Designing a gamified application to promote food waste awareness in household and further educate consumers on their food waste behavior

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# Abstract

The current statistics on food waste are not in concordance with the sustainability goals. The biggest waste producers are households and at this rate, either the production of food is to be increased, as well as the price for food, or food waste must be reduced, and awareness must be promoted.

This paper is a take on creating awareness on food waste in households and educating the consumers through a gamified application. The aim of this research is to enhance the user engagement within an application that touches upon a complex topic, to ensure a good learning environment for the user. The application is developed, designed and evaluated with the goal of answering the research question of this paper: How can user experience design influence the user engagement within an application that promotes food waste reduction?

The first chapter introduces the reader into the existing problem and the assignment. The second chapter gathers background information related to the topic of the paper. The third chapter explains the method this paper follows. The fourth chapter describes multiple ideas that have been discussed while brainstorming solutions to the problem. The fifth chapter lays out all the requirements and specifications the product must meet. The sixth chapter presents in detail the concept that was chosen and the realization of it. The last chapters present the evaluation and discussion over all paper.

Keywords: gamified application, food waste, food waste reduction, household, user experience design, user engagement

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# Introduction

It has been discovered by the department of Food and Biobased Research from the University of Wageningen that most of the amount of food waste comes from households. Annually, one third of the food produced globally is lost or wasted (Gustavsson, Cederberg, Sonesson, van Otterdijk, Meybeck 2011) and over half of all food waste takes place in households. This has consequences in more areas: water waste, water and air pollution, usage of agricultural land and resources. To meet future demands of the world's expanding population, food production must increase, or food waste reduction must be promoted. With the hope of reducing food waste, the University of Wageningen has asked the University of Twente to collaborate on a research project.

This project is conducted in collaboration with experts on food waste and consumer behavior from the University of Wageningen, Anke Jansen and Rene de Wijk, also referred to, throughout this paper, as the client. The goal set by the client is to create an application that promotes food waste reduction, raises awareness and further educates the user's food waste behavior. The target audience for this application are families, in which parents are responsible for the existent food in the household. The stages in which food waste happens at households are known to be planning, consuming storing, provisioning, preparing and disposing. Each stage is included in the application, with the goal of offering specific feedback based on actions, which will contribute to the goal of educating the user. This project is performed by Alexandra Titiu and Floor Kuipers. The time allocated to perform this project is five months, in which the students gather background knowledge by researching, brainstorm ideas, develop a concept, create a prototype and test it. Floor Kuipers' focus is on how to change food waste behavior through the use of technology, while Alexandra Titiu is responsible for designing the application towards engaging and motivating the user, while implementing techniques accordingly. The resulting application will be a working prototype, based on which a user-evaluation can be performed.

To be able to influence human behavior through technology, to extend awareness and educate people through an application, the factors that add to these goals must be explored. To be able to educate, a constant usage of the application is needed, as learning a new behavior takes time and practice. Researchers, such as Voke (2002), Hancock and Betts (2002) and Dowson and McInerney (2001), agree that engaged users are more likely to retain more, learn more and enjoy learning activities. Motivation and engagement are critical while learning online, as the time invested towards learning is up to the user. To reach a constant presence of the user within the application, factors and techniques that aim to enhance the user engagement and motivation within an application must be researched. Therefore, the research question of this paper is: How can user experience design influence the user engagement within an application that promotes food waste reduction? This paper describes the process of creating the application, starting with background research into the topic, brainstorming ideas, developing a concept and all the way to creating a prototype version of the application and evaluate it.

# State of the art

In this chapter, while keeping the goals in mind, topics that are relevant to answering this paper's research question are explored. The first section describes ways of motivating user engagement online. The second section presents more details about food waste. The last section contains a look at existent systems with a similar topic to the one developed in this project.

# Motivation and Engagement

One of the goals of this project is to educate people on the matter of food waste. This implies the necessity of a factor that makes learning successful. As learning through technology is selfinitiated, the process can be helped by motivation (Prensky, 2001). Motivation stays behind any human action, but researchers such as Sansone, Fraughton, Zachary, Butner, and Heiner (2011), insist that the presence of motivation while learning through technology is even more critical, as the time invested towards learning is up to the user. Engagement in online software is difficult to maintain. In the literature of Schlechty (2001) and Saeed, and Zyngier (2012) it is mentioned that engagement is as important as motivation and both are necessary for learning. The user's constant presence is essential for the learning process to advance. This way the learner will persist in the learning process, in this case, by staying engaged to the application.

According to Deci and Ryan (2004) there are three main types of motivational states: intrinsic motivation, extrinsic motivation and amotivated states. The focus in this paper is on intrinsic and extrinsic motivation, to better understand what needs to be triggered in order to reach engagement of user. Intrinsic motivation is the drive to perform an action without external reward, while extrinsic motivation refers to behavior driven by external rewards (Harlen and Crick 2003). The concept of this application might not be appealing to many people on the market, as many of them might miss knowledge, experience and have no interest in being criticized or helped. This is where extrinsic motivation can come in handy, with some well thought-of rewards to raise motivation where it's missing.

Gamification features aim to have an effect on the user's motivation. Kapp (2012) affirms that the main purpose behind gamification is to enhance the user's motivation. According to Deterding (2011), gamification or a gamified application is a software that implements the use of compelling game design techniques with the goal of enhancing services by working with motivational affordances or simply said, making an activity more enjoyable to perform for the user. The most common elements of game include points, badges, leaderboard, clear goals, challenges, levels, progress, feedback and rewards. Nicholson (2015) created a "recipe for meaningful gamification" meant to be of help for further developments of games. He lists six elements inspired by game design: play, exposition, choice, information, engagement, reflection, as shown in Figure 1. This is a helpful tool that is taken into consideration while in the development of the application in this project.

#### The RECIPE for Meaningful Gamification

- · Play facilitating the freedom to explore and fail within boundaries
- Exposition creating stories for participants that are integrated with the real-world setting and
  allowing them to create their own
- · Choice developing systems that put the power in the hands of the participants
- Information using game design and game display concepts to allow participants to learn more about the real-world context
- Engagement encouraging participants to discover and learn from others interested in the realworld setting
- Reflection assisting participants in finding other interests and past experiences that can deepen engagement and learning.

Figure 1: The recipe for Meaningful Gamification by Nicholson (2015)

Diving more into literature, features that are believed to aim at enhancing engagement and motivation through an application have been researched. Groh (2012) believes that relatedness, competence and autonomy are important innate needs for the intrinsic motivation of the user. Rose and Meyer (2002) believe that offering a palette of choice raises the chances of the user finding meaningful connections within the environment. According to Sutcliffe (2016), interactivity with the environment is important for the user and examples are sliders, zoom control, responsive objects, video, animations, images, metaphors, pop-up features or avatar representations. Sutcliffe mentions further in his paper that the aesthetics of the product are in focus for the initial judgement of the user (50msec), but that as exposure time increases, utility, usability and interactivity become more important in the user's judgement.

# Food Waste

This project aims to raise awareness and educate people on food waste. It is important to form a good understanding of what the application aims to promote. According to Lucifero (2016), private households are the largest group to produce food waste. Food and Agriculture Organization of the United Nations (FAO, 2011) defines food waste as the food intended for human consumption, but not used for it. The paper further mentions the contribution of food waste to other areas. The demand for agricultural land, the social impact it has, as it contributes to an increase in the price of food, the economic impact, water wastage. For example, it has been estimated that in the UK 6.2 billion cubic meters of water per year is wasted producing food that is then thrown away – the equivalent of 243 liters of water per person per day (Chapagain and James, 2011).

In the Netherlands, according to FAO (2011), per capita 47 kilograms of edible food is wasted per year, representing 13,6% of the edible food (47 kg / 349 kg). Per household this is about 105kg per year. Throwing food away currently costs the average UK family an estimated

£680 a year (WRAP, 2011b), while Dutch consumers throw away an estimated EUR 2,400 million a year (FAO, 2011).

Food waste can occur in any of the food cycle stages present at the household level, according to Hebrok and Boks (2017), such as: planning, provisioning, storing, preparing, disposal and consuming. Planning refers to the planning done before the food enters the household, such as: grocery list, meal planning, checking stock. Provisioning refers to food that has entered the house in any way, such as: from deals, store, promotions, subscriptions. Storing refers to the space allocated for food in a household, such as: store with or without packaging, freezer, fridge, closets. Preparing stage relates to the preparation of the food, for example: proportioning and decisions on how to cook the food. Consuming stage refers to the moment of consuming the food prepared and dealing with the leftovers. Disposal stage refers to the disposal of surplus of food, for example: donating leftovers, throwing leftovers in the bin.

Approaching consumers on the matter of food waste through an application seems promising, as the use of an application has great potential for changing consumer's food waste behavior. It also has the capability of reaching high number of consumers at a low cost (Mummah et al, 2017). Hoem (2017) supports this fact by saying that applications have potential to change the behavior of users. A study conducted by Van Geffen, Van Herpen, and Van Trijp (2017) mentioned in their findings that the use of an application helps in raising awareness for food waste. Therefore, the use of an application to promote awareness on food waste and further influence the behavior of the user is a perfect low-cost solution with the potential of reaching a high number of people.

# **Related Work**

To get a clear idea of what is already on the market and how it can help this paper, ideas that have similar topics have been researched. Here are some examples of websites, applications and games existent on Food Waste:

### Food Waste Game

This is a website that has the same goal as our Graduation Project, to raise awareness of food waste. On their official website <u>http://www.wiseuptowaste.org.uk/</u>, quiz games can be played to test knowledge in food waste, recycling, composting. The user has a wide range of possibilities to further share information and awareness on social media, join nearby events and collect more knowledge on the topic as the creators offer tips, news and further help.

#### Alexandra Delia Titiu



Figure 3: Food Waste Game

### Family Game - Food Waste Challenge

This game is also part of an entire website based on food waste reduction <u>http://foodwasteeffect.eu/en/home</u> that offers more information, tips, event details for people to join and as well a game to be played with family or friends to test knowledge and learn more about the topic.



### The Zero Waste Game

Kids' Science Challenge website <u>http://www.kidsciencechallenge.com/</u> created games on different topics of science. One of the games created for the kids to play and learn is The Zero Waste Game. The game starts with a given polluted neighborhood which can change into a clean one as the user answers correctly multiple random questions of food waste.



Figure 5: Zero Waste Game

### No Food Wasted

This is an application which puts the user in contact with nearby locals that have at the end of the day food left that can be given to someone in need for cheaper or free of charge.



### Too Good to Go: End Food Waste

An application that saves delicious food and fights food waste, based on the same concept as No Food Wasted, users can find, order and pay for packages of food left over from nearby locals.

# Hoe werkt Too Good To Go?



Figure 7: Too Good to Go

# Evaluation

From the research based on what games are existent on the topic of this project, it can be seen that the concepts based on creating a website that contains a game, mostly focus on giving tips and presenting ways in which the user can take actions. The games provided by each of these platforms are small and not engaging the user on the long run after one try, as they are formed to only change the order of the questions and not further advance. Of course, knowledge can be learned through playing these games multiple times, until the user gets the correct answer. Or change can be made through collecting knowledge presented by the website and further share it or attend to related events. The desire to keep the user engaged is missing as the games do not present a continuation and the chances of the user looking for these websites and further engage are small. The concepts in which, through an application, users can find leftover food from nearby restaurants, order it, pick it up and use it with a cleaner consciousness that they helped food waste reduction and can save some money are not in concordance with the context of this paper, as the focus here is on diminishing food waste at the household level.

The research helps to form an outline of how the application should be developed and what it should contain to be effective towards the goals set for the project. Useful elements the literature provided will be implemented into the development of the application and later on tested, to see their effectiveness in creating, maintaining or enhancing motivation and engagement of the user.

# Method

This paper uses the design process of Creative Technology from the University of Twente. This process contains four phases: Ideation, Specification, Realization and Evaluation. The benefits of using this process are: it serves as a guideline in the design process and it provides clear intermediate points for feedback and evaluation.

#### Ideation

Here, the problem is defined, the student gathers relevant information, related work and then generate ideas. The result of this phase is usually a more elaborated project idea and problem requirements.

#### Specification

A number of prototypes are explored here for the design or concept, together with short evaluation and feedback.

#### Realization

In this stage, the student starts the realization of the components needed and described in the specification phase. Functional testing is typically included.

#### Evaluation

More functional tests are added. Evaluation of whether the requirements identified in the ideation phase are met.

# Ideation and brainstorming

In order to form a concept for the application needed, multiple brainstorm sessions were held with Floor Kuipers, where working concepts of other known applications were discussed, systems of rewards and triggers that help towards engagement of people in an application. Games and apps such as SimCity, PokemonGo, Weight Watchers, Duolingo, Menzis and more have been looked at, as they contain many different and effective ways that keep the user engaged. They have served more as an inspiration, rather than an aspiration to create a similar product.



Figure 8: Mind map

The mind map in Figure 8 was created to have a visual overview of the factors related to food waste and the different angles this domain can be approached from. Together with the knowledge researched, inspiration from our clients and supervisors, these following ideas were formed: FoodPrint, Family Social Game and "Feed the Movement". They will be further described in the next paragraphs.

### FoodPrint

A game based on the details of the Sims game and Pokémon on a Nintendo Gameboy, in which the user plays with their character/s in another world. The world is formed on a virtual platform, similar to the ones in Figures 9 through 11, with locations much like in real life: grocery store, home, a neighborhood, etc. A system with choices and assignments, where the user can play, explore, create within the system or fail within the boundaries. The concept is that the user would play with the character to be able to level up, by making the characters do real life activities, such as: grocery list, meal planning, groceries, creative cooking, storage, socializing with others on this matter. By doing this, the user receives feedback on every activity done with the character and the progress will be expressed in their "food print".



Figure 9: Pokémon Nintendo



Figure 10: Sims Mobile



Figure 11: Sims Mobile

### Family Social Game

An application devoted to families, where the children can influence their parents to do well, as they might receive a reward based on the actions of their parents. For the family score to go up, parents need to fill in few assignments along the way, answer quizzes, scan receipts, introduce shopping lists, recipes, connect external applications (smart fridge) or existent systems (bonus card). Here the rewards are more prominent, as they are used to power up the engine of being active and engaging with the app. Achievements or rewards will be separated for kids and parents; for the kids, they can earn skins, characters from other games they play, discounts, tickets, cards. For the parents, they can receive discounts at other companies or shops who want to collaborate with the application.

A pen and paper prototype was created, to get a first look of how this application can look like. The UI will be different for the children and the parents. As seen in Figure 12, the kids will first see their character and the UI will be more playful. For the parents, the UI contains the assignments possible, rewards and other suggestions on how to participate more to the reduction of food waste.



Figure 12: Pen and paper prototype of Family Social Game

### Feed the movement

An application meant to bring communities together with the goal of finding solutions to the reduction of food waste and further share the awareness; showing an overview of posts, much like Instagram or Facebook. As drawn in Figure 13, the posts will be focused on diminishing food waste together as a community. The progress is shown in how well the user is doing in its part on raising awareness. As they like, share, post more, connect with other applications, such as Facebook, Instagram, Twitter and so on, to share the information on other platforms, the user receives points. The goal of the user is to create relevant, interesting posts to help the

community. The goal of the application is together as a community to create a solution to food waste. Menu items can be: statistics (feedback for reflection), profile page options (a character, as in a game, that becomes healthier, better, cleaner as the user earns points), user's own profile page, a feed menu with posts, likes and shares, a tips and questions menu and settings. The rewards in this application can either be expressed through a character the user needs to take care of, or more extrinsic motivation rewards such as coupons, discounts and so on.



Figure 13: Pen and paper prototype of Feed the movement

# Evaluation

These ideas were discussed with our supervisors and our clients. The FoodPrint game is much too complex and not possible to be created in the slot time provided for this graduation project. Feed the movement was thought to be a fine idea, yet just another platform on social media. The family game seemed to be preferred, as it is believed that through the motivation the children get and can spread to their parents, the application will create a more authentic behavior. The next step is to further define and shape the chosen concept.

# **Requirements and Specification**

## Requirements

Together with the client, a list of what attributes the application must have, should have, could have and will not have was created. This will help keep the focus in the right direction, will avoid the conflict between expectations and reality and will help make sure the system applies to the requirements.

#### Must have

The must haves start with the requirement of creating an application that contains gaming elements. The application must create awareness, educate, measure the user's behavior through chosen techniques, give insights (quiz to teach, explain what went wrong and why), collect data, contain a character and reach the prototype stage that can be built on in further development.

#### Should have

The application should include a sense of community for an ease of interaction and inspiration, show statistics, feedback, reflection, contain parents' rewards.

#### Could have

This category is meant to be kept as a bucket of great additions, but only focused on if there is spare time. The application could have a minigame, leaderboard/social part, scan/photograph input as a proof or as a character for the kids to play with, take care of and care for, a homeless person, animation of characters, collaborations with other companies (for rewards, ads) and more variety in the assignments given.

#### Won't have

There is no intention of creating a finalized product. The focus is on creating a welldeveloped concept of the application.

From the research done in chapter 1, an engaging gamified application must haves are: a pallet of choices and assignments (raises the chances the user will connect and engage), an increase of difficulty of challenges as the user levels up, reflection (step back and think), relate what happens in the game to real life, give the freedom to explore or fail within the boundaries, levels, progress, feedback, rewards, clear goal, leaderboards, badges and points.

The application will be created within these boundaries and sets of requirements. This paper focuses on ways to engage and maintain motivation of the target audience in a food waste application. The research question is: How can game design elements help form awareness and

educate by attracting a user and further enhance or maintain motivation and engagement in using an application for diminishing food waste? Towards finding an answer to this question, a set of game design elements will be implemented into the application. Later, they will be tested and changed based on feedback from user tests.

# Specification

In alignment with the requirements, the concept of the game is further explained in detail as well as the game design elements that will be implemented to catch the human eye and further enhance or maintain engagement.

Mentioned earlier, as a look from a different perspective on motivating people towards diminishing food waste, the game in which the target is the whole family in the household, is chosen.

# The family application

An application that involves all family members. A concept in which the influence of the children on parents is being used as a tool to stay engaged to the application and keep learning. This is done by involving the children into the play, who are easily attracted to rewards. For the rewards to be obtained, the parents need to take part of pre-defined assignments that are based on food waste. By finishing the assignments, such as quizzes or to do lists, the parents receive points that can be further used by the children or themselves to buy rewards existent in the shop of the application. This can contain clothing items for the kid's character, backgrounds, accessories, etc.

Layers of game elements and features are added on top of this concept to help trigger and engage the user. These are meant to be tested through user testing. The results will help answer this paper's research question. Also, based on the results, the layers can be adjusted or changed, to be more human centered. This is the starting set of game elements added to the first version of the prototype:

#### Starting Tutorial

Part of using an application is also showing the user what features can be accessed and how, throughout this application. It is important to present a short tutorial in which possibilities are being presented and explained to the user, as it takes part in the exposition of the engagement and sets the virtual world for the user. At the end of the tutorial, the user is allowed to create their own world within the application.

#### Progress bar (level)

A progress bar acts to constantly encourage the user, by letting them know of their progress without any effort. Points are added to the progress bar as assignments are getting

accomplished, serving to represent the family's progress in taking part of diminishing food waste. This will help measure the engagement of the user.

#### Reflection (performance graphs)

An individual performance graph, where the user can visualize their progress through graphs. This will help the user focus on improvements, as positive feedback is one of the oldest known human motivators. After every assignment, the family will get meaningful insight based on their actions.

#### Character (avatar)

An avatar will allow the user to form a relation to the application. Rewards can be used to improve the stage of the character.

#### Assignments

Assignments are used to gain progress, but most importantly, to learn. Through this, the goal is to teach and examine knowledge. Example of assignments are scan a receipt, answer a quiz, make a grocery list and other ways to push people get creative with the resources they have, pay attention to the expiry date and manage the food waste at their household.

#### Progress comparison (per city/neighborhood - nearby)

Based on the activity of the family within the application, one of the menu items will be, similar to a leaderboard, a comparison of nearby families and their take on diminishing food waste through the application. To avoid negative feedback and demotivators, the progress will be shown at a lower scale, where the difference between the families and their progress is not critical.

#### Clear goals

To gain points, the goals are expressed through rewards. Altogether, the main goal is to take part in diminishing food waste. This detail must be expressed constantly, for the focus to not shift. To do so, and for the design of the application to not be overwhelming for the user, the main goal will be expressed under the form of a name for the progress bar, which is already a constant detail that shows up without effort of the user.

#### Rewards for children

Children are involved here as a motivator of the parents. To motivate the children, extrinsic motivation is used through providing a set of rewards that can be gained by using this application.

#### Rewards for parents

The enhancement of extrinsic motivation of the parents will not be in focus, as the gaming elements added to the application serve to build, enhance or maintain an intrinsic motivation towards diminishing food waste. The application has the potential to promote other rewards that would come as a collaboration with other companies. This will not be implemented in the prototype, as it requires more time than what is given for this Graduation Project.

To understand this concept better, in the Figure 14 through 17, a visualization of the chosen idea was made. As it is in an early stage, many details might change in the realization phase of the prototype. This was made with the intention to give a more detailed pen and paper prototype.



Figure 14: Visuals and possibilities of chosen idea

Home	Family members
JOIN OUR COMMUNITY AND REDUCE FOOD WASTE	Introduce your family members
EMAIL ADDRESS	
PASSWORD	
FAMILY MEMBERS	GO
SIGN UP Already a member? Sign in	

Figure 15: Visuals and possibilities of chosen idea – Home screen



Figure 16: Visuals and possibilities of chosen idea – Children UI



Figure 17: Visuals and possibilities of chosen idea – Parent UI

#### UI for children

The interface for the children starts with the character and with the rewards they can gain, if assignments are accomplished. The children have access to customizing the character with earned items. They can also see the progress of friends around their area, access the assignments to further share them to their parents and an overview of the progress of the family. The children can purchase rewards from the store only with the currency the application has.

#### UI for parents

The interface for the parents will include the overall family progress, the assignments, the rewards the parents and the children can obtain, progress comparison as a menu item and feedback and reflection.

#### Data collection

A part of the goals of this Graduation Project is to collect data from the user on food waste behavior and user experience. The prototype does not reach the stage of saving data, as

the front-end design of the application is in focus. Therefore, to be able to test and collect data, user tests are to be planned and performed.

# Conclusion

As mentioned earlier, this project is performed by two students, with different research questions. The common part is together creating the concept of an application that serves the goals offered by the clients. In addition, this paper focuses on the design of the application and the implementation of features and techniques for user engagement, that together are to be tested upon their influence on the engagement and motivation of the user within the application.

In order to answer the research question of this paper, a prototype is created within the requirements and goals established. The application interface and gaming elements are tested through user tests and discussed in the Evaluation Chapter.

# Realization

The realization phase of this graduation project started with meetings in which the concept of the application was further shaped. The best tool to create the prototype was discussed. Adobe XD was the option that seemed fine enough to use, although later on, after doing research on the limitations of this tool, it has been discovered that the process of exporting the application can get complicated, as the extension Adobe XD exports cannot be further developed or built on. These concerns were discussed in a meeting with the supervisors of the project. From their expertise, Figma was recommended to be used, as it fixes the problem Adobe XD has. Figma is an online tool, where the participants can edit together, the changes can be seen in real time and the exported shape of the application can be further worked on or developed.

The process of realization started with designing assets, logo and characters and then later, start designing the user interface. The concept for the logo of the application was defined to represent a hero who stuffs himself with food. The logo can be seen in Figure 18.



# Feed the movement.

Figure 18: Logo

The process of choosing a font can be seen in Figure 19. With the desire of not overbooking the user interface, to keep it simple, but still appealing, "Raleway" was chosen to be used in the design of the application.

Feed the movement (Microsoft PhagsPa) Feed the movement. Feed the movement. (Raleway) Feed the movement. Feed the movement.

Feed the movement

Feed the movement

Figure 19: Fonts

While designing the characters, it was decided to add a new element to it. As the family gains process into the application, with the rewarded coins, children or parents can buy items to become a "Food Waste Hero". The coins are called "HERO coins" and the user's character can become a hero. The characters can be seen in Figure 20 and more assets can be seen in Figure 21. These additions are part of badges, points, progress bar and clear goal gaming elements mentioned earlier.



Figure 20: Characters



# Application

The application has two interfaces, one for the parents and one for the children. The parents can watch over the children and help them gain progress by solving assignments. The interface for the children contains less information. The interfaces are described further in detail:

### Common Ground

Both interfaces start from a common ground: the login screen and the home page. As you can see in Figure 22, because of the stage of a prototype, the user will be sent directly to the next page, Home. Here, both the parents and the children can interact with the chosen character and observe the family's progress in the application. A menu can be accessed on the Home page, that will present the user with the options: Home, Store, Assignments and Social. The interface for the parents presents more menu items, such as Statistics and Settings.



Figure 22: Login and Home Page

Another common ground of the application interface for both parents and children, is the Family Screen, as seen in Figure 23. Here, by clicking on a member of the family, the latest activity can be seen, as well as the status of their character.



Figure 23: Family Screen

# Parent Interface



Figure 24: Parent Interface

The assignment section of the application can be seen in Figure 25. This can be accessed from the menu. Here the parents can view the possible assignment for the day and can participate by solving them. Each assignment has a determined amount of "HERO coins" and points that can be earned. As the family gathers points, they can see their progress on this page. By earning coins, items can be purchased from the store. By earning points, the user can level up by stage, which comes with unlocking more items in the store and receiving other rewards per level.

Assignments	
	ai 🛔 11.50
Feed the movement.	12X
Assignments	
Get assignments done and help your child e These asignments are nade to test knowledge on Food Wood By working on the assignments, your family will learn more abo	am more HERO coins e and further build it. ut Pood Winste.
Ouiz your Knowledge Watch	s
Planning Consuming	Storing
	(v 3) 35/40
Weekly quiz 20	Weekly quiz
Prepare grocery first	
Provisioning Preparing	Disposing
(V 1) 3/10 3/10	(V 2) 30/35
Weekty quiz	Weekdy quiz
Scan à receipt	

Figure 25: Assignments Parent Interface

For further feedback, information and statistics, the parents have the possibility to reflect on their actions by accessing "Statistics" from the menu items. This can be seen in Figure 26. The global view presents current statistics on the issue of food waste and the end goal. The personal view presents details into the activity of the family within the application, videos, other quizzes and links that can be useful to the parents. The concept is that each day, new statistics are displayed, based on performance.

Statistics	Statistics.2
at 👔 11.50	🛥 🖹 11.50
Feed the movement. 12X	Feed the movement. 12X
Global Personal	Global Personal
Where are we now	
10 state Unceffent personality (c) at the state of the	Video of the day
Sustainable development goals Ford The Movement ford to contribute for the automatic availagment goals. Read before why the surface date development goals are so important	
1 %mm 2 80m 3 80000m 4 800m 5 800 6 8 80000m ↑ ♦ ♦ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	
7 mmer ∰ 1 mmer 1 m	Feed the movement. Actions taken by family
S 207 H Hours S 5 An B S A S A S A S A S A S A S A S A S A S	
Feed the movement. Actions Laken by family	M T W T F S S
M T W T F S S	Gather more information on how to waste less food Recommended
EI D	
	Quiz: Food Waste Valorisation
Gather more information on Food Waste and take action!	Refresh
Recommended	Telatile a manager 2 Too Good To Got ESQ
Bo Grand la Ga RESQ	eron Profitesh W MORTH GOALS
STOPFoodWasteie	STOPFoodWaste.ie

Figure 26: Statistics Parent Interface

The social section for the parent interface can be accessed from the menu. This section, seen in Figure 27, opens first by showing notifications, such as nearby activity on the application, comparing families at a low scale to avoid negativity or discouragement and current friend requests. From here, by clicking on "Friends", the parents can access a section with existent friends within the application and the possibility to accept more friends and invite other families to take part of the movement.

0000		Social other option
Feed the movement. 12X	Feed the movement, 12X	<b>⊿ ≋</b> 11.50
Notifications Friends	Notifications Friends	Feed the movement. 12X
Jenna Hampton works to become your Hend	Jenna Hampton series to become your format	Notifications Friends
Marc W, wants to become your friend	Marc W wind La becurve your freed	Jenna Hampton wetris to beccrise your fixing
John indud you to Lat's Quit your Knowledge (Rev V peer)	Marianne Toms exists to become your friend	Marc W. wastline become your fixed
Mager Wayer	Jerna Hampton wents to become your friend	Jahn institut you to Laft Guiz your Knowledge Start
Zulenstein Nee Oud-Wulven Nete	Marc W. write to become your filend	An an and Andread Andre
tier Nieuwegein II Preinsteine Houten	Marianne Torns Cresto E	ATTEND
n De Wiers Doet	Jenna Hampton Trunts E Become your friend	Details A BDD every, where neighbours can get logsther and spread waveness on bod waste Parents can bring recorary front for the family and cook it on the got.
To Dull env Waal	Marc W. Wints to become your filend	Toys, blanksts, music and pels are welcomed
capel User Ossenwähld Auflinkmink Het Monnikerhof Usersenn	Marianno Tons warts to become your found :	Subscribe to our newsletter for more information on food waste Name
Unindusion Pageoveri		Email address
Obstant allow multited by Even at Allagen of Amatt Matter Lann and purchased a Multi Amater with the HBDD Cases Way Just Josef The University Way Just Josef The University State State State State State State State State	Invite more people to join our inverse	Subscribe

Figure 27: Social Parent Interface

The store can be accessed from the menu items. The content of shop for the parents was discussed over, as the initial idea was to collaborate with other companies, such as Albert Heijn, Rituals, Jumbo, etc. This concept is not feasible in the amount of time given for this project. It was then decided that for the prototype stage of this application, the parents will have the same concept for the store, as the children. As seen in Figure 28, parents can purchase items for their character. The concept of collaborating with other companies and offer deals to the parents was thought of as it adds to keeping the parents motivated to use the application and keep learning.



Figure 28: Shop Parent Interface

An example of a quiz can be seen in Figure 29. The quizzes can be accessed from "Assignments".

al 🗎 11.50	
Feed the movement.	
Storing Wieekiy quiz The assignment is worth ga	
Which place is best to store your bread? ${}^{1}$	
Cupbeard	
Freezer	
How long can rice dishes be kept? 2 2-3 days 1 day	
What does "use by" date mean? 3	×
use around the date	

Figure 29: Example of quiz Parent Interface

Throughout the application, the goal is made clear. In the literature, one of the game elements is to keep the goals clear and visible. This has been done here by naming the application "Feed the movement" and display it on each of the screens. Other game elements that have been implemented are the progress bar, levels, leaderboard, feedback, the characters, rewards, points and challenges (as assignments).

Finally, the interface for the parents contains a settings screen, that can be accessed from the menu item. This offers them the possibility to change personal details, ways of getting notifications and other privacy settings, as seen in Figure 30.



Figure 30: Settings Parent Interface

### Child Interface



Figure 31: Child Interface

The interface for the children starts with the store, as seen in Figure 32. Here they can view the items that can be bought with the "HERO coins" and they can purchase accordingly. By asking their parents to complete assignments, the family earns points and progress per food waste stage and can unlock more characters and items that can be purchased.



Figure 32: Store Child Interface

The assignment section for the children shows only the possibilities on how to earn more coins and progress. Here, the child is advised to involve the parent for further actions, meaning any interaction on this page will open a pop-up message, as seen in Figure 33. The child is able to send a notification to the parent, as a reminder.

pop up assi	gnments	
Have your pare	nt complete this as	signment!
	OKI	
Assignments	000	
	eed the moverne	ant 12X
Assignments Here you can find the	a analpernerits your pare	mbs cart do
	Discourse interesting	
Planning	Consuming	Storing
Search Ser	an one of the local division of the local di	the section of
Wagness grants for		_
Provisioning	Preparing	Disposing
In second sport	In second spin	The second pages
Take Street		_

Figure 33: Assignments Child Interface

The social section of the child interface presents notifications and friends. Here the children can see recent friend requests, nearby activity, new assignments and can further send invites to friends. This section can be seen in Figure 34.
Social screen	Friends section
HERO Come Freed the movement. 12X	Feed the movement 12X
Amina Mungatan Amina Mungatan Mane W	America Hampston
	Mitiane Tons with bit Sectory por Hand
	Jurna Hampton Roads schedarie year Flored
Zusersten nur Oud-Wilson ann	Marc W. works to become your filend
ner Nieuwegen Reintede Houten	Mariame Torm web to be been been from E
Le nue	Marc W.
upper Land and Land a	words to become your friend Marisance Toms words to become your friend E
Hand Week Hogesteen	00000
Control Handbook (a) in A start of Handbook Angel of Handbook	to call inform galogita to part call inform wat

Figure 34: Social Child Interface

#### Usability test

Before testing the application with potential users, a test was conducted towards finding bugs or inconsistencies in the design. This has been done by using Figma Mirror, a mobile application which allows the user to explore the prototype. This is connected in real time to the workspace, so any changes can be done easily. Seeing the application for the first time on a mobile screen, helped realize the inconsistency in sizes of fonts, assets and other information. This has also helped find missing connections between the screens.

A user test was held with the intention of receiving an early feedback on concept and design. At that time, the application did not have more than three characters designed, did not provide statistics yet and the possibility to solve an assignment was not developed yet. This test was performed by three students, who had to go through the application and express their thoughts. The interface for the parents was given to them to explore. Even though students are not specifically part of the target group for this application, it can still apply to them, as they are responsible for their own food while being away from home and the application can educate them as well on this matter.

#### Results

One out of the three students have mentioned that not everyone learns the same and proposed music, text, voice or image to be added. In this project, this is not feasible, but for further development this can be taken into consideration. In an open discussion with the participants,

they have mentioned a notification strategy that would make the user think of the application at the right time. For example, for disposal stage, the application would send a notification to remind the user the trash is being picked up soon; for provisioning stage, the application could send a reminder in the first part of the day to make a grocery list. Another remark was the color used for the skin tones of the characters and it was suggested that more diversified characters should be added.

#### Changes

More characters have been designed for a more diversified environment. The size of text and assets has been modified and made more consistent. Two menu items were added for the parent interface: settings and statistics. An example of how a quiz can look like was designed.

After the small user test for early feedback on the interface of the application, a meeting was held together with the supervisors of this project. It was mentioned that the users might experience issues of not understanding the concept of the application and what they have to perform without a proper description of the whole application. Based on this feedback, more changes have been done to the interface, before going into the user testing stage. A new screen has been created providing additional information on what the goal of the application is. Another screen was added with the possibility of the user to choose which character they want to start with. The two new screens added to the application interface can be seen in Figure 35. Female and male versions of the initial characters were created to give this option as well. More assets have been created for the app shop and can be seen in Figure 36.



Figure 35: App description and character choice



Figure 36: Other item possibilities for shop

## Evaluation

In order to evaluate the prototype created for this project, it must be checked if all the requirements were met and tests have to be performed to collect data needed to answer the research question of this paper.

The requirements this application must meet are talked about in detail in chapter 3. From the must haves, the application has met the requirements of having gaming elements (challenges, levels, progress, feedback, rewards, clear goal, leaderboard and points), aims to create awareness on food waste, aims to further educate the user on the food waste behavior, gives insights, contains characters and has reached the prototype stage that can be further developed. For the should haves, the application has met the requirements of having social interaction, feedback and statistics, and rewards. For the could haves, the application has met the requirements of having a leaderboard; the minigame, scan a photo, animation and collaboration with other companies have been left out of the prototype, as the time allocated for the project made these features not feasible to create, yet they are kept in the report for further development. The game elements of increasing difficulty of challenges as the user progresses and offering a pallet of choice for increasing the chances that the user relates to the application have been expressed throughout the design of the prototype, but they must be further developed to assure their effect on the user's engagement behavior with the application.

#### User test

This user test was conducted with the goal of evaluating the features and game elements implemented into the interface of the application. The questions selected to be in the questionnaire are formulated in a way to point out the effects game elements have on human behavior. The literature of O'Brien, H. L., & Toms, E. (2010) has served as inspiration in formulating the questions properly.

As the target group of this application involves parents as much as children, both perspectives must be taken into consideration. Therefore, the parents and children participating to the user test are evaluated in different ways.

For the parents, the focus is on evaluating rather the game elements have any effect on creating, maintaining or enhancing their engagement in the application and the overall concept of involving the whole family into the process, as an engine that generates motivation to use the application. This way, the parents receive the prototype to explore and type down any thoughts about it. After 10 minutes, the parents can answer the provided questionnaire.

For the children, the focus is to attract them in the first place. Of course, there is the possibility of creating a media campaign that attracts children to use this application. Given the time frame of this project, a media campaign is left for further development. For now, the children

are to be tested by being asked questions as they look at the application, focused on whether the concept and design of the application is attractive to play. Their answers and reactions are documented.

The user test was held together with 9 volunteers, out of which 3 children, 2 students and 4 adults. The age of the children varied from 9 to 14 years old. The age of the parents varied from 32 to 48 years old. The students and the parents have been given the same steps to follow. To explore the prototype, write down thoughts and answer the provided questionnaire. The children have been given the prototype to explore, while they are asked questions. At their request, the children can also answer the provided questionnaire.

The questionnaire involves the following questions, which are meant to point out the effect of the game elements on the user and a feedback on the overall satisfaction, concept and design of the application.

- 1. How old are you?
- 2. How clear is the concept of this application? (answer from 1 to 5, 1 being the worst)
- 3. What is the overall satisfaction with the prototype? (from 1 to 5)
- 4. The likelihood of using such application (from 1 to 5)
- 5. What would make this application more attractive to use?
- 6. How engaging is the application for you? (from 1 to 5)
- 7. What would motivate you to use the application? (answers include game elements, such as: progress bar, rewards, social interaction, characters, autonomy, relatedness, design, concept and feedback)
- 8. The likelihood of you recommending this application to others (from 1 to 5)
- 9. How would you describe the application to another person?
- 10. How motivated are you to complete a quiz when your child asks you to?
- 11. How influential is the concept of involving the whole family in this application? (from 1 to 5)
- 12. How clear is the goal within the application? (from 1 to 5)
- 13. What do you think about this statement? (from 1 to 5)

"The possibility of choice makes the application more engaging"

"Using the application is rewarding"

"The application is aesthetically pleasing"

"I was so involved, I lost track of time"

#### Results

9 responses

According to the thoughts written down by one out of 3 parents present for the user test, a mother, the application has a modern look, its concept is valuable and so would be the external collaborations for the shop, it provides a way for both parents and children to learn more about food waste, which, she said, is appreciated especially as they might not even be aware of their food waste behavior. The colors in combination with the design was appreciated and the mother liked the challenges (the quizzes) the most.

From the results of the questionnaire, it seems that the most influential factor that motivates them to engage with the application is its concept of involving the whole family into the process. Then, the results show that the possibility of choice (relatedness) and feedback are on the second place on most motivating features. Next up on the rank of features and their effectiveness in an application that promotes food waste, according to the parents who participated to this user test, are social interaction and statistics on the second on the third place and aesthetics, characters, autonomy, clear goal on the forth place. Fifth place goes to the game element, progress bar. In Figure 37, it can be seen which features were influential to users.



#### What would motivate you to use the app?

#### Figure 37: Game elements

According to the students who have taken part of this user test, playing games and involving the people is fun and desirable and has the potential to create a community. Features such as the BBQ Event, progress bar and social interactions were specifically underlined by the students participating to this user test to be a source of motivation for them within the application.

The children that have participated to the user test have all expressed excitement at the beginning of the test, being very interested in trying out the application. While doing so, they 42

reacted positively to the characters and the items they can get from the shop. As soon as they understood that their parents need to solve the quizzes for them, in order to progress within the app, all 3 children have directed their focus on their parents, waiting impatiently for them to help. A common question raised by the children is rather the items from the shop will change constantly. When the idea of collaborating with other companies that are well-known by them was mentioned, the children seemed to be even more interested.

Answers to the question "What would make this application more engaging?" were the presence of a more developed game within the application, music, receiving rewards when reaching a new level and a menu with meal options.

The question "How motivated are you to do a quiz when your child asks you to?" has been answered by 77.8% to be 5/5 and 22.2% voted 4/5.

The statement "I was so involved, I lost track of time" has been voted to be 3/5 true and below, which means there is room for improvement within the application.

The statement "The application is aesthetically pleasing" has been voted by 75% to be 4/5 and 25% to be 3/5, showing that the overall design of the application must still grow qualitatively.

The statement "Using the application is rewarding" has been voted by 62.5% to be 4/5 and 25% voted 2/5. The items offered by the shop of this application should be better developed or changed into collaborations with known companies by the target, offering discounts and other more attractive deals.

The question "How clear is the goal within the application" has been answered by 62.5% to be 5/5 true and 34% voted 2/5, showing that this game element should be better expressed throughout the application.

The results in Figure 38 show that 8 out of 8 users believe that the concept of involving the whole family in the application is 100% influential in engaging with the application.



How influential is the concept of involving the whole family in this application ?

Figure 38: How influential is the concept of involving the whole family in this application

#### Conclusion

The users who have participated to the user test were intrigued towards using such an application and learning more about their food waste behavior at their household. The parents present at the testing have recognized that the concept of the child motivating its parents is of value and it motivates them to complete a challenge. Besides having this concept as an extra engine of motivation to use the application, the features implemented in the interface with the goal of creating, enhancing and maintaining engagement have served accordingly for some users, as their affect depends from user to user. The results of this user test show which features have had an impact on the user and how the application, together with the concept, was perceived by potential users. Overall, implementing features and game elements into the interface of the application creates a user-friendly platform in which the act of learning becomes more enjoyable and easier to perform. This way, the user has easy access to knowledge and the learning process is made fun by gamifying it.

## Conclusion

This application touches upon a major ongoing issue, food waste behavior at households. The problematic part with promoting such topic is the possible lack of user engagement. The user interface is the first things the user sees when he/she is presented with the application. This makes the user interface an important factor in their engagement behavior. Mentioned before, creating a constant engagement of the user within an application is difficult to maintain, especially online. The main research question of this paper is how can user experience design influence the user engagement within an application that promotes food waste reduction?

The state of the art of this paper shows that there are platforms that aim to create food waste awareness, yet most of them are only playable once, which does not offer enough information for the user to change their food waste behavior, nor focus on households, but on restaurant chains. Further in the state of art, ways of engaging and motivating the user within an application have been researched, as well as related work and more information about food waste. This has served as background knowledge in the ideation process of the application, in which 3 ideas were generated based on requirements and the presented problem.

The family application, that later received the name "Feed the movement.", has been chosen to be further developed, as it showed potential in motivating the parents through their children to keep using the application. Before the realization stage of the application, the clear goals of the client have been specified, in order to help the process of creating the application not shift from its initial course. In this stage, it has been decided that the focus of this paper is on the design of the application and the implementation of the game elements with the goal of engaging the user with the application.

Realization stage started with the design of the assets and the design of the interface. Further, game elements and features have been applied to the interface of the application, a usability test was performed with the goal of finding existent issues and a small user test was performed together with students, for early feedback on the concept of the application and the overall design, before the user test stage, to make sure the prototype is ready to be tested together with users. This has offered some good intel and changes were made to the interface.

Finally, in the evaluation stage, the prototype has been put to test together with potential users. The results of the test show that the game elements have made the learning process offered by this application more fun and easier to achieve. Some of the game elements used had more influence than others and overall, they do influence positively the way the user perceives an action that has to be performed within the application. The number of participants at this test is low and the prototype version of the application limits how far the testing can go. The prototype version does not allow performance of measurements on the user's engagement over time and see more specifically which game elements are effective. Their presence within the application has transformed the perception of the user on the application, making it look more like a game

than an application, which the users showed interest to and even asked for further development in this area. To conclude, using game elements and other features in the interface of the application helps form a good learning environment, by targeting engagement and motivation of user, which is needed for the learning process to start. This also changes the perception of the user, to viewing learning about mistakes as a fun activity, where rewards can be achieved, and knowledge can be gained. Altogether, this application and concept hold potential in becoming a good learning environment for the users and the features used for user engagement glues the platform together to make an activity more enjoyable to perform.

To answer the research question of this paper, "how can user experience design influence the user engagement within an application that promotes food waste reduction? ", it can be concluded that the user engagement within an application that promotes food waste can be influenced by many techniques, such as using game elements, motivational factors, friendly interface for the user, usability, utility, and although it affects users differently and it depends on the factors around the user, using them within this application has helped smoothen the perceptions of the target on an application that aims to teach them food waste reduction.

#### **Discussion and Recommendations**

The prototype version of this application has been tested at a low scale. More exact test result on the user's engagement can be gained as the version reaches a more developed stage. For any further testing, more game elements should be involved, and the questionnaire should be improved, to show clearer what affect game elements and other features have on the user engagement. One example of a game element to be implemented in the future development of this application is consequences. This game element has been lacking literature on what effect it can have on the engagement of the user online.

When asked "what motivates you the most within the application?" the most pointed out factors were family activity, relatedness and feedback. Some results of the test help us realize what still needs to be improved and for any further development of this concept, I recommend keeping a focus on the game elements and offer the user their benefits within the application. Meaning, creating more options of choice (characters, items, assignments, store discounts collaborations, language), create rewards for reaching new levels, create more visuals, animation and develop a minigame for the child interface. Another game element that should be better developed, in this case, is the clear goal of the application. Even after the addition of an extra screen that puts out the main steps needed to be performed within the application, there have been users who still were uncertain about the goal of the application. An increase of difficulty of challenges should be taken into consideration for further development.

Finally, in the list of "Could" requirements that has been thought of in the chapter of requirements, but not feasible in this project because of time limitations, besides the minigame, leaderboard, animation or collaborations with other companies, there is one more thing to be

implemented and that is access to the mobile's camera. Develop the possibility to scan and plan meals together with the application, be reminded of what will go out of date or post inspirational creations in the social part of the application.

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# Appendices

### Appendix A





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## Mind map B



# Appendix B

# Paper Prototype





Feed the movement 60% 100 LEVEL (4) FOOD PRINT CHI CUULUUU Patts elizabethundrinon 2000 likes 400 shales # food weste . # food the rubernearts share / returnet / discover ideas Tips Stave

# Appendix C

## Adobe XD prototype









59

## Appendix C

#### Adobe Illustrator assets



# Feed the movement.

Feed the movement (Microsoft PhagsPa)

Feed the movement.

Feed the movement. (Raleway)

Feed the movement.

FEED THE MOVEMENT

Feed the movement

Feed the movement





## Appendix D

#### Figma prototype

Parent UI















#### Child UI








# Appendix E

### Questionnaire

	How old a	re you?						
	Short answer te	ext						
	How clear	is the o	concept	of the app	lication?*			
			1	2	3	4	5	
	Unclea	r	0	0	0	0	0	Clear
	What is th	e overa	ll satisfa	ction with	the proto	ype?		
			1	2	3	4	5	
	Not sat	isfied	0	0	0	0	$\circ$	Satisfied
	The likelih	lood of		ch applica	tion			
	The likelin	1000 01	using su				F	
		0	)	-	•	4	°	
		0		0	0	0	0	
	Are there	any fea	tures you	u would co	ompletely i	gnore?*		
	Long answer te							
	What wou	ld make	e this pro	oduct more	e attractive	e to use? *		
ikelihood (	What wou Long answer to of you recom	ild make	e this pro	oduct more	e attractive	e to use?*		
celihood o	What wou Long answer to of you recom	ild mak 	e this pro	oduct more	e attractive o others 5	e to use?*		
xelihood e	What wou Long answer to of you recom	Ild make	e this pro	oduct more	e attractive o others 5	e to use?*		
kelihood d	What wou Long answer to of you recom	ild make mendin 2 0 e app to	g this app 3	plication to	e attractive o others 5	e to use?*		
kelihood k would you	What wou Long answer to of you recom 1 0 ( u describe the	ild make intendin 2 C e app to	g this pro g this app 3 another	plication to 4 person? *	e attractive	e to use?*		
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would you motivated ot motivated	What wou Long answer to of you recom 1 u describe the d are you to d 1 1 u ink about thi	III make mendin 2 2 2 2 3 4 4 4 5 5 5 5 5	g this pro	plication to 4 person? * 4 ur child as 4	e attractive o others 5 0 ks you to? 5 vv	e to use?* ery motivated track of		
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kelihood d would you motivated do you th t applicable	What wou Long answer to of you recom 1 u describe the d are you to d 1 u describe the d are you to d 1 u describe the d are you to d	Id make mendin 2 2 3 a app to 2 2 3 s staten 2	g this apr 3 another when yoo 3 o nent: * I w 3	plication to 4 person? * ur child as 4 vas so invo 4	e attractive o others 5 0 ks you to? 5 0 vv lved, I lost 5 0	e to use?* ery motivated track of applicable		
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kelihood d would you notivated do you th do you th	What wou Long answer to of you recom 1 0 0 0 0 0 0 0 0 0 0 0 0 0	IId makk mendin 2 2 2 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	g this app g this app another when you another when you another when you another ano	educt more plication to 4 person? * ur child as 4 vas so invo 4 c e app is ac 4	e attractive o others 5 0 ks you to? 5 1 ve lved, I lost 5 0 sthetically 5	e to use? * ery motivated track of applicable pleasing"		

What do you think about this statement: "Using the app is rewarding"  $^{\ast}$ 

1
2
3
4
5

Disagree
Image: Constraint of the second sec

## What do you think about this statement: " The possibility of choice makes the " application more engaging" $% \left( \left( {{{\mathbf{x}}_{i}}} \right) \right) = \left( {{{\mathbf{x}}_{i}}} \right) = \left( {{{\mathbf{x}}_{i}}} \right)$

	1	2	3	4	5	
Disagree	0	$\circ$	0	$\circ$	0	Agree

### How influential is the concept of involving the whole family in this application $\overset{\circ}{}_{2}$

1	2	3	4	5
0	0	0	0	0

#### How clear is the goal within the application?

1	2	3	4	5
0	$\circ$	0	0	$\circ$

#### How engaging is the app for you?\*

	1	2	3	4	5		
	0	0	0	0	0		

would never use it	0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\circ$	I would use it constantly
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#### What would motivate you to use the app?\*

Progress bar
Rewards
Social interaction
Family activity
Characters
The sense of autonomy
Relatedness
Design
Concept
Feedback and statistics on user's performance
Tips and further actions outside the app

#### The likelihood of you recommending this application to others

1	2	3	4	5
0	0	0	0	0