of the parents did think their children should commit to more active play. (fig 20 and 21)

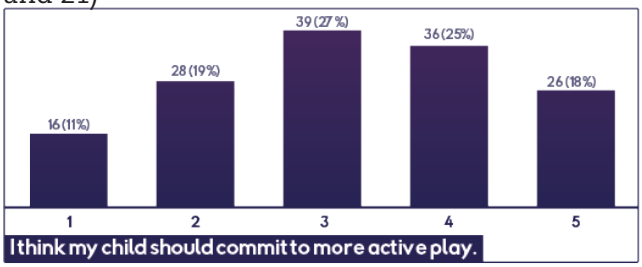


Figure 20: Results survey (k)

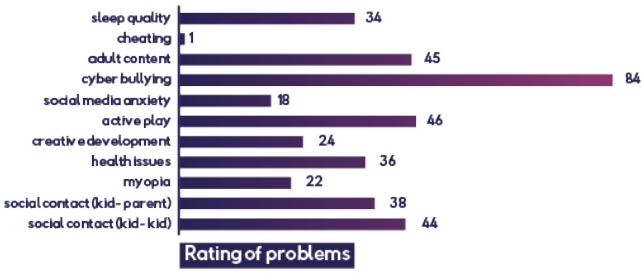


Figure 21: Results survey (l)

A lack of active play leads to negative consequences in the development of skills.

> They are doing the same thing again and again, its not a lack of creativity, but you would learn more from doing and experiencing things by yourself.

> I think active play is very important, both physically as mentally. This has a positive influence on the creativity, resilience and self-confidence etc.

Also playing on the smartphone was not seen as 'real' playing.

> Sometimes they are so busy with playing a game on the tablet, that they are less able to play.

> Play real games, instead of on the smartphone.

Parents did not indicate that their children are playing less outdoors because of the influence of smartphones. (fig. 22)
In the open questions, there were two different opinions from the parents about playing outside. One was that the smartphone offers a lower threshold and easy accessible way to play affecting playing outdoors.
The other one was that parents indicate *their* children do play outside enough, actually saying other children don't.

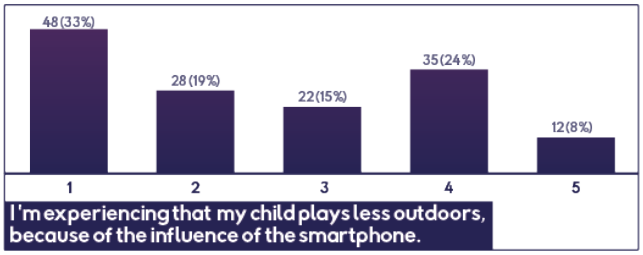


Figure 22: Results survey (m)

> My kids do play outside a lot, but that is not the case for everyone.

> Smartphone, tablet and TV are easily accessible for children. Because of this, unconsciously they are getting less active and commit to less in- and outdoor play.

> Children should play outdoors. Sometimes this doesn't happen because they want to talk with their friends through the phone, while open air could be relaxing as well.

The results from the statements about creativity did not show there was a strong coherence between reduced creativity and smartphone usage. (fig. 23) However, parents claimed in the open questions that there is a negative impact. Nevertheless, it could be hard for parents to estimate the long-term impact on creativity created by active play.

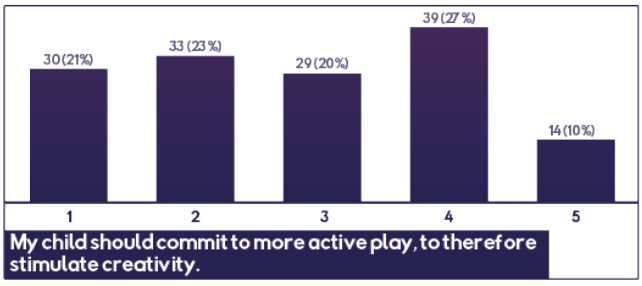


Figure 23: Results survey (n)

From the quotes, the indication was given that creativity is affected by smartphone usage.

> Their development and creativity is also hindered.

> Own creativity is reducing considerably.

The smartphone blocks problem-solving abilities. This has impact on the creative way of thinking. A child does not think about a problem and solution by itself, but looks for answers to it online.

> A child should be creative and look for creative solutions, nowadays they will find it online without thinking about it by themselves.

A new problem was that boredom does not exist among children anymore. Without this question being asked, 15 participants indicate that this was something that is happening. In addition to this, the parents argued that this issue has an impact on children being less creative.

> Being bored and with that an appeal to creativity.

> They are not able to be 'bored' anymore!

> Kids would be better in being bored and look for solutions to that.

> A kid needs to be a kid, get bored, get amused. There is always something going on with a table or smartphone.

Health

Parents did not worry about health issues that much. (fig. 24)

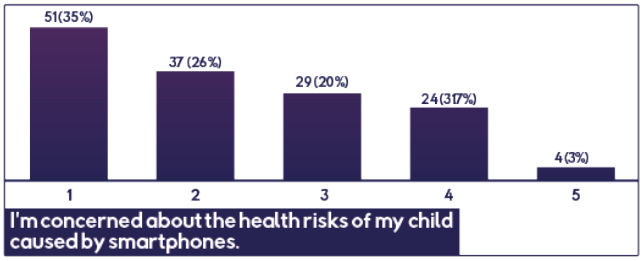


Figure 24: Results survey (o)

However, some parents indicated to have concerns about myopia.

> Myopia is proven to be increased due to smartphones.

Social contact and distraction

Parents neither agreed nor disagreed on issue of social contact and the decline in quality in general. Although the parents were not all on the same page that the smartphone is bad for the quality of contact, they did chose it to be an important topic. This could be due to the fact that the statement actually asks that they should admit their own 'faults'. (fig. 25 and 26)

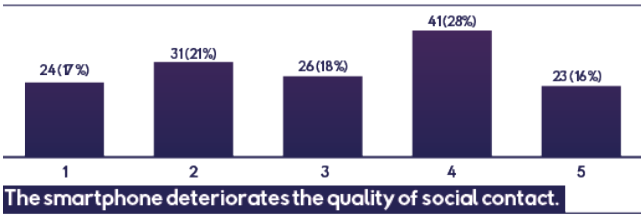


Figure 25: Results survey (p)

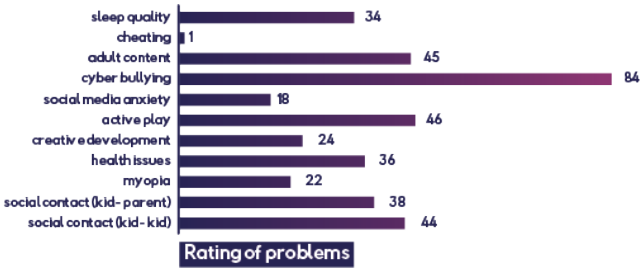


Figure 26: Results survey (q)

> The grip on the child and the bonding with the kid declines.

> Personal contact without a phone is important. You can see and feel what the other is feeling.

3.2.4 Limitations

After the survey was conducted there were some learning points to reflect on for future surveys.

In the survey, the statements were all formulated in a negative way. This may could have led to an unnuanced conclusion of the statement ratings. In contrast with some statements, that were rated to the disagree side (1 or 2) , the explanation and additional quotes give a deeper insight in the statement itself. For example some statements were rated low, but explanations on different questions gave the indication that the statement was actually applicable. A variation of both positive and negative statements could make the participant more aware of thinking about the issue and bring more nuance to the subject.

A term like "active play" was not defined on beforehand. This may have led that some participants though about it in a different way. On the one side, smartphone usage could be seen as totally not active in a physical way. On the other side, smartphone usage could be seen as completely active in a mental way. In the next section the definition of active play is discussed that is used as guidelines for the rest of this report.

Some of the statements had a double question in them. These statements were: "I'm experiencing that my child plays less outdoors, because of the influence of the smartphone." and "My child should commit to more active play to therefore stimulate creativity." Which made these questions not reliable.

Therefore this survey is not used as hard proof for continuing with a design goal. But it is used as an inspirational tool to do further (in-depth) research on and to create a first direction on the bigger topic of smartphone usage.

3.2.5 Conclusion

From the different results of the survey, inspirational elements for the design goal can be formulated.

Create a loyalty campaign that...
... motivates children to engage in more active play.
... enables children to explore their creativity.
... has an impact on cyberbullying.
... supports a problem-solving way of thinking.
... stimulates contact between parent and kid, while doing an activity.

In addition to these, several parents declared that children nowadays are not able to get bored anymore. This is an interesting phenomena to further investigate. A validation whether the decrease of creativity is a well-supported consequence, needs to be done first.

3.3 CREATIVITY, BOREDOM AND ACTIVE PLAY

From the survey it appeared that smartphones ensure that children do not experience the feeling of boredom anymore during the day. Parents argued that this will have a negative influence on their creativity. But is this a valid concern from the parents' side? And what is the definition of creativity? To investigate this, literature was consulted on these topics. In addition to this, a definition of active play is given to further clarify what this means in terms of smartphone usage.

3.3.1 Creativity

Creativity can express itself in different ways. The definition by Cambridge Dictionary (2019) is: "the ability to produce original and unusual ideas, or to make something new or imaginative." Within this definition different elements could result from creativity. Although this definition seems to be quite straightforward and is result oriented, the origin of creativity is what is more complicated. Amabile T. M. (1998 & 2012) researched the different components of which creativity exists.

Domain-relevant skills (expertise), consists of the knowledge one has on the specified topic or area. It includes knowledge, expertise, intelligence, technical skills and talent.

Creativity-relevant process (creative thinking skills) are the cognitive style such as independence, risk-taking and gaining new perspective on problems. It determines how flexible and imaginative people approach problems.

And last, the *motivation* one has. The higher the degree of internal motivation, the higher the degree of creativity. When one is driven by pleasure on the subject or the satisfaction of enjoyment it gains, it will be beneficial to the level of creativity.

The point where these three factors meet, will eventually create creativity, see figure 27 below. What this theory means for the subject of smartphone usage, will be set out in 3.4 – a first direction.

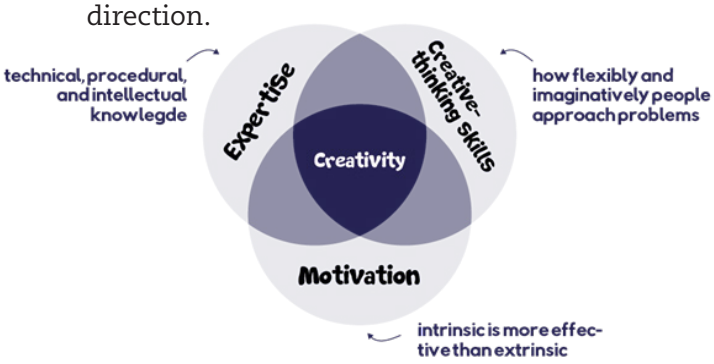


Figure 27: Model of creativity (Amabile, T. M., 1998 & 2012)

Hadani, H., et al (2015), together with the Centre of Childhood Creativity, published a framework for different types of creativity in children, divided by three development areas (cognitive, social & emotional and physical). (fig. 28) The paper argues that creativity is learned by doing, resulting in 7 different long-term creative potentials. This framework was used later as a checklist for the research questions that were answered on the topic of creativity during the interview.

Figure 28: 7 components of creativity (Hadani, H., et al, 2015)

3.3.2 Boredom

According to Mikulas, W. L., et al (1998) being bored is defined as: "a state of relatively low arousal and dissatisfaction, which is attributed to an inadequately stimulating situation." This does not sound like an activity with any positive aspects to it. On the contrary, this rather negative definition of an unstimulating situation could lead to some positive outcomes. Research showed that boredom is conductive to the creativity of a kid. (Mann, S., & Cadman, R., 2014). When a mind wonders off and daydreaming starts, creativity takes place and solutions to being bored will be found. As Brissett, D., & Snow, R. P. (1993) argued; Boredom is a pathway to enlightenment, stimulating the production of fantasies, awakening creativeness, and bringing forth entertainment within.

The state of non-activity, experiencing boredom, makes that people have an improvement on their divergent thinking (Mann, S., & Cadman, R., 2014), also known as explorative creativity, and problem-solution based knowledge (Singer, J. L., 1981).

This shows that the concern of the parents indeed is justifiable by literature. With the influence of the smartphone, children do not experience boredom anymore within the current era. You may state that curiosity of the children fades away. The smartphone is an easy time filler and offers a low threshold to a great variety of different small games. Offering a fill for the hunger to amusement. The child serves as an executor of a scripted activity, rather than being the inventor of its own activity. Affecting ones creativity.

3.3.3 Definition of active play

On the one side active play is hindered by smartphone usage, while on the other side the usage can be seen as conductive for the degree of active play. The reason for this is that active play could be both mentally or physically. To give a definition for the rest of this report, the definition from Find a health service (2019) is used. This definition is stated as follows: "Active play is essentially physical activity with spontaneous and occasional bursts of high energy. It can occur indoors or outdoors, alone or with friends and family." With this definition in mind it means that smartphone entertainment, involving playing games in a non-physically-active way, is considered as passive- , rather than active play. In contrast to this, some smartphone uses could be considered as active play. When the smartphone is used as a support for a physical activity, such as a fitness app or an interactive game like Pokémon Go. Because it is a fuzzy area, later on in this thesis, a deeper interview was conducted on the topic of active play. What does active play mean to parents and what are the differences between playing by doing and touchscreen interactions?

3.4 A FIRST DIRECTION

The new information of boredom was integrated into the mind map of consequences that is shown before in section: 3.1.3 Literature research – Results. Together with this, the additional literature and the insights from the survey, a first direction is created.

3.4.1 Direction

The mind map was revised with the new problem of boredom, and the effect on one's creativity. With this new mind map it can be noticed that there is an interplay between the different categories that came as insights from the survey. In Figure 29 these categories are highlighted.

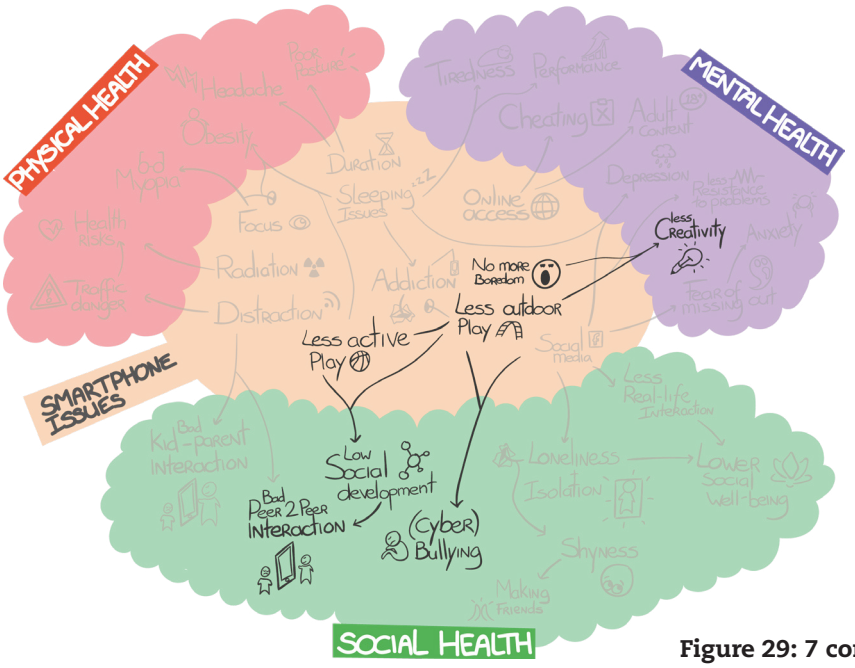


Figure 29: 7 components of creativity

This given, the first design goal is stated as follows:

> *Design a playful loyalty campaign that stimulates the engagement of children in active play by utilizing the entertainment values of a smartphone, to spark ones creativity.*

To further elucidate, the loyalty campaign will support the creativity of children as its goal. This by the means of a physical active way of playing that makes use of the "fun factor" of a smartphone. This entertainment value of the smartphone leads to an intrinsic motivation to engage in more active play. In other words: What now is a motivation for children to use the smartphone and engage in passive play, will be utilized as entry points leading to a higher degree of intrinsic motivation for play actively. As elaborated in section 3.3.1 – Creativity this forms a higher level of creativity. This factor is inserted in the framework of Amabile (1998), in the figure below.

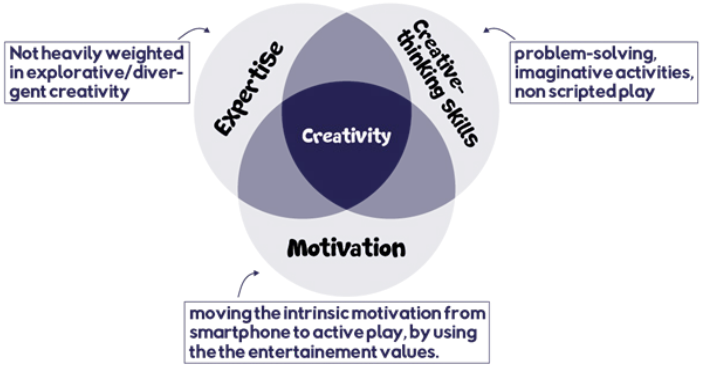


Figure 30: Integrated model of creativity (Amabile, T. M., 1998 & 2012)

The creativity that is sparked, as stated in the design goal, consists of problem-solving abilities, imaginative activities and non-scripted play. These three types of creativity came as a result in the survey. They are affected by smartphone usage and emerge from active play.
Expertise is not of interest within this subject, since the type of creativity is exploring new things. Therefore topic specified expertise on the activity is at children's general level.

The next step for continuation is an in-depth research. This offers the possibility to find out the underlying needs of both the parents and children concerning active play and specified types of creativity. Also it explores what the entertainment values of a smartphone are which can be utilized within the campaign. Eventually this was brought together into a refining or refocus of the design goal.
The in-depth research took the form of an interview and is discussed in the following section.

With the first design goal several questions arise. To make it more specific the goal is divided into 3 parts: 1) Spark creativity, 2) Entertainment values, 3) active play. Besides these three topics, it is also important to know what the context of use is. What happens around the child that supports the choice of using the smartphone? This offers a better fitting opportunity to create an intervention with design.

So to know more about these categories and to get in-depth knowledge about this, several interviews are conducted. Because of the different aspects that need to be researched, the interview is conducted with both parents and their children.

3.5 INTERVIEWS

3.5.1 Objective

The interview had 4 different objectives that were related to the categories. Therefore there were 4 main research questions with several sub questions for the interview.

1 *What boundaries does the context of use offer?*

- *When do children use the smartphone?*
- *Where do children use the smartphone?*
- *With whom do children use the smartphone?*

It is important to know what the context of use is. It offers limitations and possibilities concerning smartphone usage. This usage does not emerge in a vacuum, therefore it is required to know about timing, place and people involved.

2 *Which entertainment values of a smartphone could be used as entry points to active play?*

- *In what degree are play experiences present in a successful app?*
- *Which psychological needs are satisfied while playing on a smartphone?*

These two sub questions were based on two theories. These are now explained.

Korhonen, H., et al (2009) conducted research into better understanding the role on playfulness in the overall user experience of digital gaming. This resulted into a framework of 20 playful experiences (table 1) derived from studies in interactive art and videogames. By using these 20 categories and by looking at what is utmost present in smartphone usage, the prominent and important characteristics can be picked out.

Category	Description
Captivation	Experience of forgetting one's surroundings
Challenge	Experience of having to develop and excercise skills in a challenging situation
Competition	Experience of victory-oriented competition against oneself, opponent or system
Completion	Experience of completion, finishing and closure, in relation to an earlier task or tenstion
Control	Experience power, mastery, control or virtuosity
Discovery	Experience of discovering a new solution, place or property
Eroticism	Experience of sexual pleasure or arousal
Exploration	Experience of exploring or investigating a world, affordance, puzzle or situation
Expression	Experience of creating something or expressing oneself in a creative fashion
Fantasy	Experience of make-believe involving fantastical narratives, worlds or character
Fellowship	Experience of friendship, fellowship, communality or intimacy
Nurture	Experience of nurturing, grooming or caretaking
Relaxation	Experience of unwinding, relaxation or stress relief. Calmness during play
Sadism	Experience of destruction and exerting power over others
Sensation	Meaningful sensory experience
Simulation	Experience of perceiving a representation of everyday life
Subversion	Experience of breaking social roles, rules and norms
Suffering	Experience of frustration, anger, boredom and disappointment typical to playing
Sympathy	Experience of sharing emotional feelings
Thrill	Experience of thrill derived from an actual or perceived danger or risk

Table 1: Categories of digital experiences (Korhonen, H., et al, 2009)

To get an insight into the deeper layer on these play experiences, the theory of Desmet, P.M.A. & Fokkinga, S.F. (2018, in press) was used. This theory is an overview of all the most important needs a person could experience. These needs serve as drivers resulting in certain actions or decisions (see figure 30).

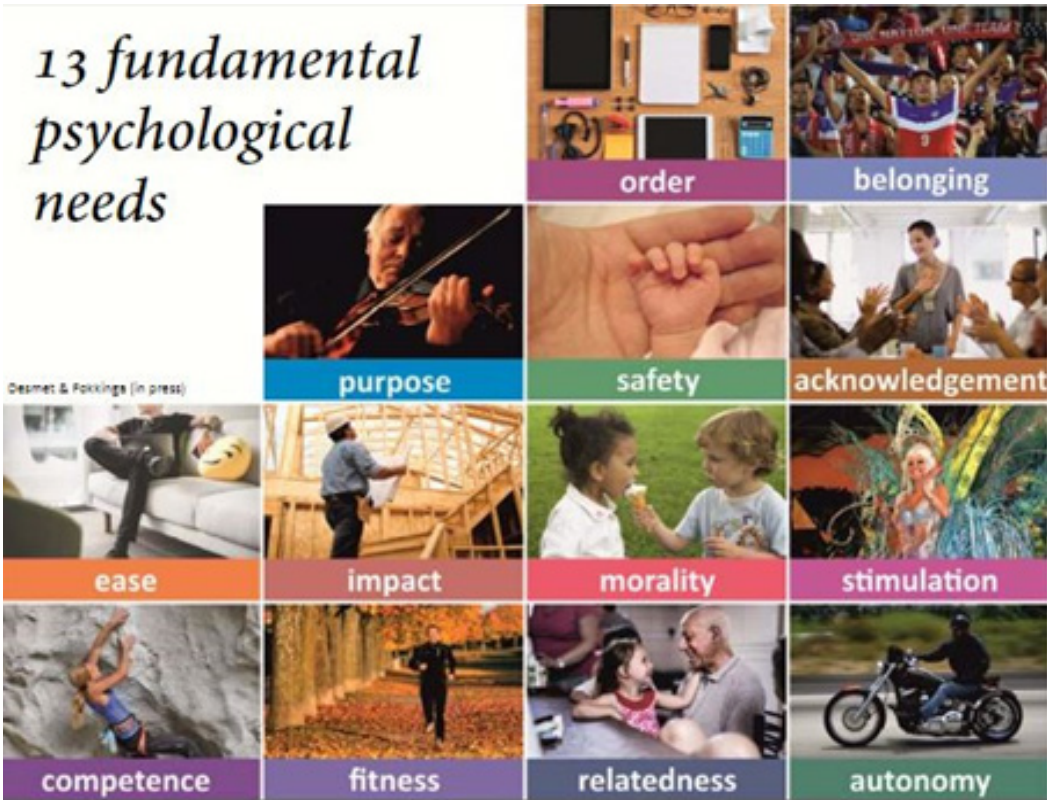


Figure 31: 13 fundamental human needs (Desmet, P.M.A. & Fokkinga, S.F., 2018, in press)

3 *What is the influence of the smartphone's low threshold usage and accessibility on active play?*

- *What is the impact on outdoor play?*
- *When would a child chose active play or touchscreen interaction above the other?*
- *What problems do parents experience concerning the effect of smartphone usage on active play?*

As discussed in 3.3.3 - Definition of active play, it is important to deeper investigate the topic of active play. What is the impact from the smartphone? What are the parent's experiences? And why would a child prefer one above another?

4 *What is the influence of the smartphone on a child's creativity?*

- *What is the impact on the imagination and originality?*
- *What is the impact on the creativity in flexibility?*
- *What is the impact on creativity in decision making?*
- *What is the impact on communication & self-expression?*
- *What is the impact on motivation?*
- *What is the impact on collaboration?*
- *What is the impact on physical creativity?*

These 7 sub questions were based on the theory which is described in section 3.3.1 - *Creativity*. It will gave more insights in the elements of creativity that are negatively or positively influenced by the digital entertainment, leading to a higher degree of creativity..

3.5.2 Method

Booklet

Accompanied with the interview a booklet was made. In this booklet 5 different tasks were given that were completed by the child during the interview. The reason for this is that it created a less formal way to interview the child and therefore made it less imposing. The attention was drawn to the exercises, meanwhile a talk was conducted. The booklet can be found in *Appendix 4: Interview booklet*.

Location

The interviews were held at the home of the children.

Participants

In total 4 interviews were conducted with 6 kids in total, 3 girls are siblings. With each interview with the kid a parent was also present. (fig. 32)

Setup materials

- *Booklet including 3 sticker sheets (blue, red, green)*
- *Notebook to make notes during the interview*
- *Several pens*
- *2 recording devices*
- *Interview outlines*
- *Touchscreen device provided by the kid*
- *Child's chosen toy*
- *Photographer with camera (interview 2, 3 and 4)*
- *Informed consent form to be signed by the parent*
- *Chocolate Easter bunny as a gift for participation*

Figure 33: Interview setup (participant K2)

Figure 34: Gift for participation

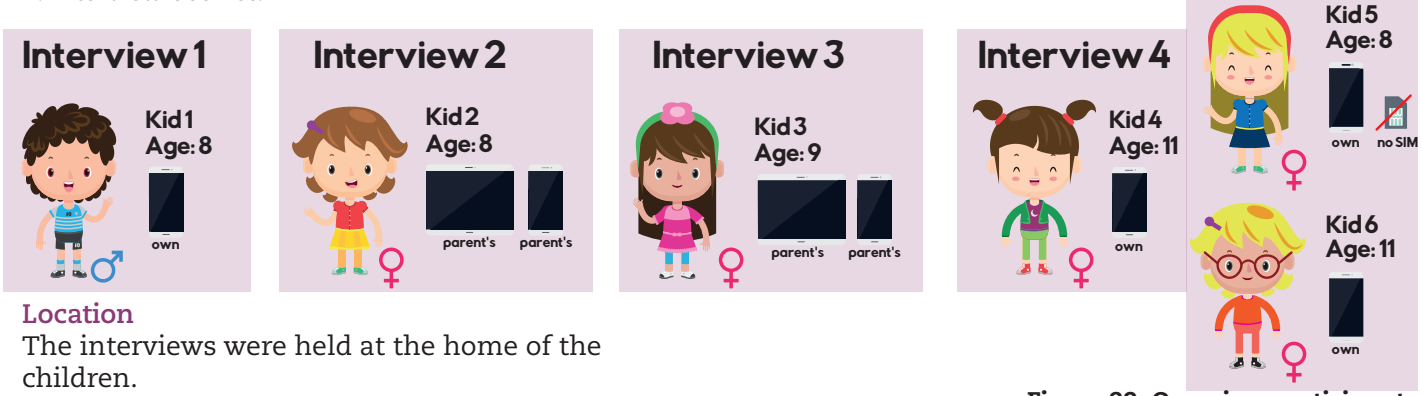


Figure 32: Overview participants

Protocol

As a preparation to the interview an email was sent out to the parents. This email can be found in Appendix 5: Interview protocol. In this way the parents and children knew what to expect form the research.

The first task in the booklet consisted of general information. Also a small icebreaker was introduced. With the email, the child was instructed to pick one of their most favourite toy and tell something about it. After that, the subject of smartphone usage has been introduced. The complete script which has been used during the interview can be found in Appendix 5: Interview protocol.

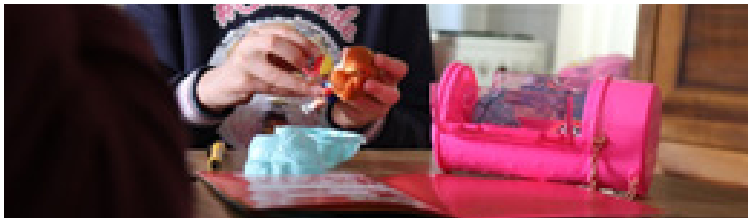


Figure 35: Chosen toy (K3)

Figure 36: K3 showing tablet

The second task in the booklet was context based. Several different images were shown on which the child indicates where smartphone usage occurs often, sometimes or never in that specific case.

The third task was to let children take their device and show the interviewer some applications that they like to do. After that they needed to complete two sentences telling about their accompanied emotions.

At the fourth exercise, a long list off different popular applications were given. The child first needed to scratch through all the apps he/she did not know, since they were useless for the following tasks. These tasks were indicating which application they had on the phone, they liked and disliked by pasting stickers in the booklet.

Figure 37: K6 stickering apps

The last task were three different dilemmas the child needed to choose from. These were directed to active or social play vs screen usage.

All of the different tasks were used as a conversation starter between the interviewer, parent and child. The answers on the tasks itself would have led to superficial results, but the conversation around them provided a deeper understanding of the subject.
After filling in the booklet with the child, the parents were interviewed. These questions were related to their opinion on general smartphone usage, active play and creativity. The questions can be found in Appendix 5: Interview protocol.

Data collection

The data has been collected by recording voices. These recording were transcribed for analysis.
For the purpose of reporting, pictures were taken during session 2, 3 and 4. Regarding the data collection and participating in the interview, an informed consent form is presented to the parents. This was signed by them after the interview had been completed. See Appendix 5: Interview protocol for this informed consent form.

Analysis

The transcripts of the interviews were use for the analysis. Divided by each research question, a content analysis has been conducted. For the second research question, the different play experiences will be rated looking to what extent they are present in smartphone use among children

3.5.3 Results

The transcripts of the interviews can be found in the additional supplement. Now the analysed results are given divided per sub question.

Note: A first clear result was that tablet and smartphone usage are intertwined with each other. If owned by the child itself, the smartphone is chosen to play with. On the other hand when possession of a smartphone was not yet the case, the child mostly interacted with a tablet instead. This tablet use was than combined with usage of their parent's smartphone. From now on all reference to smartphone usage are converted to digital entertainment or touchscreen interaction.

1 *What boundaries does the context of use offer?*

When do children use the touchscreen device?

The touchscreen device was mostly used during the morning or afternoon. Also when the child got bored he or she grabbed the device for entertainment purposes.

The tablet and smartphone were used when the parent of the family is cooking dinner.

Diner time was important to parents and therefore screen use was prohibited while eating together.

Where do children use the devices?

Usage was most common around the house. The couch was indicated as most popular place of usage. Around the house, also included their own backyard. Nevertheless, they did not use their device in an active way of playing outdoors. Just passively in a chair when the weather offers the possibility. More on the subject of active play is highlighted later on.
Children were not allowed to take a device further than the boundaries of home.

With whom do children use the devices?

Digital entertainment was mostly done by the child itself. When friends are around, they did not prefer this type of entertainment. Although they did not engage in long lasting times playing together on a device, they showed others (friends and family) stuff they did on the device. Occasionally friends played together on one device.

> P1: **If you have found a funny video, you want to show this, right?**

Online contact with strangers was strictly prohibited by parents. When a child gets older they need to get more online freedom, but it is controlled by parents as much as possible. Meanwhile, it was one of the biggest concerns that parents were experiencing. This because they did not had any control on the online behaviour of their child. They did try to supervise it as much as possible, but in practise it was hard to do.

2 *Which entertainment values of digital play could be used as entry points to active play?*

In what degree are play experiences present in a successful app?

A rating on the different play experiences (Korhonen, H., et al, 2009) is given based on the interviews. (figure 38)
It shows the degree of presence of experiences in smartphone and tablet interaction. Some of the most interesting insights regarding these experiences are now discussed.

Figure 38: Presence of experience

Captivation The player on the smartphone/tablet forgot one's surrounding while playing. The immersive experience dragged the person into the story of the device.

> P1: **Can talk to them whatever I want, but they do not hear me anymore.**

Challenge This characteristics was avoided as much as possible. When something was found difficult to do, an easy app is preferred. Often the device was even used to avoid being challenged. When children were not able to continue in a game or they had a certain question, they would watch Youtube videos of how to continue. Therefore they would not use using their own problem-solving skills.

P3: What would you prefer? A game from the cabinet or one on the phone?
K3: Phone. (...) With that you always lose and in this there are a lot of game you already know.

Completion Succeeding in levels results in a sense of completion and excitement. This was for a very brief time though, since a next level is started easily. When one part is too long, it resulted in quitting the activity before it was finished. Digital entertainment of one app was very volatile. On the contrary, interaction lasted over several days (Minecraft), but parts of the story needed to be completed bit by bit.

K1: Yes! I completed a level!

INT: And do you do that often?
K2: No, not really.
P2: Then you have to finish it, otherwise it will be lost.

Discovery This consisted of the ability to find new things, improve your character and get more and more new stuff and updates. The apps are packed with different gifts and collections you can receive and discover. This element was found entertaining and children saw it as a characteristic worth mentioning during the interview.

K2: Sometimes there is a gift over there. If you tap it, in my world, you will receive something.

K3: That there is new stuff everytime. First there was no crossbow and now there is.

K4: (...) then you have to search for stuff and that was something I really liked, (...)

Exploration Worlds were explored when playing on the device. Chests were found and opened up to get rewards, which also was discussed in discovery.

Not only digital worlds were explored, but "AH insecten app" brought this digital entertainment element into the real world by letting children explore bugs in the real world.

K1: You have to take pictures with this insects app. And these are all outside. So we take this outdoors to look for insects in the backyard. And I will take pictures of them.

Expression The creative aspects from the digital entertainment usage were somewhat more elaborated than the other categories. In the last research question all elements of creativity are discussed. Expression was slightly present in applications. The user created something and afterwards showed it to their parent and therefore expressed themselves. Also it was possible to visit other player's creations.

Fantasy You can play as a fictive character. The fantasy was limited though due to the scripted play. It was directed by what the programmers offers you could be. A more elaborated analysis of fantasy in relation to creativity is given in the last research question.

K5: A baby with wings.

K2: No it's a rainbowsheep!

Nurturing Taking care of a specific place or character was a returning element in games. This element was highly intertwined with the element of simulation, which is discussed later on.

K2: This one sleeps here, and this one over here.

Relaxation Playing on the touchscreen device was considered as relaxing. While playing, a passive posture was taken. Laying or sitting in the couch was the most popular way to play.

K1: On the couch you can lie down and here you really have to sit. I am a lazy one. I like to chill.

Sadism Killing and destruction were things that children enjoyed doing in the digital environment.

K2: Here you cannot demolish anything.

Brother K1: You have to chose a world and drive. And you can die.
K1: You have to damage as much as possible.

Sensation Sensory experiences were limited when using a touchscreen device. Everything happened on a flat screen and visual elements were only supported by audio.

P3: It is a limitation of your senses. (...). Only your sight on a screen. You do not feel anything, you do not smell anything, only a flat screen... It is different than clay for example.

Simulation Digital entertainment offered a possibility to let you experience something you are not. Children associated themselves with the character they were playing with. Also they saw themselves as the 'owner' of a specific world or place.

> K1: Take care of your own farm.

> P3: Yeah, maybe it is addictive. A screen. Creating your own world.

Subversion Doing stuff you actually shouldn't was found entertaining. Social rules and norms were broken when the possibility for it arose. The digital environment offered an opportunity to do this without any consequences. Chickens were buried in the ground together with other humans and avatars of other players could have been adopted.

> P3: I also have buried a lot of people.

Which psychological needs are satisfied while playing on a smart device?

Ease Playing on a touchscreen device was found relaxing. A relaxing posture was taken and play most often happened while sitting in the couch.

Stimulation Fun was the number one driver to play a game. Crazy pictures were taken and laughs were occurring during play

Competence While challenge was avoided, proudness happened when something was created by the kid. They wanted to show off what they made to their parents. On the contrary, the lack of challenge lowered the improvement of the level of competence.

> K3: Proud of replicating the Big Ben.

> K1: No, I am not proud of that. I completed so many levels before.

Reversed morality Morality was reversed in digital play. What was not accepted in real-life, would be executed in the digital environment.

> P3: I also have buried a lot of people.

Acknowledgement High scores were mentioned by children. They wanted to let the other know, what their best scores were within a specific app. Also gaining likes on Tiktok was appreciated since it showed the acknowledgment of others.

> K3: Just to be sure, I will first a heart to myself. (...) Then I will receive more hearts.

> K5: Look, it says best 3380. That is quite a lot.

Lack of Relatedness Relatedness was not searched in digital gaming. When it comes to relationships children preferred direct social contact and physical play. Some interactions between people were done by the means of a smartphone and/or tablet, but mostly this was a brief interaction quickly showing something to the other. When one device was used, the other was looking at the other playing passively.

> INT: And do you play on the phone then?
> K6: Yeah, actually that is a bit boring...

Nevertheless children sought the possibility to bring in relatedness while playing on a touchscreen device.

> P5: When you play a game, you also use Facetime simultaniously.

3 *What is the influence of the touchscreen's low threshold usage and accessibility on active play?*

What is the impact on outdoor play?

Back in the days when parents were children themselves they indicated that they played outdoors more often. They saw a big difference between them and their kids concerning this.

The low threshold of touchscreen usage resulted in the kids easily grabbing a device instead of playing outdoors. They needed a stimuli to start playing outdoors. When doing the outdoor activity no problems were seen, it just needed that little push.

> P1: If you leave the choice up to them, they will never play outdoors anymore. (...) When you give them the option: phone or outdoor play, they will always choose the screen.

Children indicated that there are not much applications to use outdoors. The concept of Pokémon Go was widely appreciated, but when the franchise of Pokémon itself was disliked, there was no alternative. Having interaction between device and outdoor was considered fun.

> K6: **It is a game that is not my cup of tea. The game is fun, speding time outdoors. (...) There are not many app games for outdoor use.**

> K4: **Well, Pokemon itself. It's stupid. Catching beasts with an egg which is called a Pokeball.**

> INT: **That you have an app with which you can play outdoors?**
> K3: **Yes, then I will! Then I will play outdoors!**

A problem with Pokémon Go was that it is still a very scripted way of playing outdoors. Following instructions, doing disadvantage of the positive aspect of open play outdoors.

> P1: **Of course they will go outdoors and that is good, but they need to be able to do it without that thing too. (...) Otherwise they will walk outside like this. (...) and still do not use their fantasy. They do what the phone asks. 'Ah, there should be a Pokemon.' No that is not playing outdoors to me.**

So the digital and real world were not connected. The "AH insecten" app was doing a good job bridging between the real world and digital entertainment. It used the application as a stimuli to explore the real world.

When would a child chose active play or touchscreen interaction above the other?

When playing together, active play was preferred. Brief interactions did extinct with the use of a device, but it consisted of passively showing a picture or seeing someone else play.
When the child was by themselves the active play needed to be directed by the parents. Parents needed to indicate to their children that screen-time is almost over, therefore making it possible for them to set boundaries to the usage. This issue seemed hard to tackle because interplay between real world activities and digital entertainment was missing. Indicating they were not integrated with each other.

What problems do parents experience concerning the effect of touchscreen usage on active play?

Parents wanted to have a good balance between playing on the device and active play. The child did not have a natural stop on playing with the touchscreen, and therefore it needed to be stopped by the parent.

> P1: **There needs to be a balance. That's it. It should not only be this or that. Then it becomes negative.**

4 *What is the influence of the mobile device on a child's creativity?*

What is the impact on the imagination and originality?

You might say originality was hindered when the devices were used. Children watched Youtube videos and re-enacted or copied the things they saw. They did not think touchscreen usage involves own fantasy, but rather interpreted it as replication.

> INT: **But you build stuff. Or is that no fantasy?**
> K3: **No, that is a replication.**

> P2: **If she sees someone drawing, she will not take a wooden plank to build a shack.**

> P4: **I think you should get bored once in a while. Then you are able to think creatively and the most creative things to do will come from that.**

While in first instance it was hindering a child's imagination, it acted as an inspirational tool. Own skills needed to be used to reproduce. Also alterations would be made by the child, since completely copying is seldom the case. As Austin Kleon suggests in his book "Steal like an Artist" (2012): *"Everything builds on what came before, and every new idea is just a mashup or a remix of one or more previous ideas. Nothing is completely original."*

> K3: **I once tried to build a treehouse (Minecraft), but I did not succeed. I always do it high in the trees. He does it in the middle.**

> P1: **I used to replicate the booklets, that is also scripted. And it is not like he re-enacts it completely. It is a stimulation. (...) When building with LEGO, you need to use your own skills. So I don't think it is negative.**

Minecraft was seen as a positive creative app/game. Creating something is good for the development for the child. It was double though. Other sensory elements were not stimulated.

> P3: **I think Minecraft is funny. Building with blocks and making houses and animals. I think it is nice, when you can create something.**

What is the impact on creativity in flexibility?

Scripted entertainment of the device reduced the amount of flexibility. When playing on the device, creativity happened but is set between the boundaries the app offers. Applications were not combinable with each other, while toys did offer this possibility.

> K1: I use LEGO with other toys too. Then I create a whole fantasy story out of it.

> P1: Of course they will go outdoors and that is good, but they need to be able to do it without that thing too. (...) Otherwise they will walk outside like this. (...) and still do not use their fantasy. They do what the phone asks. 'Ah, there should be a Pokemon.' No that is not playing outdoors to me.

What is the impact on creativity in decision making?

The creative problem-solving skills were different when a smartphone or tablet is in the area. When you got stuck with something or you did not know how to fix something, a Youtube video would be watched to find the answer. Therefore the user would let the device do the decision making for them and let it show the best possible answer to them without thinking about the topic by themselves.

> P1: Recently you had that with that Lego game. When stuck in a level, he will search for it on YouTube. Then he sees how they do it and then he is able to continue.

What is the impact on communication & self-expression?

Communication and self-expression were present in digital entertainment. As discussed before, not a lot of interaction with other people happened when using a phone or tablet, but when it happened it mostly existed of showing to the other what you made. Allowing them to express their ideas.

What is the impact on motivation?

The applications on a smartphone or tablet were doing good in terms of motivation to children. As the theory suggests: the higher the degree of intrinsic motivation, the higher the level of creativity (Amabile, 1998). With integrating a lot of the different entertainment values, that are discussed before, the application made the need of stimulation at its max i.e.: Fun!

What is the impact on collaboration?

Collaboration is not actively present in digital device use among children. This because the use is mostly done alone. When playing with a friend, physical play and therefore collaboration is preferred.

> P3: I do not want any screens if a friend comes over. A Tiktok once in a while, but then it is over.

What is the impact on physical creativity?

Physical activity was reduced by the devices. As outlined in the previous research question, physical active play was not integrated in mobile devices, they are two different worlds. When interaction with the real physical world was integrated in applications, which was the case of just a handful of apps, it was considered as a lot of fun. Nevertheless when a topic of a certain app was disliked, substitutes were not on the market. The fact itself, that it was called digital and real world suggests that it were completely different worlds.

3.5.4 Conclusions

Now the most important insights per research question are given as a summary of the results before. This eventually forms the design direction that is discussed in *3.6 Design Direction*.

1 *What boundaries does the context of use offer?*

The usage of the touchscreen device is mostly during daytime, in other words day light is there and outdoor play can be utilized as an opportunity.

Children indicate they use the device when they are experiencing boredom. Therefore it is confirmed even more that children escape from this by committing in digital entertainment. One parent is even consciously aware of this issue affecting the fantasy of a child and therefore made her children experience the feeling of boredom.

The device need to be kept around the house, since not all children are allowed to take it with them to others.

Usage is done by the child itself and therefore the activity needs to be mainly happening alone. On the other hand, this can offer a possibly to playing together by using the smart device as a support in a more active fashion possible.

Online contact with strangers needs to be avoided and therefore the use needs to be in a controlled environment.

2 *Which entertainment values of digital play could be used as entry points to active play?*

The digital entertainment values that can be utilized are the ones that are rated the highest in the results section. The strongest USP of applications are the possibility to create a captivating simulation of a real-world situation, where things can be discovered and unlocked. The experience needs to be easy to do and might happen volatile. In addition to simulation, children like the fact that the digital entertainment offers the possibility to play without social consequences and enables them to small proportions of sadism.

Sensory experiences are not present in applications. This is found to be a troublesome characteristic and a big difference between active play.

Playing on the device is found relaxing. And therefore obstructs the active play of children.

3 *What is the influence of the touchscreen's low threshold usage and accessibility on active play?*

A first incentive for active play needs to be given. When children get this first push they commit to active play. If there is no initial incentive, the low threshold of digital entertainment makes children commit to touchscreen amusement. According to children itself, there are not much applications that connect real world play with the entertainment of digital. Bridging between the real world and digital world is therefore an opportunity to design for.

There is not a natural balance between active play and digital device play.

4 *What is the influence of the mobile device on a child's creativity?*

Children use the smart device as inspiration to creativity. They recreate examples they see and use their own insight to do so. Although the devices are an inspirational tool to let children explore their own creativity it shackles the use of their sensory experiences. Also the entertainment is seen as obstructing their own flexibility, since it cannot be combined with any other toys or applications, and other creative fantasies. The main focus lies on the device rather than the real world. The physical creativity is therefore reduced by the touchscreen entertainment too.

3.6 DESIGN DIRECTION

With this exploratory research, this part of the report comes to an end. It offers a possibility to design for and the goal to the project. Now the final design direction is given as a starting point for part 4: Ideation.

3.6.1 Current interaction

Nowadays, children have easy access to mobile devices such as tablets and smartphones. The main driver for touchscreen device usage is the amusement and entertaining value they offer to the user. It creates a possibility to simulate the 'real' life and making your own world. Together with discovering of a variety of objects and this renewing character an app can offer. Counting up a touch of breaking social norms. It forms the motivation for children to engage in digital entertainment.

In addition to this motivation, the accessibility of mobile devices is the reason that children are often focused on a screen for a longer period of time. While they are lying in the couch, they are entertained. Parents indicate that keeping a balance between digital amusement and active play is hard to obtain. This active play can take various forms such as palpable creations of LEGOs, outdoor play or any other tangible activity, in which more senses participate rather than the interaction with a flat screen. For this, children do need a first incentive or boost (externally by parents) to engage in active forms of play.

3.6.2 Desired interaction

Banning the screens is not a solution within this era. On the other hand, it could offer the opening to the experience of the non-digital world. For this reason, the design challenge becomes to intrinsically motivate children to play actively through the use of a digital incentive. This design opportunity is also confirmed by the children themselves, because there is was lack of apps that bring the digital- and 'real' world together. So mobile equipment can be used for this, but the focus will have to be on the physically present play.

Based on this phenomena, ideas are generated that are applied to the values of supermarkets *(see 2.2 Stakeholders)*. Food, activity, creations and family bonding are topics that provide theme to the various concepts. Being an educator in the field of one of those 4 subjects and having a fun content, forms Edutainment; a saleable campaign for UNGA

With the three stakeholder and their needs, an overview is created to visualize the goals. This overview can be found in the figure 39. The sweet spot is the basis of design.

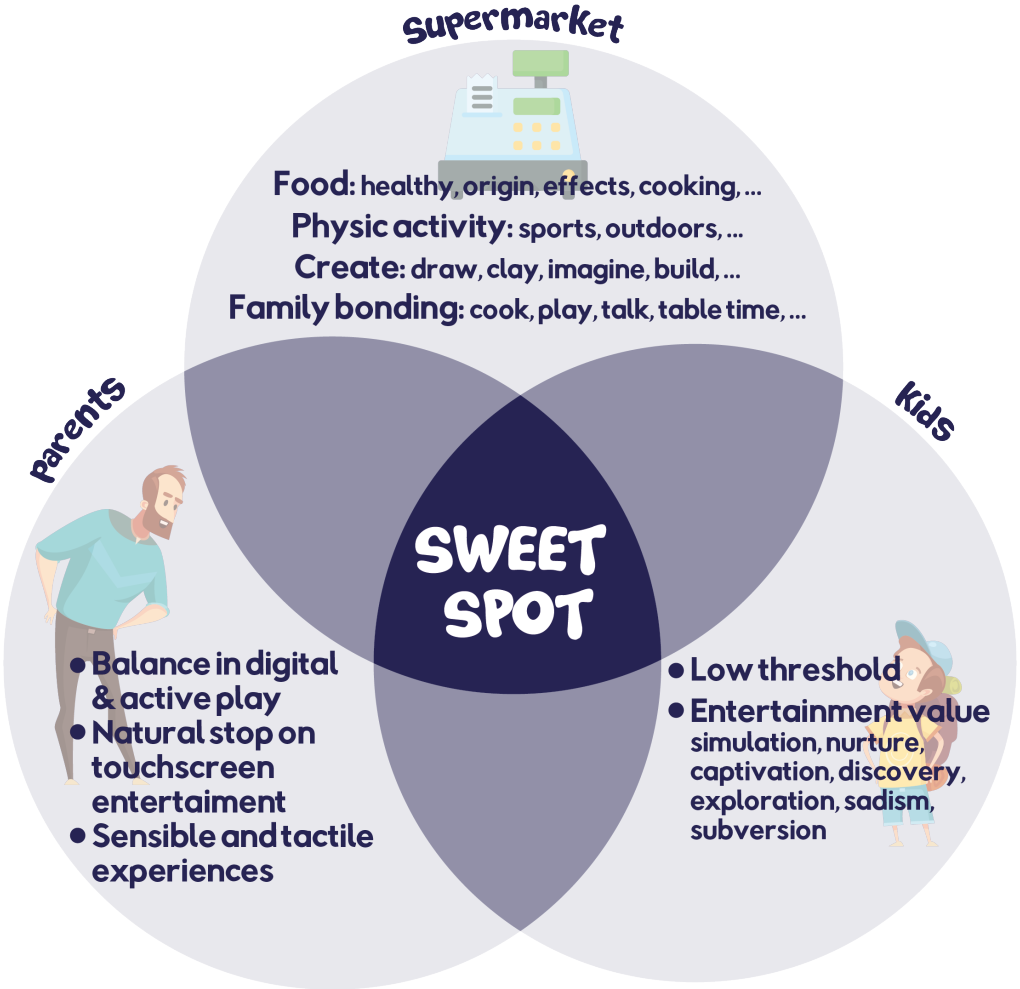


Figure 39: Overview of needs

3.6.3 Examples

There are some examples that respond to the same needs of stakeholders. An advantage of loyalty campaigns, however, is that it can be made available to a large group of participants at the same time and therefore promotes its awareness.

Beasts of Balance

Beasts of Balance is a tablet connected stacking game. It is created by Sensible Object "a team of artists and engineers working to make screen time… family time!" (Beasts of Balance, 2019), as the website states. With this game a central tower is build. It can be both played solitary or with a bigger amount of players. Besides the tower, an application could be used that shows goals and creates a storyline of a fantasy world.
The game is highlighted because it integrates the digital world into a real world experience. A tactile experience is created with extra support of digital entertainment, but still the focus of game-play is on the tower itself.

Figure 40: Beasts of Balance (Kapi Awards, 2018)

Figure 41: TOP Insecten (Thuisleven, 2019)

TOP Insecten, AH

This campaign took the subject of insects and their usefulness on the production of vegetables and fruits. Tattoos made insects, which normally are considered as scary, accessible and tangible for children. As support there was an app, that brought children in contact with real insects around their house. An insect safari could be started and in this way the digital entertainment values of exploring and discovering were brought into connection with 'real' world experiences.

3.6.4 Design Goal

To start the ideation phase, the following goal is formulated from all of the previously mentioned research.

> *"The tactilization and experience of digital entertainment. In order to bring a connection between digital and "real world" concepts and make them accessible to children."*

3.6.5 Concept Criteria

To make this design goal more concrete the following criteria are formed. These criteria are formed from the knowledge that is gathered throughout the whole second and first part of this report. Later on in the next part, when the ideas take form, they are tested against these principles offering a supported decision making tool.

The concept should…
… educate on the subject of food.
This criteria comes from one of the 4 subjects that are important to supermarkets.

… be able to be played alone.
Mobile device usage mostly occurs when a kid is by themselves.

… support playing together.
Family time and bonding is important to supermarkets. Therefore the concept should enable them in social play with any other person.

… contain a part of simulation during the play.
One of the most appreciated play experiences in digital entertainment are simulation and nurturing. To make the concept successful this must be included into the design.

... involve the exploration and discovery of new elements.
A second important play experience is discovery and exploration. By offering the ability for children to collect new things and using them during the game play this value is increased.

... involve experimentation without social consequences.
One of the mostly enjoyed aspects of mobile entertainment is sadism and subversion. A kid enjoys to see (digital) negative consequences without any effects on the real world.

... create play which is mostly focussed on a central tangible/touchable object integrated with digital entertainment.
Secondly the focus can be lied upon a mobile device interaction, but it should not act as carrier of the concept.

... be able to be played during daytime.
Digital entertainment mostly occurs during the day. To integrate digital with real world concepts it needs to be able to be done during the day.

... not involve any online contact with strangers.
During the interview this was seen as one of the most important criteria to be avoided.

... let children experience an unknown real world phenomena.
Digital entertainment is considered fun to children because of a high level of simulation. It seems to be one of the core strengths of mobile device amusement. Therefore it opens up the opportunity to let children be immersed into these unknown subjects.

... not be able to be played without a physically present object.
This criteria is based on the fact that, as stated in the goal, the digital and 'real world' need to become integrated with each other. If an app game is involved, it should not provide the ability to interact with it independently. When an app game does offer the possibility to be played alone, this whole situation and the current interaction will still remain the same and the desired interaction is not obtained.

... able to be played without the use of a mobile device.
This criteria is based on the fact that not all children are allowed to take their smart devices outdoors. To support play past their front door (e.g. on playgrounds), playing without device should be able.

... have a high level of collect-ability.
From the points described in *2.3.2 Loyalty campaign - Successfactors* an important factor of a successful loyalty campaign is collect-ability. Having a well-fitting and coherent line-up to collect improves collect-ability and therefore the success.

... is valuable when only a few gifts are received by the user.
As stated in *2.3.2 Loyalty campaign – Successfactors* play should be able when the user has an incomplete set. Some kids will only collect a few pieces and therefore it is still important that with this, interaction and play can take place.

... involves creating something.
This criteria comes from the third category in which supermarket like to see an campaign. Creating something can be seen as a very broad concept varying from drawing to claying and from building to using own insights in any other form.


Little Restaurant
What's inside?
Collect all 30
-3 cards
Little Restaurant
Collect all 30 cardboard cards
Goal of Little Nutritions is to facilitate the effect of nutritions food on your body
What's inside?
Little Nutritions
Collect all 30
Cards
Build card
Recipe
Pasta with meatballs
-Card shows a composition of characters you can rebuild.
-The back gives meaning to the structure. What contains the same nutritions? It shows a recipe
App provide by offering
keep your food logbook
3D paper toys
Upgrade scan card for app
What's inside?
Build as high as you can. Effects the score
IRON
MINERAL

PART 4: IDEATION

The ideation for concepts starts in this part. Ideas are created with the direction formed from the learnings of the research. Eventually one of the four ideas is chosen and conceptualization is initiated.

4.1 OVERVIEW IDEATION

The ideation is initiated with the design direction from the previous section as starting point. In total 4 different early concepts are presented. These ideas are generated by looking into the field of toy design and translating these opportunities into loyalty program concepts fitting the direction.

Some elements of the concepts are rapidly prototyped and visualizations are made. This enables the concepts to become discussable and validatable to the concept criteria. Leading to a supported decision making for the next part: conceptualization.

Please find an overview of the phase in the figure below.

Figure 42: Overview Ideation

4.2 LITTLE NUTRITIONS

The different concepts are outlined in detail. The first sketches of them can be found in *Appendix 6: Concept Ideation.*

The first concept is Little Nutritions. Little Nutritions is an interactive collectable that teaches children about nutritions by turning this microscopic and vague concept into a tangible experience for children.
In this way children can see what nutrients do and what the positive effects of them are on one's body.

Figure 43: Logo Little Nutritions

4.2.1 Content

With the spending of an X amount of money on groceries, the customer receives one flowpack. In this flowpack are two different components. (1) A 3D bioplastic character, standing for a nutrition accompanied with its (2) double sided card. Also an additional free app is added to this concept.

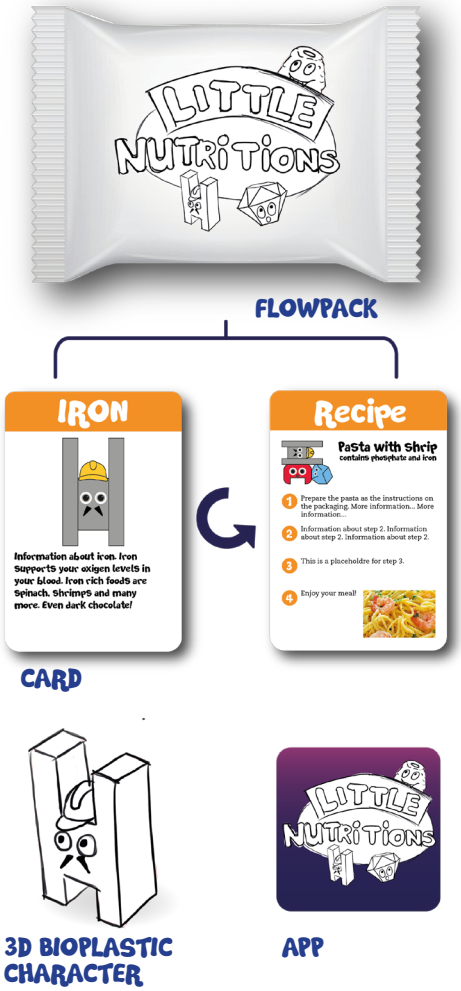


Figure 44: Content of Little Nutritions

In total 14 nutritions can be collected. Varying from vitamins, to water and from carbohydrates to different types of minerals.

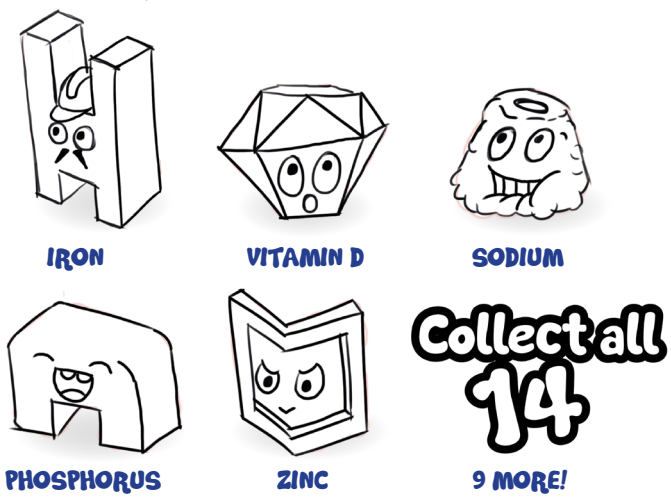


Figure 45: Collection of Little Nutritions

4.2.2 How does it work?

The main principle of Little Nutritions is to let children play with the 'building blocks' of the body, the nutritions. These little workers are teaming up in your body to get you as healthy as possible. Within this concept there are different types of play.

Little Nutritions offers a great variety of cards, thus recipes, you can collect with unique combinations of building blocks. In this way children learn that foods are made out of nutrients in a fun way.

The first way of playing is non-digital. A story of the nutrient you received is given on the card. On the other side of this card, a recipe is given which shows a dish that contains the nutrient (For figure 44 this is iron) and other prominent nutrients in that particular dish. (Figure 46)

Figure 46: Zoomed in card

If you have collected the other characters ,you can rebuild this recipe by stacking and balancing the 3D figurines. This is a game principle used in several dexterity boardgames such as 'Meeple Circus' (figure 47) which shows its successful play experience.

Figure 47: Meeple Circus (Board Game Quest, 2017)

The multi-player variant is to draw a card and be faster to rebuild the combination than your opponent.

The second way of playing is with the app.
The app will bring the nutrients to life by showing the effects they have on your body.
In the home-screen an avatar is shown in an anatomical way of presenting. (figure 48)
Different levels point to different places in the body, corresponding to the location in which the nutrient does its job.
When collecting the 3D figurines the different levels can be unlocked.

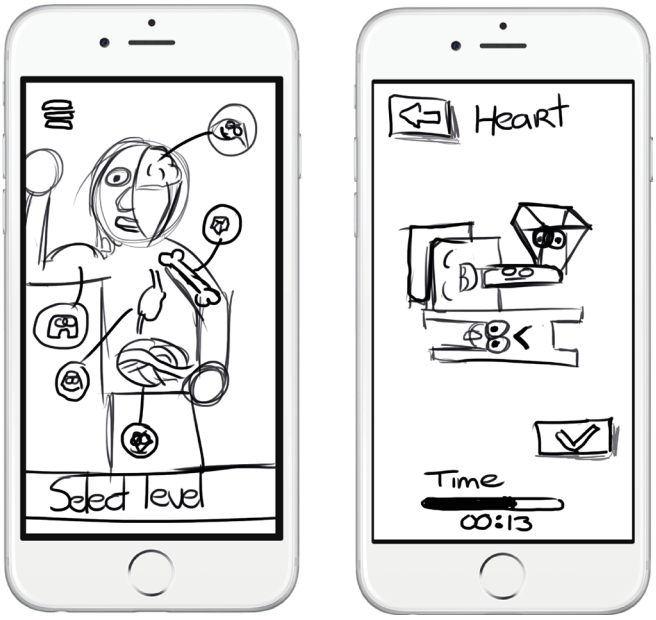


Figure 48: App

If a level is chosen, the app brings you into the place you have selected, as if your are traveling through your body (see the mood-board in figure 49). Within this level, combinations of building blocks are generated that needs to be build before the time runs out.

Figure 49: Mood-board app

When a level is succeeded this is reflected into the home-screen avatar. The better you are, the healthier the person will be.

A second game-play of the app is a local 1 vs 1. By stacking faster then the other player, you will receive points and bring the nutrient into your body. The better you do, the worse the other avatar's health will be. This version enables children to experiment with one of the most popular game experiences, as explained in 3.5.4 *Interviews - Conclusions*, sadism.

The app verifies whether the combination is build correctly or not with the use of object recognition. This technology is used in a different game concept (Plugo Link by Shifu, figure 50) which reflects what happens in real-life into the digital app environment. Demonstrating it is a feasible technology.

Figure 50: Plugo Link (Shifu, 2019)

4.3 FOOD WORLD

The second concept is called Food World.

This concept is quite similar to Little Nutritions in terms of game-play and reflecting the food effects into a digital environment.

Food World is a craft collectable which incorporates the ongoing battle between healthy and unhealthy foods.

Figure 51: Logo Food World

4.3.1 Content

When spending an X amount of money on groceries, the customer receives one flowpack. In this flowpack there are two different components. (1) A paper toy character and (2) a double sided card. Also an additional free app is accompanied with this concept.

In total you can collect up to 20 different characters divided into two categories: healthy foods and unhealthy foods.

Figure 52: Collection of Food World

Figure 53: Content Food World

4.3.2 How does it work?

Food World is about a planet far far away where foods are coming to life. On this planet there is an ongoing battle between the healthy and unhealthy foods, just as you experience during your real-life.

First up, you have to assemble the characters. They are made out of paper and by folding you can get them into a 3D shaped figurine.

The offline variant of the game is to stack-up the characters and to build as high as possible.

The digital version however, will bring in more game-play to the experience. On your phone, you have to stack the foods on top of each other.

When stacked, they are brought into the digital world of the foods and start fighting. As an increased difficulty the phone starts vibrating.

Figure 54: Stacking Food World

This one is not that elaborated in comparison to the other concepts. The reason for this is that while prototyping the paper toys, folding them was a very precise process. Assembling is hard and the stack is not that stable.

Figure 56: Content Little Restaurant

4.4 LITTLE RESTAURANT

Little Restaurant is an interactive concept that enables children to cook in a way that is safe. It does not involve real heat and sharp knifes.

Little Restaurant teaches about food preparation and let children be in the shoes of a star chef. This requires multitasking abilities.

Figure 55: Logo Little Restaurant

4.4.1 Content

With the spending of an X amount of money on groceries, the customer receives one flowpack. In this flowpack there 4 to 5 cards, which together form a dish. These cards refer to ingredients and tools for cooking. In the example of figure 56, these cards create a hamburger. There is a free app in addition to the cards.

Figure 57: Collection of Little Restaurant

4.4.2 How does it work?

Play mainly happens with the use of the app. When you have collected a set of cards you are able to activate them within the Little Restaurant application.

In the app you have to manage your own restaurant. You are standing behind your counter and customers come in to do their order. Because the phone is standing vertically, it can see what you do on the table in front of you. This space is your working area. (figure 58) Here you have to do all actions regarding the cooking process. In the figure below an example is given of Cooking Fever (figure 59), in which the game-play would be the same. The digital cooking part however, is moved from the digital environment into the real world (your working area).

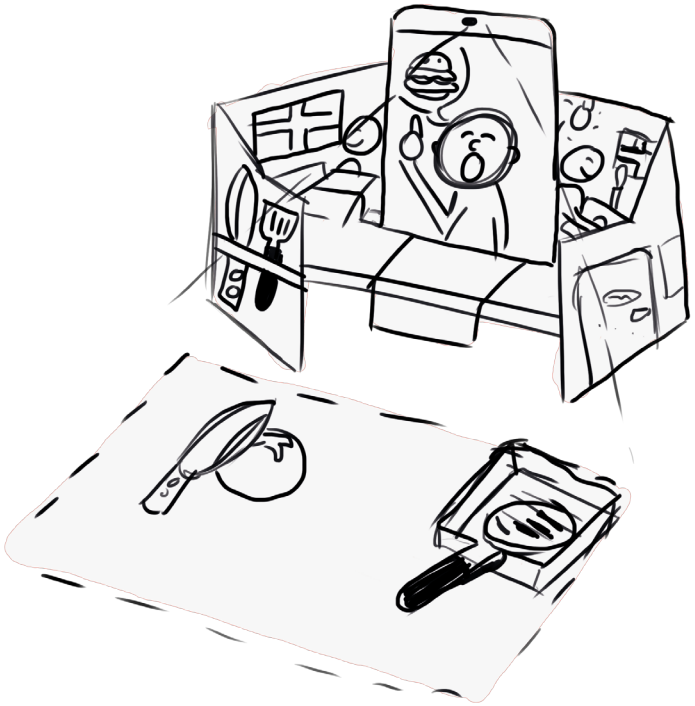


Figure 58: Little Restaurant set-up

Figure 59: Cooking Fever (Google Play, 2019)

Time-management is important in these games. You have to make sure that you flip the burger just in time before it burns and to do the cutting of the tomato at the same.
All of this is done by using your cardboard tools which are noticed by the phone.

So the app needs to know what is happening in-front of the phone. This technology is already feasible and used in different toys. A toy that was the base inspiration for this concept is called 'Osmo Pizza Co.' in which you have to make pizzas with the right toppings. A small mirror is placed on top of the tablet, which can be sold as an additional buy for Little Restaurant.

Figure 60: Osmo Pizza Co. (TechCrunch, 2016)

4.5 CLAY FARM

The last concept is called Clay Farm.
Clay Farm is an interactive farming experience that teaches children about farmers craftsmanship and product origin.
Clay Farm educates children in an engaging way by taking the best of what a digital app could offer and by connecting this to the real world.

Figure 61: Logo Clay Farm

With Clay Farm you turn your home into a farm.

This concept will be a follow up of the clay concept UNGA is developing at this moment.

4.5.1 Content

With the spending of an X amount of money on groceries, the customer receives one flowpack. In this flowpack you get about 4 pieces of clay, a cardboard cut-out, a leaflet and a free downloadable application.

A character can be made by using the instructions on the leaflet. 12 different characters can be collected which are foods or food origin related animals.

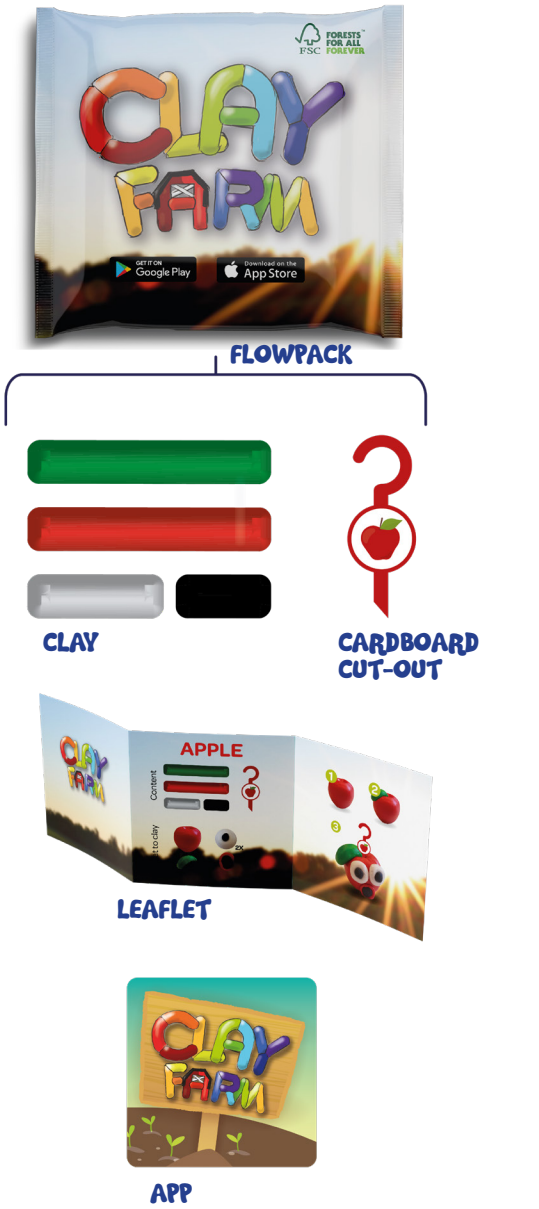


Figure 62: Content Clay Farm

Figure 63: Collection Clay Farm

4.5.2 How does it work?

When you receive a flowpack in the supermarket you can use your leaflet to clay the character. If done, the cardboard cut-out functions as a sign label and placing tool (figure 64 and 65). In other words, you need to place the product/animal you just clayed into its real context. This is how an apple belongs in a tree, a carrot in fertile soil, a tuna in the water and a pig on a muddy spot.

Figure 64: Clay Farm apple in the tree

Figure 65: Clay Farm carrot in the soil

The play in the app starts if you have finished the placing. The app is a farming game, like Hay Day, in which you have to take care of your crops and animals. (figure 66)

Figure 66: Hay Day (Google Play, 2019)

The clayed character needs to be activated in the app. After a while, the product or animal needs some attention in the form of watering, feeding, harvesting, etc.
In your home-screen you will be notified if you need to take a certain action.
Just like a real farmer you need to go to your products and take care of them. This is done by scanning the icon of the cardboard cut-out. (figure 67 and 68)

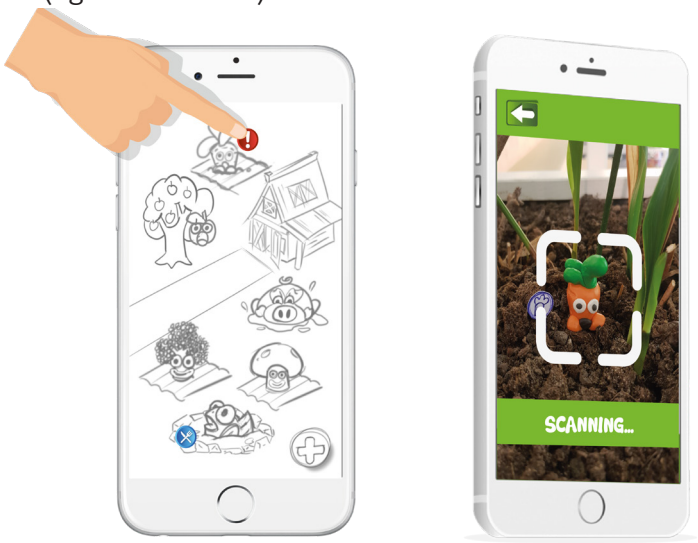


Figure 67: Clay Farm app

Figure 68: Clay Farm app prototype

With the use of augmented reality you can water your vegetables and feed your animals.
But sometimes a farmer has to do his job, even though he does not feel like working. If you have placed your pig outdoors and it is raining, you still have to go there and give food to keep him happy.

The goal of the app is to create a sense of appreciation towards farmers and the attention they put into the food you are eating every day.

4.6 DECISION MAKING

From the 4 concepts one is chosen to continue with the conceptualization. This is done by comparing against one another on the criteria formed in the final section of part 3. See 3.6.5 *Design Direction - Concept Criteria* for further elucidation on the topics.
The Harris profile for each concept is given in table 2. Below some descriptions to outstanding criteria are given and a final decision is made.

4.6.1 Little Nutritions

As seen in the Harris profile this concept scores the best. In comparison to other concepts, Little Nutritions does well in playing together ánd solo. Also this concept is most challenging in bringing a new unknown world phenomena to children. At this moment, nutritions and what they mean for the body is a hidden thing that is somewhere invisible in foods.
Sadism is in the concept but not brought to the surface. By battling against each other and by seeing your avatar getting sick the sense of sadism over the avatar is implemented.

The last element worth highlighting is the only minus it gets. For an interesting stacking game you need to have collected some different characters. It will be hard to enable this type of play when only one nutrient is received.

4.6.2 Food World

As stated before this concept is somewhat familiar to Little Nutritions. This could be the reason that this Harris profile is somewhat equal too. The biggest difference lies upon bringing the unknown subject to children. Nowadays education is given on the subject on healthy vs unhealthy foods. Meaning this is a less unknown real world phenomena.
Also, it scores less on the two solo play criteria. This because the play is less extensive. Stacking upwards is the main goal in Food World, while Little Nutritions offers a more elaborated stacking principle.

4.6.3 Little Restaurant

The biggest disadvantage of this concept is that all the play happens with the app. If the child has no access to a touchscreen device they are not able to interact with this concept at all. Maybe fantasy play can exist in the form of imaginary cooking play, but a lot of alternatives are already on the market for this.
Nevertheless, Little Restaurant scores high on the topic of tangible integrated play. It offers an innovative interplay between the app and the cardboard ingredients on your table.

4.6.4 Clay Farm

Clay Farm is a concept that is mostly played all alone. Nevertheless, it does a great job in the ability for children to create something. Clay is a great way of self-expression.
In terms of bringing a new world phenomena, it does a good job, but does not offer a new experience as described in *2.3.4 Loyalty Campaigns - Little garden*. UNGA is already teaching the farming life and origins of products in a more engaging way, by using the seedling pots. Therefore in terms of this project, looking for chances of new digital interactions to educate on real world subjects, Little Garden does a better non-digital job. It is not all bad though.
Clay Farm has a high level of play when just one flowpack is received. Collect-ability is high, since the more you collect the more expanded your farm will be.

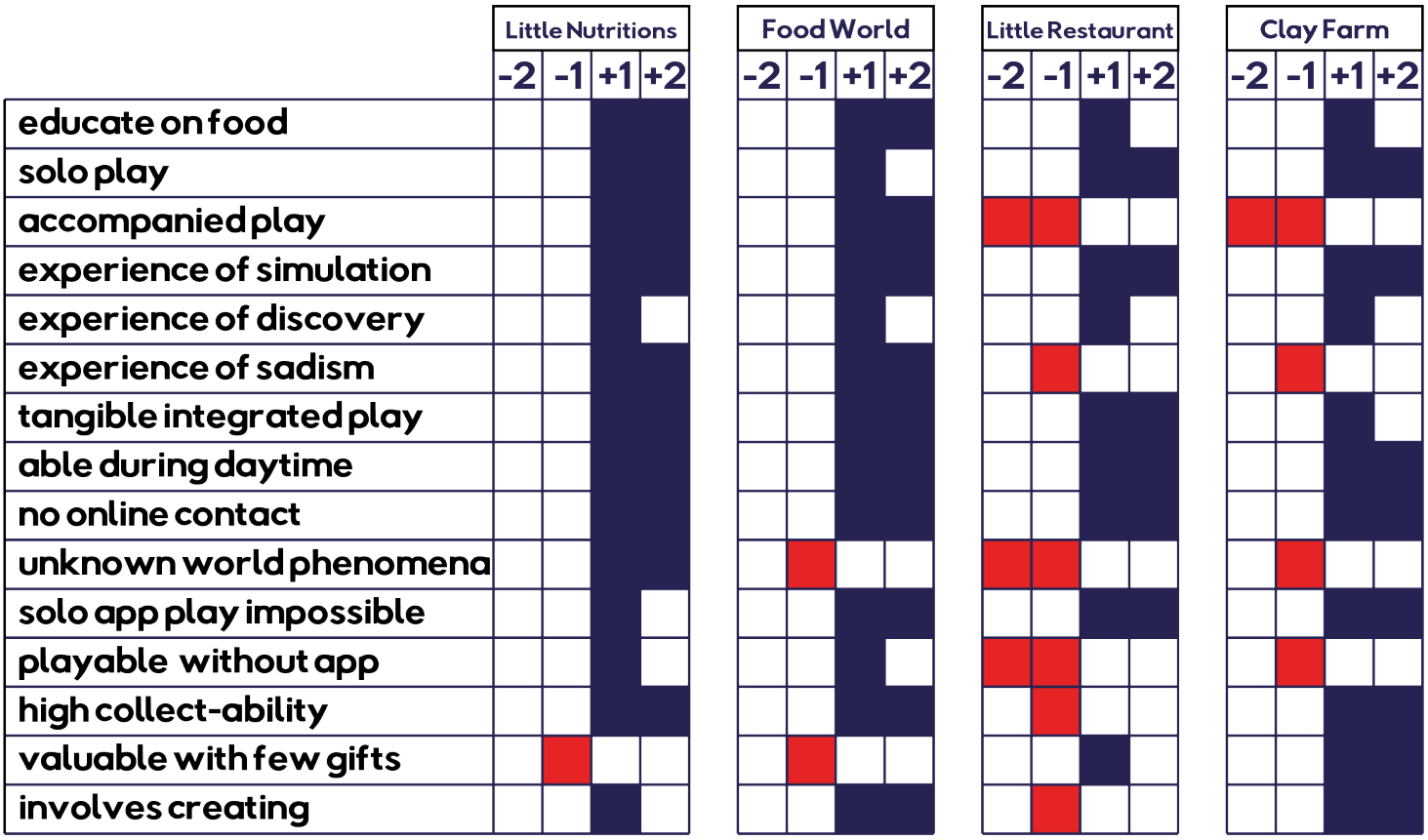
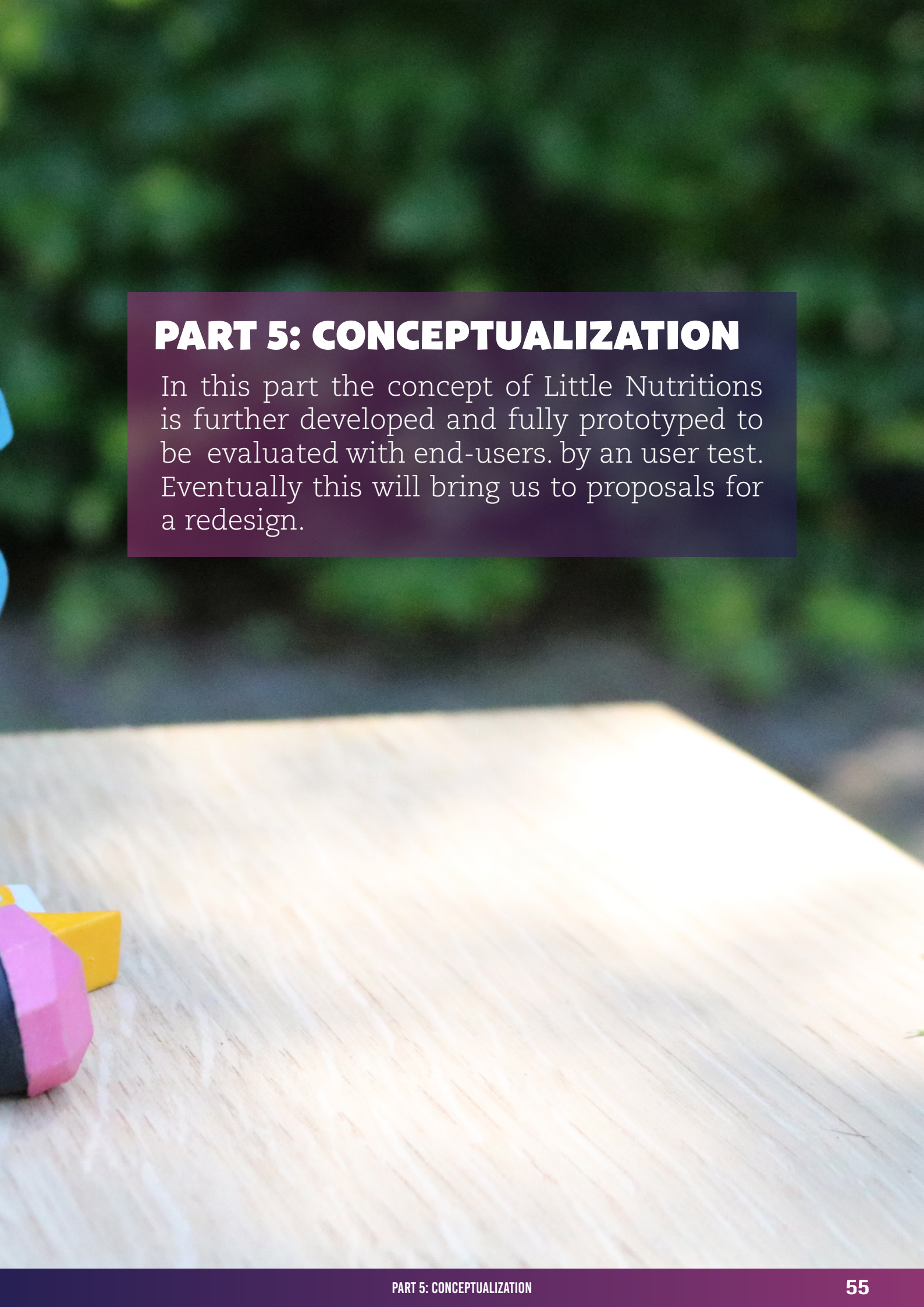


Table 2: Harris profiles

4.6.5 Verdict

It may be clear that Little Nutritions is a interesting concept to further elaborate on. The exact flow of play is designed in the next part: Conceptualization.


BOUWSTENEN
van je
LICHAAM
speel!
1 vs 1
collectie



PART 5: CONCEPTUALIZATION

In this part the concept of Little Nutritions is further developed and fully prototyped to be evaluated with end-users. by an user test. Eventually this will bring us to proposals for a redesign.

5.1 FIRST DETAILING

As a starter to this part, the concept is visualised in more detail to make it discussable during an internal meeting at UNGA. Now this concept is outlined and design choices within the concept are highlighted. These choices are originated from the criteria as they can be found in 3.6.5 *Design Direction – Concept Criteria*. The criteria are indicated in purple for direct reference.

Note: The name of Little Nutritions is from here on changed to Little Nutrients.

5.1.1 Goal

The goal of Little Nutrients is to interactively educate children on the topic of nutrients and the effects of them on their body. Little Nutrients makes a vague concept as the microscopic world of nutritional values tangible and concrete for children.
This includes the criteria of:
- educate on food
- unknown world phenomena

5.1.2 Content

When spending an x amount of money at the supermarket you receive one flow pack including a 3D nutrient character made out of plant based plastic and two cardboard cards. One card is about the nutrient while the other one shows a food product. Also an application can be downloaded for free.

Figure 69: Content Little Nutrients

5.1.3 Characters

The characters stand for important nutrients to the body. The style for these characters is abstract, but with reference to the nutrient and its role within ones body. See the mood-board below, which was shared with UNGAs design team as a reference.

Figure 70: Mood-board characters

Prior to the meeting three different nutrient characters were designed and rapidly prototyped with clay. From left to right in figure 71 these are phosphorus, calcium and magnesium. Phosphorus, which is amongst other things responsible for firm teeth, was designed as a big teeth with great smile. Calcium, which makes strong bones, is designed in the shape of a bone. And finally magnesium is responsible for a lot of different chemical reactions in the body and therefore a stressed guy. In total 12 characters can be collected.
- high collect-ability

Figure 71: Clayed characters

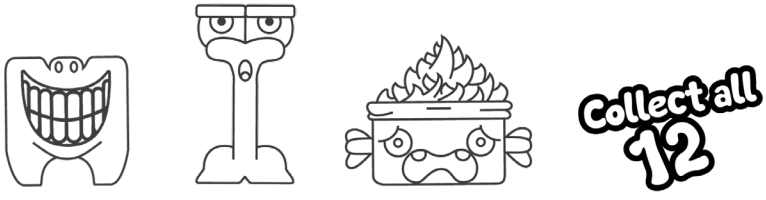


Figure 72: Character sketches

5.1.4 Playing styles

In total there are 4 different playing styles with Little Nutrients. Digital and non-digital and played by one or more players.

One player non-digital

With the non-digital one player variant the kid gathers all the characters it has collected. Then the nutrient description cards are piled up on a deck. When drawing a card, the kid needs to stack the corresponding character on top of the previous one.

- *playable without app*
- *involves creating*

Figure 73: Playing style 1

More players non-digital

The second variant of play uses the product card. On this card a product is shown with underneath a combination of nutrients that this particular product contains. The players collect their characters and one of them draws a card. The combination on it needs to be build as fast as possible. The first player succeeding receives the card.

- *playable without app*
- *accompanied play*

Figure 74: Playing style 2

One player digital

The app of Little Nutrients brings the unknown world of the characters and the effects of them on your body alive. With the app, the player finds himself in the world inside the body where the nutrients are doing their job. In figure 75 below the mood-board of the app is given.

- *unknown world phenomena*

Figure 75: Mood-board app

In the home-screen you find an anatomical visualization of a person with levels pinpointing to different locations in the body (figure 76). These locations are based on the nutrients and the place where it does their job. Think of phosphorus which makes teeth strong and therefore has its location as the mouth. When the real-life characters are collected the level is unlocked.

- *experience of discovery*
- *high collect-ability*

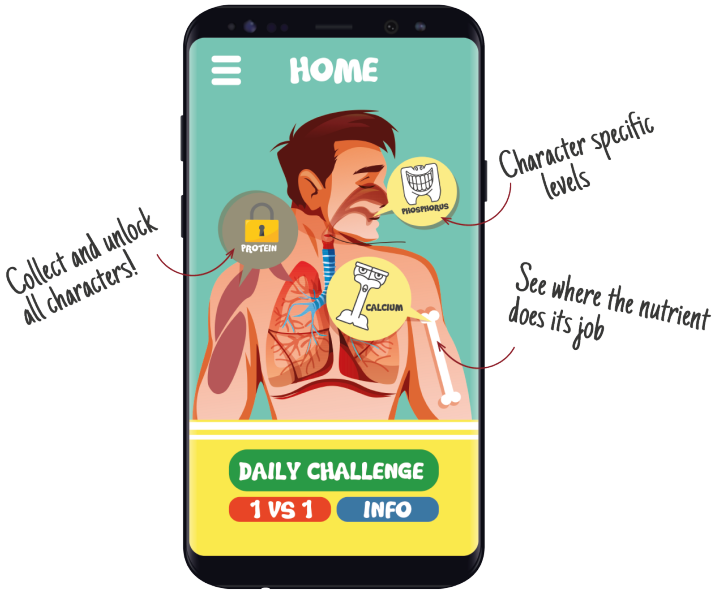


Figure 76: Home-screen app

By starting a level, the app will deep dive into place in the body where the nutrient is located. The level below (figure 77) is an example of the phosphorus game. An animation in the upper half of the screen shows the characters within their working context. The lower half generates different combinations of nutrients that the player needs to build*. With only two characters collected, combinations can already be generated by the app.
- valuable with few gifts
- tangible integrated play

By making the stack within the time given no consequences are there. But when the player do not succeed within the timespan negative consequences will be shown. As seen in image 77, a tooth will get loose and fall out.
- experience of sadism
- experience of simulation

Figure 77: Phosphorus game

*Note: Within these visualisations of the app and with later prototypes verification of the pile-combination is done by pressing the button. In the eventual app this is automatically done by object recognition as stated in 4.2.2 *Little Nutritions – How does it work?*

Each nutrient have their own context in the app. As a second example the busy guy called magnesium is located in the control centre of the body regulating all sorts of chemical reactions. Not succeeding the level results in him getting more and more stressed (figure 78).

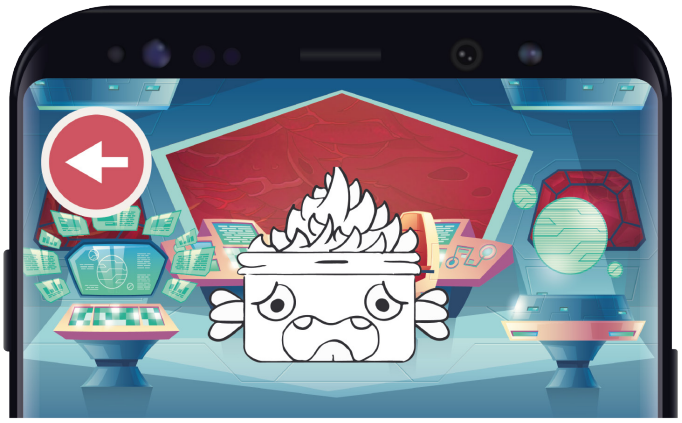


Figure 78: Magnesium working context

More players digital

The last play style is with more than one player and with the app. The smartphone needs to be placed between the players. The app generates random combinations of nutrients which has to be built as fast as possible. The first player done receives points for the stacking.
- accompanied play
- tangible integrated play

This play variant can only be done locally, which means that it is played on one device. The reason for this is to make play possible without the use of an online environment, which is highly prioritised by parents.
- no online contact

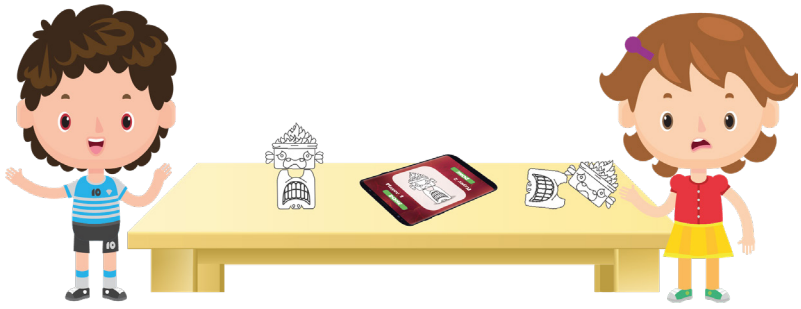


Figure 79: Playing style 4

A fifth play variant, which is solo play on the app without physical character, is left out. This to further support the design goal of tactilization of digital entertainment.
- solo app play impossible

5.1.5 UNGA's feedback

The current concept is presented internally to UNGA. Some points within the concept needs alteration and redesigning.

To improve collect-ability, a series of 20 characters is preferred. For this the 20 nutrients need to be specified. When specified, the characters will be further designed in collaboration with the design team.
- high collect-ability

The storytelling aspect of the nutrients and its effects needs further detailing to make it more understandable and coherent. Simulation can play a bigger role on the foreground of the app to therefore further suppress the educational value.
- educate on food
- unknown world phenomena
- experience of simulation

Regarding the cost price, the two cards are removed. However, as a formulated criterion, the concept must be playable without the use of an app. UNGA indicates that no cards will result in free play, which still gives sufficient value as a playing style for one and more players. This also means that the information about nutrient characters must be integrated into the app.
- playable without app

Finally,the age range needs alteration. As focussed in the research the age range was set from 8 till 12 years. Since UNGA is mainly aiming from 6 till 12 these earlier years will be taken into account too. Within these first years, as explained in the first part of this thesis, it is not common for them to have a phone. Therefore this play is mainly focused on the game play without the app.

5.2 USER TEST

As an interaction designer it is important to evaluate whether the intentions you make as a designer arrive at the user. Therefore, an important part of the project is to user test the concept with end-users. Redesigns led from this and improvements can then be made.

5.2.1 Objective

The concept was built out of the criteria formed as a result of the research phase. The design goal, the overarching aim of the criteria, is stated as follows:

> *The tactilization and experience of digital entertainment. In order to bring a connection between digital and "real world" concepts and make them accessible to children.*

Thinking about these criteria is one, but whether the users really do experience these values and if the concept is fun to play with is a second thing. That is why the concept is fully user tested to evaluate everything that was designed with certain intentions. Problems which were occurring finally were transformed into redesigns as improvements.

The design challenge which was addressed was therefore stated as follows:

> *How can problems occurring in the concept be improved and opportunities be utilized to further optimize the concept in relation to the criteria formed?*

This design challenge was reformulated in the following research question for the user test:

> *What problems and opportunities, in relation to the formulated criteria, arise when the concept is used?*

5.2.2 Method

As mentioned before, the goal of the user test was to validate the design decisions against the determined criteria. So these design decisions needed to be presented to the end users and must be able to be experienced by them while playing.
Therefore two important assets to the test were the character prototypes and the digital app prototype, enabling all the different playing styles. With the feedback from UNGA and to make testing possible, these two elements were redesigned.

Nutrient categories

Due to the complexity of nutrients and their effects on the body, as well as the increase from 12 to a total of 20 characters, it was not possible to refer to places in the body in an understandable manner. The nutrients will now not directly pinpoint to an effect, but were categorized by umbrella groups of tasks to the body.
Research is done into the different nutrients and the effects of them on the body. Resulting in the categories of *Defence, Water, Brains, Energy* and *Power*.
The full list of references can be found in the supplement within the reference list: *7.2 References on nutrients*.

Defence stands for nutrients that fight against viruses to prevent you from getting sick. They are brave and dare to fight against intruders in the body.
Water stands for the level of hydration you have in your body. It keeps the fluids in the right balance.

The *brain* category includes the smartest ones. They are responsible for a well-functioning brain and boost memory functions.
Nutrients that fall in the *energy* category are the engines of your body. They take care of energy production and assure you will have the stamina to full-fill an efficient day.
Finally there is the category of *power*, also known as the Arnold Schwarzeneggers of the body. They make up your muscles and keep your bones strong. Without them you will collapse like a bag of pudding.
Since not all nutrients could be divided with a strict division, some nutrients have multiple powers.

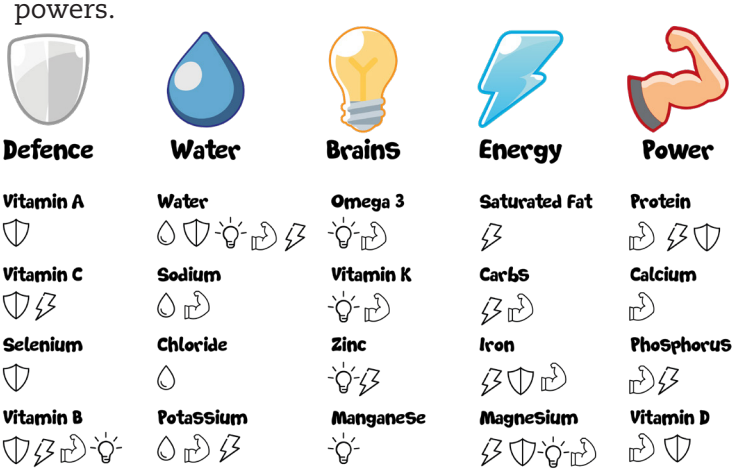


Figure 80: Nutrient category overview

Character prototyping

First of all, the characters must be stackable to make a good gameplay possible. The forms were first made out of sharp lines. By using a grid (see figure 81), well-fitting structure were made. Within this grid there was room for the design of the character.

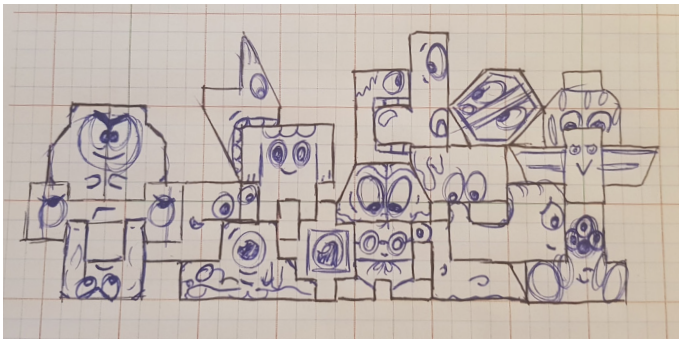


Figure 81: 20 character forms in grid

These preliminary forms were cut out and shaped with foam to test the stack-ability.

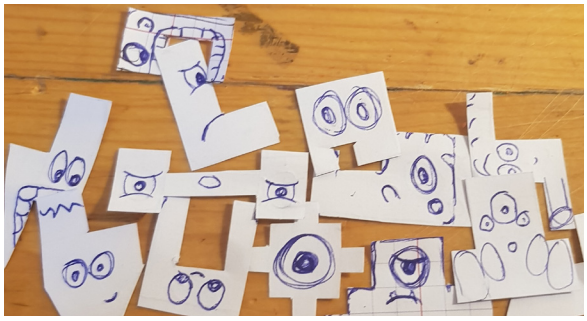


Figure 82: Paper prototype

Figure 83: 20 character in foam

Together with UNGA's design team these structured shapes of characters resulted into first sketches that can be found below. (figure 84)

Figure 84: Character sketches

The characters were drawn in 3D (figure 85). The 3D models were 3D printed and later used in the user test (figure 86). Important for these 3D models was that there shoud be a balance between stackability (straight lines) and free character forms (organic lines).

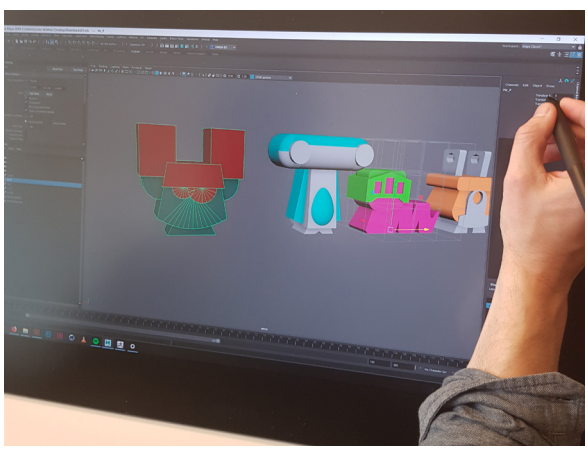


Figure 85: Drawing the 3D's

Figure 86: 3D printed characters

In total 11 characters were 3D printed and painted. This number of characters was sufficient to perform the user test. With 11 characters two players would be able to play the multiplayer variant.
The first 6 characters were designed with more eye for detail. Which means that they have been given names and the nutritional value is linked to them. The other 5 served a less prominent role during the test.
Figure 87 shows the characters, together with their names, category and the nutrients they represents:

Figure 87: Character prototypes

App prototyping

Also an interactive prototype of the app was made. A lot of changes have been made in comparison to the previous design of the application. This to improve on the different criteria enumerated in section 3.6.5 *Design Direction - Concept Criteria*. For testing purposes, the application was designed in Dutch.

Name

The name and logo were updated. The name in Dutch was: “Bouwstenen van je lichaam”, which is translated as “Body Building Blocks”. This name was chosen to support the educational value of the characters, which is in fact building blocks for your body, and refer to the game play itself, namely stacking.

- educate on food
- unknown world phenomena

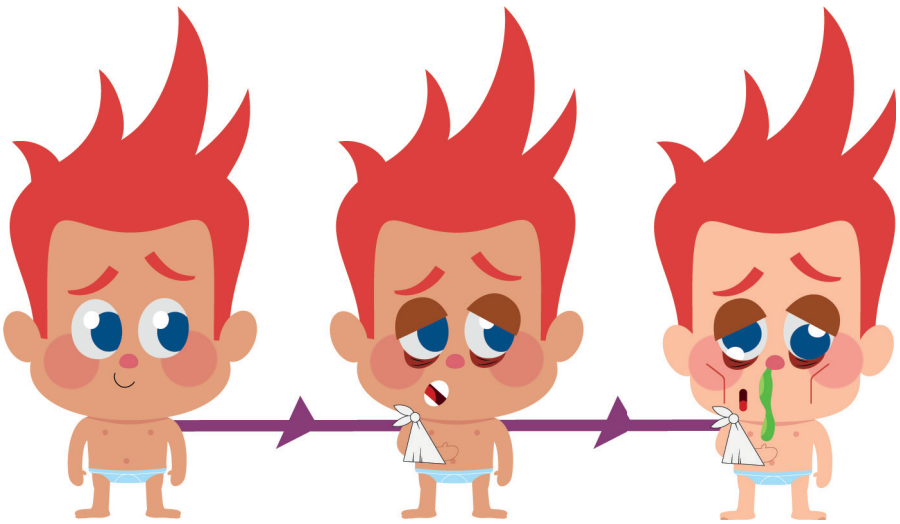
Multiplayer

In 1 vs 1 two players battled and see who was the best. The app randomly gave combinations to stack to both players at the same time from the combined pool of collected characters. In this way players could combine all the characters they have collected together.
The player who finished first hits the ‘done’ button and received one star.

- accompanied play

When receiving a star, your opponents character got more and more unhealthy. As you build faster, you would eat more nutrients and your opponent would eat less. Resulting in them not receiving the nutrients which are necessary to stay healthy. This to even more support the experience of sadism and simulation within the game.

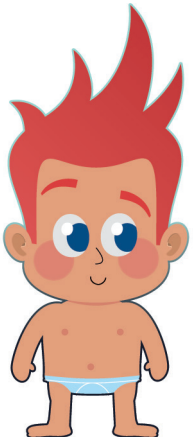
- experience of sadism
- experience of simulation



Avatar

An avatar pops up when the one player version of the app was opened. It showed a status concerning the 5 categories as discussed before. The avatar should be fully customizable, but for purpose of the test this was one standard character. To fit other concepts of UNGA, this character was the same as used in a different product called “Expedition Human Body.”.

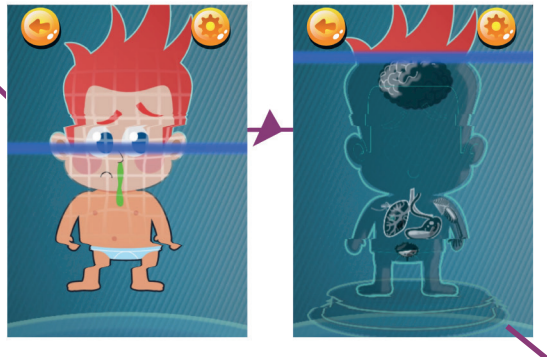
- experience of simulation
- experience of sadism



Status

Underneath the avatar, the 5 categories and its status were shown. In the real app, errors occur at certain moments during the day, alerting you have to play a game. In this case it concerned the defence category. This error was also reflected in the avatar visualization by a snotty nose. The player needed to take care of their avatar’s stats to bring him back to health again.

- experience of simulation



If the level was selected, an animation started playing. It showed a transition of a scan resulting in an anatomical representation of your avatar. In this way you can deep dive into its body.

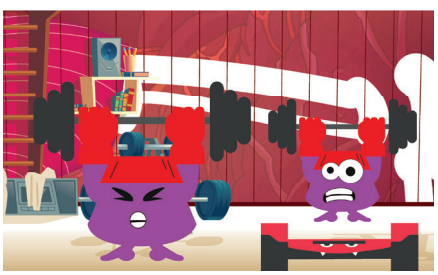
Level selection

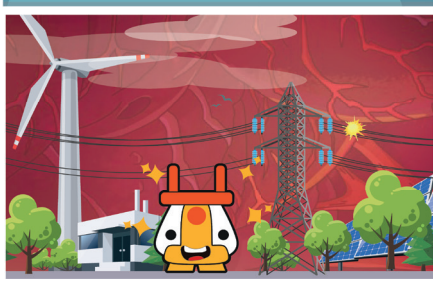
After the scanning animation, all the levels were shown. Communication could be made with different locations inside the body where the characters/nutrients are working. Animations were shown to playfully show what they ere doing in your body. In this way it explained about the effects of nutrients on ones body. As can be seen in the defence level in the phone on the right, viruses infiltrated in the body causing trouble for your health.

- unknown world phenomena
- educate on food

Some of the locations were locked but would be unlocked if enough characters are collected.

- experience of discovery





Gameplay

The following screen was shown when the level was opened. As can be seen the screen was divided into two parts. The top part was your avatar at the dining table and the lower part of the screen was the working location of the nutrients With the use of an animation a (food) product was thrown on the plate and a combination of a stack was showed inside of it. The player need to copy this combination as fast as possible with the real collected 3D characters. An animation of the avatar eating the product started shortly after the player confirmed the task had been completed by hitting the 'done' button. A second animation showed the nutrients fall into the stomach (the lower part of the screen) and they started doing their job for the body, namely fighting the viruses.

- solo play
- educate on food

Scoring

The more successful stacks you made within the given time-frame of 3 minutes, the more stars you would gain as a final score.

Warning

Due to testing purposes not all screens of the prototype were made. For instance there was only one playable level in the one player variant. If a dead end was reached in the prototype the lower message would pop-up to inform the participant.

Collection

Clicking on the character led to more information about the nutrient. Not collected character were hidden.

- educate on food

Collection

Finally there was a screen in which the collection could be kept up. All the 20 characters could be found here sorted by their category.

- high collect-ability

Adding

Hitting the plus opened up a frame and automatically started the camera. By pressing 'ok' the new character was added to your collection. Collecting certain characters may led to unlocking different areas of the app such as new levels.

- experience of discovery

The app was made into a fully workable prototype including all the animations needed. The app prototype was made with the use of ProtoPie, a new player in the field of app prototyping.With the QR underneath, the prototype can be accessed. (figure 88)

Note: The app will open up in your browser. The browser will not be able to play the mp4 animations and sounds. The app may not always immediately respond to a touch trigger. For the best result, download the ProtoPie Player App. Loading may take a while.

BIT.DO/BOUWSTENEN

Figure 88: App prototype QR

Setup materials

All the materials used during the user test were:

- *11x 3D characters*
- *Laptop with ProtoPie*
- *Usb cable*
- *Smartphone with ProtoPie prototype*
- *Recording device*
- *User test outlines (protocol)*
- *Informed consent form*
- *Notebook*
- *Pen*
- *Camera*

Participants

In total 2 user test sessions were conducted with in total 6 participants. The participants were selected by a variety of different ages. In that way the usage was be evaluated on the whole area of its intended age range (6 till 12 years). The parents of the participants were present at the time of testing.

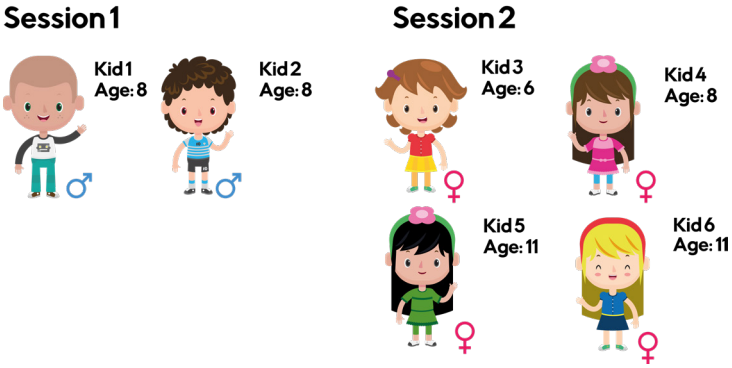


Figure 89: Participants user test

Location

The sessions were held at the participants' home. This because this is the place where end useeventually takes place.

Data collection

Data was collected by recording voices, observations and taking photographs to support these observations for later reference.
An informed consent form for the parents of the participants enlighten them that photos containing children's faces would be blurred. Neither video footage was taken and used.

Protocol

The user test was conducted by a guided gameplay, addressing all the different elements that were prototyped. The children were given 6 tasks to complete regarding the characters and the app. These tasks were:

- *Ordering the characters to their liking*
- *Organising all the characters within the 5 categories*
- *Looking up character and nutrient names of the collected characters*
- *Adding a new character to the collection*
- *Soloplay the level of defence*
- *Play a game of 1 vs 1*

The elaborated script of the user test protocol can be found in *Appendix 7 : User test script.*
What should be noted is that the non-app playstyle of the game was not included within this script.
To simulate the characteristic of freeplay, which was the non-app style should be like, this part of the test consisted of natural observation instead of a guided gameplay. The goal for this was to see whether freeplay was stimulated by the stand-alone characters and what this play consisted of.
In case the participants did not commit to any non-app play, they were directed to playing without the application.

After this part of the user test, a retrospective interview regarding the play and experience was held with both the children and the parents. For the exact script of these questions, reference is also made to *Appendix 7: User test script.*

Analysis

The gathered data of the user test was processed with the use of a thematic analysis procedure. The themes for this analysis were the criteria formulated as stated before. As the main research question suggests, problems and opportunities within the criteria themes were explored. Therefore it was an explorative analysis with a focus in the different themes.

5.2.3 Results

The data is shown divided per criteria topic. It may be noticed that some of the criteria were given facts within the concept and therefore did not need any further evaluation.

The concept should…

… educate on the subject of food.

The first criteria that is discussed on data is the educational value of the concept in relation to food.

Preliminary to the test the participating children were asked about their current knowledge on nutrients. As a result children showed they have basic knowledge on that nutrients are connected to food and health.

> Facilitator: **Do you know what nutrients are?**
> Kid 2: **Yes, because that is food.**

More specifically the children were familiar with the vitamin nutrients since they gave them as examples of nutrients.

> Kid 6: **That could be vitamin D.**
>
> Kid 4: **Vitamin C, Vitamin A, Vitamin B.**

But when they were asked to name more nutrients then these vitamins, they were unable to answer this.

The last question asked before the playing commenced, was about the effect of nutrients on one's body. Kid 6 was the only participant mentioning one of the 5 category, which was the need for energy:

> Kid 6: **That you don't get tired.**

At the end of the test, in the interview, the children were asked a second time about the effects of nutrients on the body by naming the 5 categories. Kid 2 and Kid 6 were able to name them all, Kid 5 missed one of them. Kid 1 was not asked this question, since he would have repeated Kid 2's answers and Kid 3 and Kid 4 missed the last part of the interview due to bedtime. More about this in the limitation section.

> Kid 2: **Good protection, energy, water, strength and brain.**

Of course this only showed an improvement of short-term memory. Long-term knowledge about nutrients cannot be tested within this user test of one time play, but a first incentive to learning is always made by increased short-term effects.

However the learnings about effects increased, knowledge about nutrient specific information could possibly not be enlarged.

When adding Mr. P (protein) to the collection, a popups showed more information about the nutrient in particular. Observations showed that this text is not read by any of the kids. The mother of Kid 2 states the following:

> Mother 1: **They just got reading comprehension at school. Reading is a difficult thing.**

Nevertheless she also stated:

> Mother 1: **But it is not bad that it is difficult. If it appeals to them, they will read and learn about it.**

She proposed a solution for this by adding video clips in the app:

> Mother 1: **And maybe it can be read aloud. If you click on the collection you will get: 'Hello, I am calcium and I am etc etc.'**

… be able to be played alone.

This criteria was a given fact, since the app had the ability to be used by one player.

Figure 90: Kid 4 playing solo

… support playing together.

Just like playing alone, this criteria was also a given fact. The 1 vs 1 play style made it possible that children played against each other.

Apart from this play style, the first session with Kid 1 and Kid 2 showed that the solo play style supported a different (cooperative) type of playing together. The level was played again but now Kid 1 suggests:

> Kid 1: **What if we work together?**
> Kid 2: **If he starts with one and then me?**
> Kid 1: **Divide work, then it goes much faster.**

The participants divided their workload to work together for a better joint result.

> Kid 2: **We got one star!**
> Kid 1: **Pretty good!**

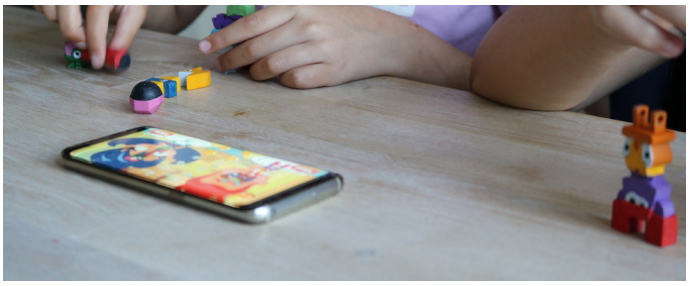


Figure 91: Kid 5 and Kid 6 playing 1 vs 1

… contains a part of simulation during the play.
When opening the app, the avatar showed it is sick and one of the 5 categories (defence) showed an error. This visualisation was intended to give the user an experience of simulation. But was this really experienced that way? Children did mention that, after succeeding the level of defence, they did not see any difference with this visualisation of the avatar being healthy again.

> Kid 2: **It is still not quite right!** *Looks at the avatar*
> Facilitator: **No, with the final app you will see that he is healthy again and that the booger is gone.**

The result of completing the level, so bringing the avatar back to health, was not designed within the prototype that was used. Although it was not prototyped, kids showed that they did expect this change to happen.
The prototype not matching the users expectations demonstrates the user see it as missing element. Therefore the part of simulation was experienced as the goal of the game for the one player variant. The goal was different for the 1 vs 1 game, explained later.

… involves the exploration and discovery of new elements.
Children showed a high interest in unlocking different elements of the game. Both observations and quotes showed that expanding the game experience by unlocking new levels drove the attention.
Kid 1 and Kid 6 tried to add the different characters in the collection, although this was not possible due to prototype limitations.

> Kid 2: **Ah I get it! You actually have to collect those and then you are able to play it. So you just have to collect as many characters as possible! Come on and do alot of groceries, I thinks this is really cool!**

> Kid 5: **That you have made 5 categories of nutrients and that you have to unlock those.**

The parent of the 2nd session indicated that unlockables could extent campaign sympathy.

> Dad 1: **Then the game remains interesting.**

… involves experimentation without social consequences.
When opening the app, the avatar showed a booger. This resulted in the children laughing. As outlined at the simulation criteria, bringing your own avatar back to health was seen as the goal of the game. In contrast to that, the goal of the 1 vs 1 game was reversed. Kid 5 highlighted, as one of the main elements of fun in the game, making someone sick might sound obscure, yet it was entertaining.

> K5: **Maybe it sounds a bit weird… That you enjoy making the other person sick.**

Therefore the element of sadism was experienced positively.

… create play which is mostly focussed on a central tangible/touchable object integrated with digital entertainment.
Within the concept there was a combination of tangible play with digital support. The intention for this criteria was that there should be a bridge between the digital entertainment and tangible play. During the test, parents assess this element of the concept as something innovative. This way of playing, even though is did involve an app, was not considered as digital gaming anymore.

> Mother 1: **Now they are still on the screen, but they have to think about how to physically build something. That is a completely different way of 'gaming'.**

> Mother 1: **I think this will work. The combination of normal and smartphone play.**
>
> Kid 2: **Yes!**
>
> Mother 1: **So I think it's great that it apparently can go hand in hand.**

> Mother 1: **They don't have to look at the screen constantly, they are actually playing next to the screen.**

> Dad 1: **It's something different than what is already out there.**

… be able to be played daytime.
The concept was independent from the fact whether it was played during daytime or night.

… does not involve any online contact with strangers.
This criteria was a given fact within the concept and therefore needed no further evaluation. No online connection was made within the app.

… let children experience an unknown real world phenomena.
This criteria was connected to the criteria of educational value which was the first to be discussed. The unknown world phenomena of small nutrients working inside of your body was intended to be addressed with this concept. This unknown world phenomena, food turning into workers, was understood by the children, however they needed some time to understand it. After the defence level was played a couple of time Kid 2 said:

> Kid 2: **Do you have to make so many that the bacteria disappear?**

This showed this was not clear from the beginning on.
A second quote that indicated it was not clear the nutrients were brought into the body to do their job was the following quote:

> Kid 2: **Why is he eating it?**
> Mother 1: **He wants to get healthy!**

Dad 1 stated that the concept could become more immersive too to make more like a travel through the body.

> Dad 1: **Make it bigger. For example a roller coaster ride through the veins.**

… not be able to be played without a physically present object.
This criteria was a given fact. No game elements could be played without the use of the physically present characters.

… can be played without the use of a mobile device.
At the commencement of the test, while introducing the concept as a whole, the characters were brought on the table by the facilitator.
Instantly, all of the six children turned their attention to the 3D characters. They examined the characters and started putting them on top of each other. Since no instructions were given to the children, this observation was seen as a form of free play which was initiated by the standalone characters.
A second moment in the test where free play initiated, without the giving restrictions to do so, was when the obligatory tasks were completed. Four out of the six children continued playing with the characters. This play consisted of stacking characters on top of each other and building as high as possible. The other two children, which were Kid 3 and Kid 4, were not able to commence free play in this final phase of the test, due to their obligation of bedtime.
After the app level was completed, and they finished playing it a couple of more time, the free play started to arise. The app was an incentive to start free play with the physically tangible objects.

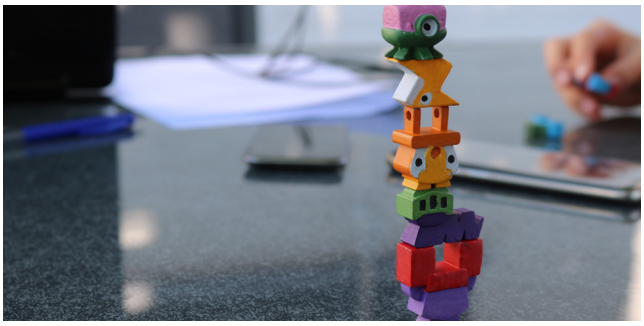


Figure 92: Kid 1 freeplay

… has a high level of collect-ability
The experience of discovery enhances the level of collect-ability. The test showed that the driver to unlock elements in the app maked that more characters should be collected.

> Kid 2: **Ah I get it! You actually have to collect those and then you are able to play it. So you just have to collect as many characters as possible! Come on and do alot of groceries, I thinks this is really cool!**

> Mother 1: **Collecting is always good.**

Characters that had familiar and well-known characteristics were considered to be likened more than the ones that were more ambiguous in their meaning. Instant recognitions led to a higher likening. An example of this was the dumb-bell character. Chosen to be the favourite of both Kid 2 and 4, because they interpreted it as a hoverboard which they liked. (figure 93)

Figure 93: A kid's association

… is valuable when only a few gifts are received by the user.

To be able to play the stacking game, the child must have collected several characters. Dad 1 declared that it might be impossible for some children to play a game with just two characters. However, this did increase the need to collect more characters and thus make the app playable.

> Dad 1: **If someone only has one character in what way is he or she triggered via the app to get more? If you integrate different levels for two, eight and build-up that way, you will have an extra motivation.**

… involves creating something.

Both parents argued that this concept was broad in its content. The combination of app use with learning and the addition of spatial awareness made that was a comprehensive whole. The spatial awareness in particular was named by a parent as learning purpose of the game.

> Mother 1: **It's educational. They can play, collect and gain spatial awareness.**

Apart from the data that parents indicate it promotes spatial awareness, creating structures made children experience proudness and competence. As outlined before, the 4 children started to commit to free play after the levels in the app were completed. This consisted of stacking as high as possible. When a new height was reached by the child this resulted in a cheer of pride. Also they wanted to capture this success and asked to take a photo of the pile. (figure 95)

> Kid 2: **Take a picture! Take a picture!**

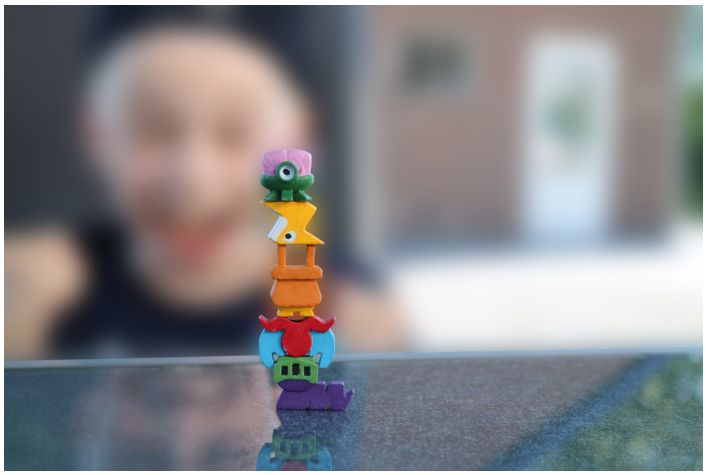


Figure 95: Cheers of pride

Yet within the app some of the stacking combinations were difficult for children to complete. Especially the given combination below was skipped by three out of the six children, namely Kid 2, 3, 4, 5, after failing several time the skip button was pressed to prevent a bigger loss of time. Kid 2, his mother and the father at the second session proposed to add gradations of difficulty to make it challenging for all ages.

Figure 96: Difficult stacking combination

> Kid 1: **Some combinations were a bit difficult.**
> Mother 1: **Maybe different levels of difficulty?**
> Kid 2: **Yes. So you can play easy, intermediate and advanced levels.**

other results

The children were able to group the majority of the nutrients within their right category. During both sessions the children correctly grouped 8 out of 11 characters. Thinking out loud showed the distribution was mainly based on colours.

Figure 94: Categorizing the characters during session 1

5.2.4 Limitations

To be able to critically examine the conclusions of the user test evaluation, the limitations of the study are now given.

Sample size

This user test was a first explorative research focussed on the different criteria formed for the concept. Due to the purpose of this research, only two sessions were held with six participants in total. This amount of participants was sufficient enough for this stage of the project, since it quickly gave a clear overview of opportunities and pitfalls in the concept. Nevertheless, the sample size should be increased when the concept becomes more defined and smaller details of the product needs analysis. For this reason it was not possible to draw strict conclusions about specific components and micro-interactions in the design. But it could certainly offer redesign iterations about the main lines of the concept.

Interview
During the last part of the second session Kid 3 and 4 were obligated to bedtime. This resulted in the earlier completion of the test for them. Unfortunately, not much was known about the opinion of the only six-year user experience participant, except for the superficial opinion that the concept was fun to play with.

Group dynamics
Since the two sessions were held with more children at the same time, the evaluation on the topic of knowledge may not be as watertight as when they were interviewed independently. When together, they complemented each other so it was more about combined knowledge.

5.2.5 Conclusions
Now the conclusions of the results are outlined by answering the research question:

What problems and opportunities, in relation to the formulated criteria, arise when the concept is used?

Difficulty
Some of the stacking combinations were too difficult for children to complete. Nevertheless, it is not an option to just make everything easier for them. Skills differ from child to child and succeeding a more difficult stacking combination leads to proudness. Children liked to had pictures taken of their creations. Also the user group is quite diverse in terms of age range, thus their fine motor skills. There is an opportunity to support the proudness which occurs, but the problem of difficulty needs to be addressed.

Spatial awareness
The spatial awareness learning in the concept can be further put to the test. Parents like this aspect of the game

Unlockables
One of the mostly enjoyed features in the app is the ability to unlock levels and characters. The collect-ability can further be increased by increasing the amount of unlockables and therefore the experience of discovery.

Characters
The children mostly succeed in assigning the characters to their category. This division is mainly based on matching colours within the same group. Knowing this, the categories can be assigned stricter colours to further promote coherence.
Children mostly liked the characters which were made out of familiar properties. The more ambiguous characters were picked less as favourites.

Nutrient information
Additional information about the nutrients is not read by the children at all. This leads to no improvement on nutrient-specific knowledge.

Inner body
At first instance it is not clear to the user what the app is showing. The step from having a stack of nutrients on your plate and seeing them working in your body is not suppressed clearly enough. The scanning visualisation does not provoke the feeling of traveling through the body.

5.2.6 Redesign suggestions
The research question was formed from the design challenge which is:

How can problems occurring in the concept be improved and opportunities be utilized to further optimize the concept in relation to the criteria formed?

These redesign suggestions will now be drawn from the conclusions of the user test.

Levels of difficulty
In the redesign levels of difficulty will be integrated so that it will meet the different levels of competence. It will still enable children's proudness to occur according their own level.

Challenges
Challenges, that have different perspectives on spatial awareness, can form a new gameplay. For instance building with your non-familiar hand, stacking without looking or piling as high as possible. A lot of challenges can be added to the game what offers the possibility to increase the amount of unlockables. Every character received can then unlock new challenges. This will increase the collect-ability level of the campaign and so the experience of discovery which is notified as fun.
A photograph feature can be added to the challenges to support this a child's proudness.

Characters
The redesign of characters should be connected to recognizable objects fitting within the categories.

Animations
Animations will be added when a character is unlocked. In this way the character comes alive and children can learn about them without being hindered by difficult reading texts.


BODY BUILDERS
PLAY
MULTIPLAYER
CHALLENGES
COLLECTION

PART 6: DESIGN PROPOSAL

To conclude the dissertation, the concept is elaborated into a complete design proposal. The app is being overhauled and the entire series of characters is designed. Finally, the next steps for the project are set out.

6.1 FINAL DESIGN PROPOSAL

The conclusions of the user test are used to iterate on the entire design. Both the app and characters are revised to improve on the concept criteria.

6.1.1 Characters

More coherence is brought into the design of the characters. This is done by choosing one matching colour for each of the categories.
A second change is that the characters have more familiar references.
Some of the characters are re-used or altered for the complete line-up. (figure 97)

Again, together with UNGA's design team the characters were designed in 3D, printed and painted. (figure 98 and 99)
Due to time constraints with the design team not all characters could be sampled.

Figure 98: 3D printed samples

Figure 97: Final character lineup

In total 9 characters are made into prototypes. (figure 99) Two of them are more detailed versions of previously used figurines. (figure 100)

Figure 99: Overview of character samples

Figure 100: Improved detailing

6.1.2 App

The knowledge obtained with the user test is integrated into a complete new app design. Some elements of the game are kept the same, such as the multiplayer and solo variant. While the way of playing stays the same, the whole appearance has been changed.

A new interactive prototype of the app redesign can be accessed by scanning the following QR-code or by using the link.

BIT.DO/BODY-BUILDERS

Note: The app will open up in your browser. The browser will not be able to play the mp4 animations and sounds. The app may not always immediately respond to a touch trigger. For the best result, download the ProtoPie Player App. Loading may take a while.

Design

The app is now designed to better fit the topic of nutrients in the stomach. The whole atmosphere of the app should feel like you are located at this place.

Difficulty

The player can now choose their level of difficulty for the one player variant of the game.

Name

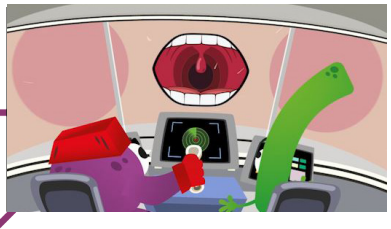
The previous name, which was Body Building Blocks, is now shortened to Body Builders. This name retains the meaning of it, while keeping it concise.

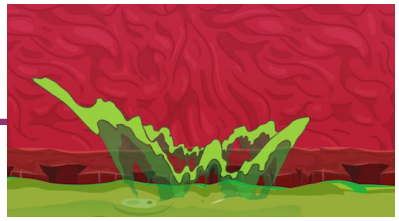
One player menu

The screen is updated with the new styling, but preserves the same function. It shows the avatar's status and it is the place where you start deep diving into the body.

Animation

A new transition animation is made to further suppress the feeling of getting inside the avatar's body. Together with the nutrients you will travel through the pharynx towards the stomach.





Level overview

After the animation is completed you will be located in the stomach of your avatar. The different levels remained the same. The viruses in the defence level have been replaced to one enemy that needs to be defeated: The Flu Blob. This is the reason the avatar is sick and you will have to fight him to bring back health. The coming of the blob makes that the nutrients are in panic and stressfully running around.

Level of Defence

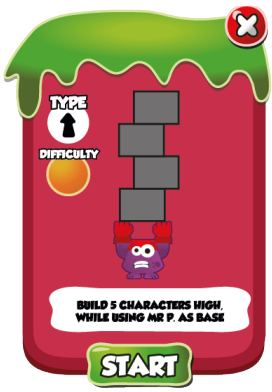
The level is completed when you made enough stacking combinations to defeat the blob. When the blobs health is brought to zero your avatar will be completely healthy again.
The faster you succeed, the more points you will get.

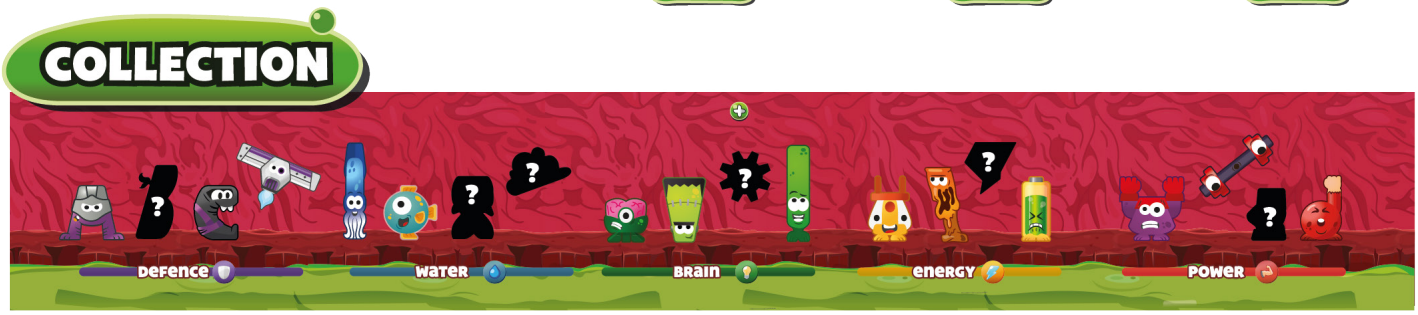
Multiplayer

Not much changed to this game play other than the stacking combinations given. They are now designed using the new characters.

Challenges

The new play mode is challenges. They are presented divided by level of difficulty. They will become unlocked depending on which characters you collect. In this way, unlockables can be gathered until the very end. The experience of discovery can be even more suppressed by offering a new daily challenge every day.
There are different types of challenges, varying from building as high as possible to blindly recreating a stack. When completed a challenge you can take a picture and save it within the app.





Collection

As it was before, all of the characters can be activated within the collection area of the application. Also information on the nutrients can be found within this screen.
However, the user test showed that children did not read texts about the information on the nutrients. That is why these texts have been deleted and replaced with a more engaging way of presenting the same information. When clicked on, an animation starts. The nutrient will introduce itself and tells the kids all about what they do for someone's body.

6.2 NEXT STEPS

Bringing us to the very last part of the thesis. Recommendations for future steps on this project are outlined, making it possible to move ahead.

Characters

Designing the characters is an almost ongoing activity of improvement. This because many factors must be taking into account while doing so. First of all the characters must be stackable in different ways to make a challenging game play possible. What is possible in the loyalty business is highly depending cost price. Free give-aways need to be as cheaply produced as possible. Production methods, and therefore cost price, will give many design restrictions.
The third factor is depending on the taste of the end user. If characters are not liked, the need to collect will be absent. So it is important to make sure this most important driver to a loyalty campaign is present. Therefore the characters need to be subject to the evaluation of children.

UI testing

The user test performed in this thesis was mostly explorative and regarding user experience. It was a first ever test with the user group of a new concept. One explorative user test will not deliver all the pitfalls the design may have. Especially on the level of micro user interaction a lot of improvement can be achieved. This concerns the exact way of how people interact with the application, what flows of use are taken and what expectations there are when using the different menus. Beyond the suggestion of testing it on user interaction, the new design should be subject to user testing on experience a second time. The new design with the intention to more inner body experience need to be evaluated to the expectations. It must be verified whether children have a better understanding of what exactly happens in the app.

Object recognition

The solo play variant of the game should use object recognition to validate whether stacking combinations are successfully completed. Due to limitations on app prototype software this could not be integrated into the design yet. Therefore an app developer will have to see if the technology has sufficient potential for this to be used for this particular game concept. Again, this should be subject to user testing.

PART 7: REFERENCES

7.1 REFERENCES

AJC (2016). Fear of missing out can make social media using teens feel stressed. Retrieved on March 22nd 2019, via https://www.ajc.com/lifestyles/parenting/fear-missing-out-can-make-social-media-using-teens-feel-stressed/q4QOC-JC3ZPkYuWAqPG8IcI/

Amabile, T. M. (1998). How to kill creativity (Vol. 87). Boston, MA: Harvard Business School Publishing.

Amabile, T. M. (2012). Componential theory of creativity. Harvard Business School, 12(96), 1-10.

Beasts of Balance (2019). Home. Retrieved on May 7th 2019, via https://beastsofbalance.com/

Board Game Quest (2017). Meeple Circus Review. Retrieved on June 17th 2019, via https://www.boardgamequest.com/meeple-circus-review/

Boomerang (2017). Top 10 used apps by our users (the kids). Retrieved on March 22nd, via https://useboomerang.com/2017/11/16/top-10-used-apps-users-kids/

Bozzola, E., Spina, G., Ruggiero, M., Memo, L., Agostiniani, R., Bozzola, M., ... & Villani, A. (2018). Media devices in pre-school children: the recommendations of the Italian pediatric society. Italian journal of pediatrics, 44(1), 69. Retrieved on March 21st 2019.

Bucksch, J., Sigmundova, D., Hamrik, Z., Troped, P. J., Melkevik, O., Ahluwalia, N., ... & Inchley, J. (2016). International trends in adolescent screen-time behaviors from 2002 to 2010. Journal of Adolescent Health, 58(4), 417-425. Retrieved on March 18th 2019.

Brissett, D., & Snow, R. P. (1993). Boredom: Where the future isn't. Symbolic Interaction, 16(3), 237-256.

Brockman, R., Jago, R., & Fox, K. R. (2010). The contribution of active play to the physical activity of primary school children. Preventive medicine, 51(2), 144-147.

Cain, N., & Gradisar, M. (2010). Electronic media use and sleep in school-aged children and adolescents: A review. Sleep medicine, 11(8), 735-742.

Cambridge Dictionary (2019). Meaning of creativity. Retrieved on April 23rd 2019, via https://dictionary.cambridge.org/dictionary/english/creativity

Chak, K., & Leung, L. (2004). Shyness and locus of control as predictors of internet addiction and internet use. CyberPsychology & Behavior, 7(5), 559-570.

Desmet, P.M.A. & Fokkinga, S.F. (2018, in press). ID5564. Human concerns, week 5, 13 fundamental psychological needs. [PowerPoint slides] Retrieved from https://brightspace.tudelft.nl/d2l/le/content/74135/view Content/761320/View

Find a health service (2019). Active play for early childhood centres and family day care. Retrieved on April 10th 2019, via findahealthservice.act.gov.au/c/fahs?a=dlglobres&globres=1264819845.

Google Play (2019). Cooking Fever. Retrieved on June 17th 2019, via https://play.google.com/store/apps/details?id=com.nordcurrent.canteenhd&hl=en_US

Google Play (2019). Hay Day. Retrieved on June 17th 2019, via https://play.google.com/store/apps/details?id=com.supercell.hayday&hl=nl

Green Garage Blog (2015). 18 essential pros and cons of cell phones. Retrieved on March 22nd, via https://greengarageblog.org/18-essential-pros-and-cons-of-cell-phones

Hadani, H., & Jaeger, G. (2015). Inspiring a generation to create: Critical components of creativity in children. Sausalito, CA: Center for Childhood Creativity.

Hands, B. P., Chivers, P. T., Parker, H. E., Beilin, L., Kendall, G., & Larkin, D. (2011). The associations between physical activity, screen time and weight from 6 to 14 yrs: the Raine Study. Journal of Science and Medicine in Sport, 14(5), 397-403.

Hunter, J. A., Abraham, E. H., Hunter, A. G., Goldberg, L. C., & Eastwood, J. D. (2016). Personality and boredom proneness in the prediction of creativity and curiosity. Thinking Skills and Creativity, 22, 48-57.

Kapi Awards (2018). Beasts of Balance. Retrieved on May 7th 2019, via https://kapiawards.com/2018kapi/beasts-of-balance/

Kleon, A. (2012). Steal like an artist: 10 things nobody told you about being creative.

Korhonen, H., Montola, M., & Arrasvuori, J. (2009, October). Understanding playful user experience through digital games. In International Conference on Designing Pleasurable Products and Interfaces (Vol. 2009).

KPN (2017). Nederlandse kinderen krijgen steeds eerder mobiele telefoon. Retrieved on March 18th, via https://overons.kpn/nl/nieuws/2017/nederlandse-kinderen-krijgen-steeds-eerder-mobiele-telefoon

Kumardeepak (2019). Components of creativity. Retrieved on April 23rd 2019, via https://kumardeepak.wordpress.com/2012/07/18/components-of-creativity/

Kushlev, K., & Dunn, E. W. (2018). Smartphones distract parents from cultivating feelings of connection when spending time with their children. Journal of Social and Personal Relationships, 0265407518769387.
Retrieved on March 21st 2019.

Little Housewife (2016). Arrived on my doorstep. Retrieved on May 7th 2019, via http://www.littlehousewife.co.nz/2016/09/arrived-on-my-doorstep-september-2016.html

Livingstone, S., Haddon, L., Görzig, A., & Ólafsson, K. (2011). Risks and safety on the internet: the perspective of European children: full findings and policy implications from the EU Kids Online survey of 9-16 year olds and their parents in 25 countries.

Mann, S., & Cadman, R. (2014). Does being bored make us more creative?. Creativity Research Journal, 26(2), 165-173.

Mikulas, W. L., & Vodanovich, S. J. (1993). The essence of boredom. The Psychological Record, 43(1), 3.

National Public Radio (2017). How smartphones are making kids unhappy. Retrieved on March 25th 2019, via https://www.npr.org/sections/health-shots/2017/08/07/542016165/how-smartphones-are-making-kids-unhappy?t=1553506718808

NOS (2018). Kwart 13-jarigen bijziend, onderzoekers waarschuwen voor telefoongebruik. Retrieved on March 21st, via https://nos.nl/artikel/2235090-kwart-13-jarigen-bijziend-onderzoekers-waarschuwen-voor-telefoongebruik.html

Novick, M. B., Hendy, H. M., Adams, W., & Williams, K. (2018). Identifying Technology Associated with Weight Status and Health Problems in Children Referred for Weight Management. J Obes Chronic Dis, 2(1), 8-11. Retrieved on March 18th 2019.

O'Keeffe, G. S., & Clarke-Pearson, K. (2011). The impact of social media on children, adolescents, and families. Pediatrics, 127(4), 800-804.

Parool (2018). Onderzoek: kind bijziend door getuur naar scherm. Retrieved on March 18th 2019 via https://www.parool.nl/binnenland/onderzoek-kind-bijziend-door-getuur-naar-scherm~a4599370/

Pea, R., Nass, C., Meheula, L., Rance, M., Kumar, A., Bamford, H., ... & Zhou, M. (2012). Media use, face-to-face communication, media multitasking, and social well-being among 8-to 12-year-old girls. Developmental psychology, 48(2), 327.

Peper, E., & Harvey, R. (2018). Digital addiction: Increased loneliness, anxiety, and depression. NeuroRegulation, 5(1), 3-3.

Picssr (2019). Unreachable. Retrieved on May 7th via, http://picssr.com/photos/ahbeeldmateriaal/interesting/page6?nsid=57578968@N05 (unreachable)

RIVM (2019). Schermgebruik, blauw licht en slaap. Retrieved on March 21st, via https://www.rivm.nl/publicaties/schermgebruik-blauw-licht-en-slaap

RTL Nieuws (2019). Alarm slaaptekort tieners door mobieltjes. Retrieved on March 22nd, via https://www.rtlnieuws.nl/nieuws/nederland/artikel/4631586/voor-eerst-onderzocht-kinderen-slapen-40-minuten-minder-door

Russell, L., & Hill, M. (2018). UMB CURE 2018: How Do Smartphones Affect Childhood Development?. Retrieved on March 21st 2019.

Russo, B. J., James, E., Aguilar, C. Y., & Smaglik, E. J. (2018). Pedestrian behavior at signalized intersection crosswalks: observational study of factors associated with distracted walking, pedestrian violations, and walking speed. Transportation research record, 2672(35), 1-12.

Sanders, E. B. N., & Stappers, P. J. (2012). Convivial toolbox: Generative research for the front end of design. Amsterdam: BIS.

Sarwar, M., & Soomro, T. R. (2013). Impact of smartphone's on society. European journal of scientific research, 98(2), 216-226.

Shifu (2019). Plugo Link. Retrieved on June 17th, via https://www.playshifu.com/plugo

Singer, J. L. (1981). Towards the scientific study of imagination. Imagination, Cognition and Personality, 1(1), 5-28.

TechCrunch (2016). Osmo's new Pizza Co. game uses augmented reality to teach kids about running a business. Retrieved on June 17th 2019, via https://techcrunch.com/2016/10/20/osmo-launches-pizza-co/

The Conversation (2014). Too much screen time and too little outside play is holding back kids. Retrieved on March 25th 2019, via https://theconversation.com/too-much-screen-time-and-too-little-outside-play-is-holding-back-kids-31116

The Guardian (2013). How technology and inactive lifestyles are changing our children. Retrieved on March 25th 2019, via https://www.theguardian.com/sustainable-business/technology-inactive-lifestyle-changing-children

Thuisleven (2019). Top insectenplaatjes en tattoos sparen met Freek Vonk. Retrieved on May 7th 2019, via https://www.thuisleven.com/top-insectenplaatjes-en-tattoos-sparen-met-freek-vonk/

Time (2018). There's Worrying New Research About Kids' Screen Time and Their Mental Health. Retrieved on March 25th, via http://time.com/5437607/smartphones-teens-mental-health/

Twinq (2018). Succesfactoren spaaracties voor kinderen. Retrieved on May 27th 2019, via the server of UNGA.

Uswitch (2018). Biggest smartphone trends of 2018: a look back at the year in pocket tech. Retrieved on March 22nd 2019, via https://www.uswitch.com/mobiles/features/biggest-smartphone-trends-of-2018/

Verywell family (2018). The negative effects of too much screen time. Retrieved on March 18th 2019, via https://www.verywellfamily.com/the-negative-effects-of-too-much-screen-time-1094877

Washington Post (2015). Teens spend nearly nine hours every day consuming media. Retrieved on March 22nd 2019, via https://www.washingtonpost.com/news/the-switch/wp/2015/11/03/teens-spend-nearly-nine-hours-every-day-consuming-media/?utm_term=.7e064ec8a97e

WGXA (2018). New survey shows parents worry their kids are addicted to their phones. Retrieved on March 22nd 2019, via https://wgxa.tv/news/local/new-survey-shows-parents-worry-their-kids-are-addicted-to-their-phones

7.2 REFERENCES ON NUTRIENTS

Sources Little Nutrition's
Disabled World (2019). Nutrition: Nutritious food types and dietary information. Retrieved on June 12th – 16th 2019, via https://www.disabled-world.com/fitness/nutrition/

Ducksters (2019) Biology for kids. Retrieved on June 12th – 16th 2019, via https://www.ducksters.com/science/vitamins_and_minerals.php

Dr. Axe (2017). 11 Essential nutrients your body needs now. Retrieved on June 12th – 16th 2019, via https://draxe.com/essential-nutrients/

EUFIC (2015). The functions of fats in the body. Retrieved on June 12th – 16th 2019, via https://www.eufic.org/en/whats-in-food/article/facts-on-fats-dietary-fats-and-health

DHSV (2019) The role of calcium, vitamin D and phosphorus in maintaining healthy teeth. Retrieved on June 12th – 16th 2019, via https://www.dhsv.org.au/dental-health/teeth-tips-and-facts/calcium-vitamin-d-and-phosphorus

Goodnet (2013) 11 essential Vitamins and Minerals Your Body Needs. Retrieved on June 12th – 16th 2019, via https://www.goodnet.org/articles/11-essential-vitamins-minerals-your-body-needs

Healthline (2016). How your body uses phosphorus. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/health/how-your-body-uses-phosphorus

Healthline (2018). Top 15 Calcium-rich foods. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/15-calcium-rich-foods

Healthline (2019a). 17 science-based benefits of omega-3 fatty acids. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/17-health-benefits-of-omega-3#section10

Healthline (201b9). What does magnesium do. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nu-

trition/what-does-magnesium-do#other-benefits

Healthline (2019c). 10 foods high in magnesium. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/10-foods-high-in-magnesium#section11

Healthline (2019d). 10 reasons of iron supplements. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/health/10-reasons-iron-supplements

Healthline (2019e). 11 healthy iron rich foods. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/11-healthy-iron-rich-foods#section12

Healthline (2019f). Selenium benefits. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/selenium-benefits#section4

Healthline (2019g). Manganese bneefits. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/manganese-benefits

Healthline (2019h). Selenium rich foods. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/health/selenium-foods#bananas

Healthline (2019i). Vitamin B. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/health/food-nutrition/vitamin-b-complex#benefits

Healthline (2019j). Vitamin D. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/9-foods-high-in-vitamin-d#section10

Healthline (2019k). Functions of protein. Retrieved on June 12th – 16th 2019, via https://www. healthline.com/nutrition/functions-of-protein#section8

Healthline (2019l). 20 delicious high protein foods. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/20-delicious-high-protein-foods#section20

Healthline (2019m). Carbohydrate function. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/carbohydrate-functions#section7

Healthline (2019n). High carb food. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/12-healthy-high-carb-foods#section13

Healthline (2019o). Foods high in copper. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/foods-high-in-copper#section8

Healthline (2019p). Foods high in vitamin A. Retrieved on June 12th – 16th 2019, via https://www.healthline.com/nutrition/foods-high-in-vitamin-a#section2

Heart (2019). Polyunsaturated Fat. Retrieved on June 12th – 16th 2019, via https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/fats/polyunsaturated-fats

Livestrong (2019a). What does sodium do in the body? Retrieved on June 12th – 16th 2019, via https://www.livestrong.com/article/427018-what-does-sodium-do-in-the-body/

Livestrong (2019b). How does sulfur help the body?Retrieved on June 12th – 16th 2019, via https://www.livestrong.com/article/441274-how-does-sulfur-help-the-body/

Livestrong (2019c). Molybdenum Rich foods. Retrieved on June 12th – 16th 2019, via https://www.livestrong.com/article/249835-molybdenum-rich-foods/

Medical News Today (2017a). Nutrition: What is it and why important? Retrieved on June 12th – 16th 2019, via https://www.medicalnewstoday.com/articles/160774.php

Medical News Today (2017b). Health benefits and risks of copper. Retrieved on June 12th – 16th 2019, via https://www.medicalnewstoday.com/articles/288165.php

Medical News Today (2018a). Why do we have fluoride in our water? Retrieved on June 12th – 16th 2019, via https://www.medicalnewstoday.com/articles/154164.php

Medical New Today (2018b). Is saturated or unsaturated fat better for you? Retrieved on June 12th – 16th 2019, via https://www.medicalnewstoday.com/articles/321655.php

Medical News Today (2018c). Everything you need to know about potassium. Retrieved on June 12th – 16th 2019, via https://www.medicalnewstoday.com/articles/287212.php

Medical News Today (2019a). Chromium: Health befits, sources and potential risks. Retrieved on June 12th – 16th 2019, via https://www.medicalnewstoday.com/articles/288177.php

Medical News Today (2019b). 10 foods rich in vitamin E. Retrieved on June 12th – 16th 2019, via https://www.medicalnewstoday.com/articles/324308.php

Medical News Today (2019c). Chromium: Health befits, sources and potential risks. Retrieved on June 12th – 16th 2019, via https://www.medicalnewstoday.com/articles/288177.php

Medline Plus (2019a). Magnesium in diet. Retrieved on June 12th – 16th 2019, via https://medlineplus.gov/ency/article/002423.htm

Medline Plus (2019b). Facts about saturated fats. Retrieved on June 12th – 16th 2019, via https://medlineplus.gov/ency/patientinstructions/000838.htm

MSD Manual (2019). Overview of Sodium's role in the body. Retrieved on June 12th – 16th 2019, via https://www.msdmanuals.com/home/hormonal-and-metabolic-disorders/electrolyte-balance/overview-of-sodium-s-role-in-the-body

My Food Data (2019a). Top 10 foods and drinks highest in fluoride. Retrieved on June 12th – 16th 2019, via https://www.myfooddata.com/articles/high-fluoride-foods-and-drinks.php

My Food Data (2019b). Top 10 foods highest in Vitamin C. Retrieved on June 12th – 16th 2019, via https://www.myfood-data.com/articles/vitamin-c-foods.php

National Institutes of Health (2019a). Calcium. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/Calcium-Consumer/

National Institutes of Health (2019b). Iron. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/Iron-Consumer/

National Institutes of Health (2019c). Magnesium. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/Magnesium-Consumer/

National Institutes of Health (2019d). Potassium. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/Potassium-Consumer/

National Institutes of Health (2019e). Selenium. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/Selenium-Consumer/

National Institutes of Health (2019f). Vitamin A. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/VitaminA-Consumer/

National Institutes of Health (2019g). Vitamin B. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/VitaminB-Consumer/

National Institutes of Health (2019h). Vitamin C. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/VitaminC-Consumer/

National Institutes of Health (2019i). Vitamin D. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/VitaminD-Consumer/

National Institutes of Health (2019j). Vitamin K. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/VitaminK-Consumer/

National Institutes of Health (2019k). Zinc. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/Zinc-Consumer/

National Institutes of Health (2019l). Vitamin B12. Retrieved on June 12th – 16th 2019, via https://ods.od.nih.gov/factsheets/VitaminB12-Consumer/

NHS(2019). Vitamin D. Retrieved on June 12th – 16th 2019, via https://www.nhs.uk/conditions/vitamins-and-minerals/vitamin-d/

NOF (2019). Calcium/Vitamin D. Retrieved on June 12th – 16th 2019, via https://www.nof.org/patients/treatment/calciumvitamin-d/

Nutrition for Kids (2019). A dietary approach to lifelong health. Retrieved on June 12th – 16th 2019, via https://p.widencdn.net/9h7o6h/Nutrition-for-Kids

Nutritious life (2019) The 5 Most Important Minerals You Should Be Getting in Your Diet. Retrieved on June 12th – 16th 2019, via https://nutritiouslife.com/eat-empowered/most-important-minerals-in-your-diet/

Parents (2005). 9 must-eat nutrients for your child. Retrieved on June 12th – 16th 2019, via https://www.parents.com/kids/nutrition/healthy-eating/must-eat-nutrients/

Science Museum (2019). What do carbohydrates do for you? Retrieved on June 12th – 16th 2019, via http://whoami.sciencemuseum.org.uk/whoami/findoutmore/yourbody/whatdoyourcellsdo/whatisacellmadeof/whatdocarbohydratesdoforyou

Study.com (2019). Molybdenum benefits. Retrieved on June 12th – 16th 2019, via https://study.com/academy/lesson/molybdenum-function-deficiency-benefits.html

Web MD (2019a). How potassium helps your heart. Retrieved on June 12th – 16th 2019, via https://www.webmd.com/heart-disease/potassium-and-your-heart

Web MD (2019b). Vitamins and supplements. Retrieved on June 12th – 16th 2019, via https://www.webmd.com/vitamins-and-supplements/features/iron-supplements#1

Web MD (2019c). Protein benefits. Retrieved on June 12th – 16th 2019, via https://www.webmd.com/men/features/benefits-protein#1

WIKI books (2019). Fundamentals of Human nutrition/chloride. Retrieved on June 12th – 16th 2019, via https://en.wikibooks.org/wiki/Fundamentals_of_Human_Nutrition/Chloride