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Master's Thesis  
Academic Year 2020

Little Chef: A Gamified Interactive Recipe  
Aiming to Involve Children in Meal Preparation



Keio University  
Graduate School of Media Design

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A Master's Thesis  
submitted to Keio University Graduate School of Media Design  
in partial fulfillment of the requirements for the degree of  
Master of Media Design

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Abstract of Master's Thesis of Academic Year 2020

Little Chef: A Gamified Interactive Recipe  
Aiming to Involve Children in Meal Preparation

Category: Design

Summary

As the society steps into the internet age, our lives became more convenient than the past with the help of technology. In the aspect of eating, an important part of our daily well-being, we rely heavily on ready-prepared foods we acquire from different sources. The increased presence of processed meals on our dining tables has led to a growing concern over the unhealthy dietary behaviors of children that could lead to health issues when they grow up. It is believed that such an undesirable trend is also resulted from the demise of cooking skills among the younger generation.

Although relevant research has clearly indicated that involving children in meal preparation can contribute to the formation of healthy dietary practices, cooking with children has always been a difficult subject for many. Factors such as parents' lack of experiences to perform mentorship and children's disinterest in cooking have all hinder the practice from being carried out within households.

With the outbreak of COVID-19 quickly sweeping through the world, the chances for families to dine outside have rapidly decreased due to the closure of restaurants and the emergence of social distancing campaigns. Moreover, the expensive costs of meal delivery services have made people unwilling to order meals online. Such a background has given cooking with children a great opportunity to be performed at home.

This paper will introduce the design of a gamified culinary curriculum powered by an interactive recipe. It solves the problems of cooking with children from two perspectives: motivating children and empowering parents. In addition, the experimental results and the extensibility of the project will be discussed in the end of the paper.

Keywords:

cooking with children, gamification, human-computer interaction, parent-child interaction

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# Chapter 1

## Introduction

### 1.1. Project Background

Eating is one of the most fundamental activity which keeps us alive. From the ancient world to the modern society, an important part of human culture has been built around food and dining. In such contexts, meal preparation is no longer a way to obtain an adequate amount of nutrition just for survival, but rather it becomes a universal practice which deeply affects important aspects of our lives, such as health, interpersonal relationships, education and communication.

Being an activity that is widely performed inside families, meal preparation has also been seen as an important way to influence child development. Prior to the enlightenment period in Europe which led to the widespread of modern science, not much effort has been put into observing the impact of food on children. Yet when the advancement of science started to fulfill the physiological need and the safety need of the general public, scholars began to look into how food could be a crucial factor to the wellbeing of children. For instance, in 1894, American pediatrician Emmett Holt published his famous book *The Care and Feeding of Children*, which provided a genuine guide for parents on preparing meals for their children from a scientific perspective. In the following decades, such an effort had been further extended to the development of culinary curriculums which allowed children to take part in meal preparation. For instance, Betty Crocker, the famous American recipe advertising brand, published numerous series of cook books for children in the 1960s, aiming to popularize culinary art education in the country. It was acknowledged by many that allowing children to participate in kitchen activities could improve their basic living skills which are essential to their physical and mental development.

As the wave of globalization proceeded in the past decades, our society has taken

a big leap forward in terms of industry upgrading under the power of technology. With the dramatic increase of career opportunities generated from these emerging industries, notably the advancing internet world, more and more individuals are inclined to walk out of families and join the massive workforce to achieve economic prosperity. Under such a changing circumstance, the population of housewives who have been playing as the supervisors of children inside households has thus declined drastically. According to a study from the U.S Bureau of Labor Statistics in 2002, the number of working women is projected to reach 92 million by 2050 —on the basis of an annual growth rate of 0.7 percent (Toossi 2002). The rapid transformation of household structures is even more evident in East Asian countries such as China, Korea and Japan, where traditionally women were encouraged to take care of the household instead of joining the workforce. The declination in the number of housewives in these countries causes the lack of mentorship which kept children further away from kitchen.

At the same time, internet companies have started to seek business opportunities in between the pain points of modern working individuals, such as the lack of time and energy to cook. Companies like Uber in USA, Meituan in China and Demae-Can in Japan have created food delivery services which utilize the internet technologies that keep us connected. As result, the hurdle for getting cooked food has been significantly lowered, further depriving the precious opportunities to participate in meal preparation from children. Without enough lessons on food appreciation, the increase presence of cooked food in families has led to unhealthy dietary practices being performed by children, and consequently to various health issues. According to the Centers for Disease Control and Prevention (CDC), 1 in 5 school-age children and young people aged 6 to 19 years in the United States has obesity (Fryar et al. 2018). Some of them suffer from diseases such as diabetes, asthma and cardiac arrhythmia.

### **1.1.1 The Outbreak of COVID-19**

When it seems that the decreasing trend in the involvement of children in meal preparation will not reverse in the near future, COVID-19 surprisingly struck the world in the beginning of 2020. Originated in Wuhan, China, the pandemic quickly swept through the rest of the world in the following months, bringing more than

61 million confirmed cases and 1.44 million deaths worldwide by December. It has entirely, and in some senses permanently changed the way people live, leading to the emphasis on social distancing and staying indoor as often as possible. As restaurants were either forced to shut down or shift their businesses to online platforms, the scarcity of available cooked food and the drastically rising prices for meal delivery services have once again made cooking at home a necessity for many families. According to App Ape, Japan's largest market data analytic platform, the daily active users (DAU) of the country's trending cooking applications such as Cookpad, Kurashiru and Delish Kitchen has experienced a sudden increase starting from the end of March, following the close down of the country in the beginning of the month (Figure 1.1).

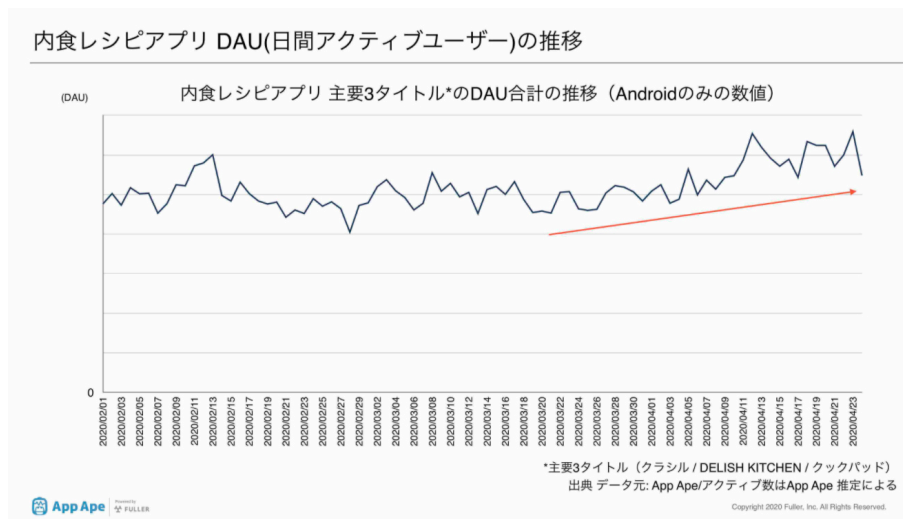


Figure 1.1 The DAU Trend for the 3 Major Online Recipe Services in Japan

Not only were families more exposed to cooking after the outbreak of COVID-19, the time spent between parents and children has also experienced an increase as schools were forced to shut down under national orders. The behavioral changes which the post-pandemic society have gone through provides an unprecedentedly suitable environment for the practice of children's culinary curriculum guided by their parents.

## 1.2. Goals

Now, with the core problem and the opportunities identified, I began to examine them from a closer perspective. First, I conducted a preliminary research survey on the topic of cooking with kids, targeting those who have children aged from 3-5. The purpose is to lay a foundation for the next step, which is a design solution that would install the culture of cooking with children into families. I believe 3-5 is an appropriate age range to observe, since I could implement design interventions that would provide rudimentary lessons in meal preparation and food appreciation before children start to attend primary schools. Within a week after I published the survey online, I have collected responses from a sample size of 112 respondents living in 7 different countries, including China, USA, UK, Germany, France, Japan and Korea. The goal of the survey is to find out how frequent parents cook with their children, as well as the possible factors which prevent them from doing so.

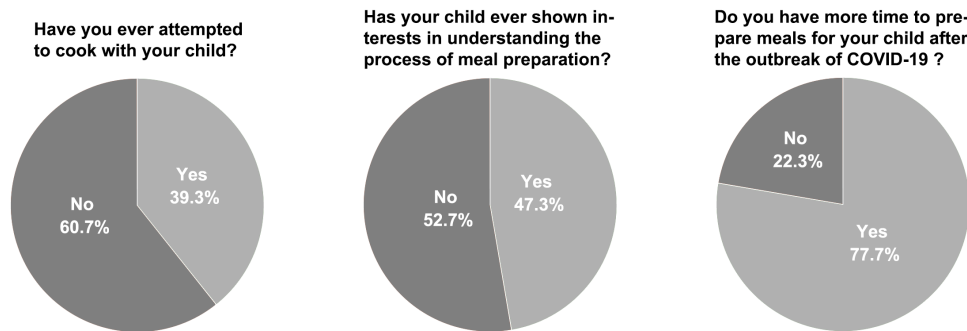


Figure 1.2 Survey on the Views with Respect to Cooking with Children aged 3-5 (N=112)

According to the survey (Figure 1.2), more than 60% of respondents haven't attempted to cook with their children in the past. However, nearly half of the respondents report that their children have shown interests in the process of meal preparation at a certain point. Although the other half did not report such interests, the numbers have left an imaginative space for potential design interventions which would make cooking more appealing to children, yet avoiding the possibility of completely starting from scratch if the percentage of "yes" is significantly

lower. Furthermore, 77.7% of the respondents said that they have more time to prepare meals for their children after the outbreak of COVID-19, which supports my previous hypothesis that the post-pandemic society is a suitable environment for the implementation of culinary curriculum for children with the guidance from their parents.

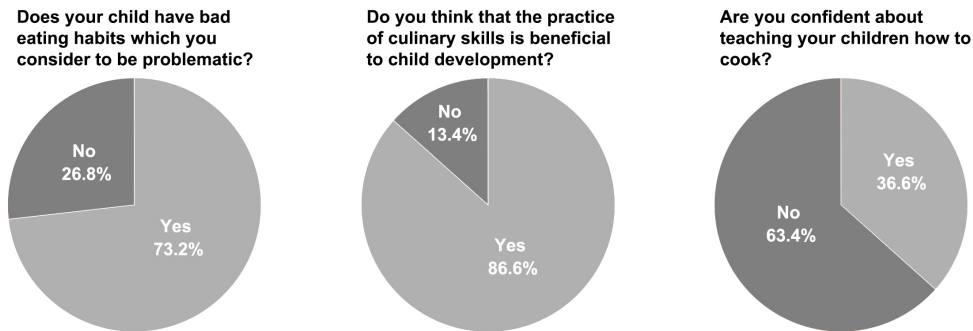


Figure 1.3 Survey on the Views with Respect to Cooking with Children aged 3-5 (N=112)

On the other hand, the majority of respondents reported that their children have poor dietary practices which they believe to be problematic. Moreover, more than 86.6% respondents do believe that the practice of culinary skills is beneficial to child development, yet most of them are not confident about teaching their children how to cook (Figure 1.3).

Not only does the survey show that parents generally do not have confidence in their children's ability to follow a recipe, but it also indicates the proportion of different barriers which prevent children from joining meal preparation. While "the lack of time" is no longer an issue for most respondents with the stay home campaigns launched around the world, "children's lack of interest" and "the lack of confidence to teach" have become the most apparent obstacles which parents face when they start to consider letting their children into kitchen.

To sum up, while the outbreak of COVID-19 sets up a desirable scene for the promotion of cooking with children, parents still need assistance in appropriately perform guidance throughout the process. At the same time, with barely any lessons on the appreciation of food, children also need to be motivated in order



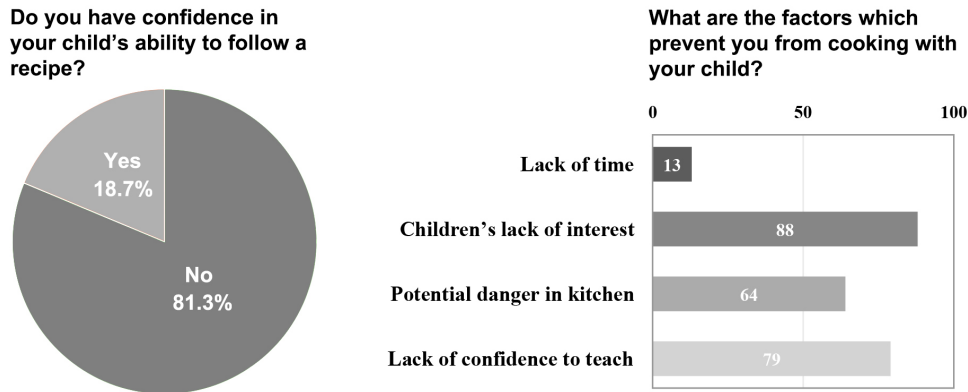


Figure 1.4 Survey on the Views with Respect to Cooking with Children aged 3-5 (N=112)

to be an active participant in meal preparations.

That is what “ Little Chef ”, a project I have started, aims to solve. Taking the form of a gamified interactive recipe, Little Chef not only plays the role of helper for parents, but also provides entertaining experiences for children to be engaged in meal preparation. By carrying out this project, I hope to seize the opportunity of the increasing household-oriented activities during the pandemic to install the culture of cooking with children into families, and consequently lead to the development of healthy dietary practices for children. Here are the goals of the project:

### 1.2.1 Motivating Children

Motivating children is a crucial part of the project. From my field research which will be further discussed in the 3rd chapter, I've found out that children from 3-5 generally have the cognitive ability to understand simple language and instructions. The challenge then is to create pleasurable experiences powered by intuitive contents that would keep them interested and motivated. Without a strong catalyst that could contribute to the ignition of their passion for cooking, children could easily drop out of the cooking process regardless of the degree of cognitive ability they possess.

### 1.2.2 Empowering Parents

From the research survey, it is evident that parents nowadays are still relatively clueless when it comes to guiding their children in kitchen. I envision Little Chef to be a teaching assistant which helps parents to cook with children in a more entertained way, while ensuring that professional instructions are being given out. Since kitchen is considered to be a dangerous place to perform educational activities with children, I want to alleviate the stress for parents brought by their role as a coach under such a circumstance. To achieve this, I aim to empower them with relevant instruction hints that could help them when they feel unsure at any stage of the cooking process. Interaction designs which strengthen the notion of companion between parents and their children are also included in the making of the gamified interactive recipe.

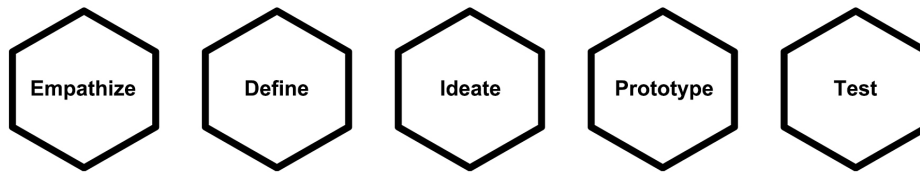


Figure 1.5 The Five Phases of the Design Thinking Process

## 1.3. A Design Thinking Approach

The execution of the Little Chef project is guided by the design thinking process (Figure 1.5). It is a human-centered approach which involves five phases—Empathize, Define, Ideate, Prototype and Test. The strategy lays a solid foundation to the design concept with methods including problem framing, convergent and divergent creative thinking, prototyping and usability evaluation. Since the design directions of Little Chef are based on hypotheses derived from relevant research and observations, employing the design thinking strategy would make sure

that the final product has the potential of being deployed to the market.

## 1.4. Thesis Organization

This paper follows the basic structure of a design track thesis. Here are the contents of each chapter:

- Chapter 1 introduces the background of Little Chef with a focus on how contemporary lifestyles have made involving children in meal preparation difficult. It defines the problem which the design artifact aims to solve from the analysis of a preliminary research survey, as well as introduces the project goals.
- Chapter 2 reviews related academic research in three main topics: the effect of involving children in cooking on their dietary practices, children's perception on meal preparation, and cooperative parent-child relationships. It also reviews related works related to cooking with children.
- Chapter 3 focuses on the design process of Little Chef, including the field research of the project and the showcase of the design artifact.
- Chapter 4 explains the comparative experiments performed with 2 families, using both the design artifact and standard smartphone recipes to cook the same cuisine with children. It also analyzes the data collected from the experiments.
- Chapter 5 examines the entire project based on the given goals, and further discusses the extensibility of the project in the future.

# Chapter 2

## Review

### 2.1. Related Research

In order to ensure the fidelity of the defined problem and to gather supportive literature for the design ideation, three related research fields were studied: the effect of involving children in cooking on their dietary practices, children's perception on meal preparation, and a cooperative parent-child relationship.

#### 2.1.1 Effects of Cooking on Children's Dietary Practices

Since this design project is centered around the concept that involving children in meal preparation is beneficial to child development, it is necessary to determine the correlations between such a practice and children's health through literary reviews. Anliker et al. (1992) reported that children who have more control over consumed food have significantly higher scores on nutrition awareness, including the origin of foods, food values, and the role of foods in the energy balance. It was also evident that children's participation in food related activities correlate with intakes of protein ( $r = .18$ ) and vitamin C ( $r = .26$ ) (Anliker et al. 1992). In a survey targeting 3,398 Canadian elementary school children, Chu et al. (2013) discovered that children who have helped with food preparation at home have a higher tendency for selecting and eating healthy foods out of self-consciousness (Chu et al. 2013). Horst et al. (2014) conducted an experiment targeting 47 children to observe the effect of their involvement in meal preparation on their vegetable intake. After comparing condition 1 ( $n=25$ ) where children prepare meals under parents' assistance and condition 2 ( $n=22$ ) where parents prepare meals alone, it is confirmed that involving children in meal preparation can increase vegetable intake (Horst et al. 2014). The research presented above indicates that encour-

aging parents to involve their children in meal preparation could be beneficial to children's health. However, according to the preliminary research survey which I have conducted, most parents are still not confident in guiding their children during the process of cooking. Although there are many school-based nutrition education programs that partially contribute to the development of culinary skills for children, these programs could not be carried out on a daily basis, nor are they available in the midst of the COVID-19 pandemic. To promote this health improvement strategy, it is necessary to design a new way to ensure that cooking with children could be smoothly carried out within families from time to time.

### **2.1.2 Children's Perception on Meal Preparation**

Another important aspect to frame the design concept is children's perception on meal preparation. Since one of the goals of Little Chef is motivating children to participate in meal preparation, it is crucial to understand the current situation and children's mentality before proceeding to the content design of the product.

The demise of cooking skills among young people has been a widespread social concern. Lang and Caraher (2001) stated in their study that the increasing input in the development of young people's technological skills is directly associated with the decline in traditional skills such as cooking (Caraher and Lang 2001). To find empirical evidences on the increasingly analogous food culture among young people, Caraher et al. (2004) conducted an experiment using a technique called draw and write to understand the views of children on the world of cooking and food. They targeted 82 children aged 8-9 in three schools in UK, finding that the presence of fast food clearly has significant influences over children's stories on food preparation at home. The declining presence of "formal meals" which consist of cooking from basics and introducing an order could be seen when processed food frequently show up in children's drawings (Caraher et al. 2004).

Despite the fragmentation of food culture and food literacy among young people, a survey given out by the National Food Alliance in UK (Figure 2.1) suggests that their food skills rise significantly when there is a greater input of technology in cooking-related activities (MORI 1993). Although this result might suggest that technologies have turned "cooking from scratch" into "opening a packet", young people's high literacy in technology and their interests in the digital world still

have a crucial role in helping them to retrieve the cooking skills that have been disappearing in the recent generations.

**Young People Skills: Which of these can you do yourself?**

Skill	Percentage with these skills
Play computer games	93
Use a music centre or CD	77
Programme a video to record something on TV	61
Heat up a pizza in a microwave	60
Make a cake	54
Cook a jacket potato in the oven	38

Figure 2.1 A Survey by the National Food Alliance, UK (MORI 1993)

Moreover, children’s drawings with implications on meal preparation as “love from caregivers” could also be seen in the research conducted by Caraher et al. (2004). The study suggests that meal preparation still plays a central role in expressing love and caring in family situations (Caraher et al. 2004). Therefore, starting from the emotional value of preparing meals at home could be a viable strategy motivating children to get involved in such activities.

To sum up, the opportunities of developing a successful cooking experience for children lie between two main approaches: the implementation of technology in the cooking process, and utilizing the emotional value of preparing meals at home. The design of children’s experiences in Little Chef is guided by these two directions derived from the research presented above.

### 2.1.3 A Collaborative Parent-Child Relationship

Designing the style of interaction between parents and children during the process of cooking together is also important to the Little Chef project. Tradi-

tionally, when parents want to teach their children how to cook, they usually play as instructors who give out orders. However, it is questionable whether this style of unilateral instruction-giving could arouse children's willingness to be involved in meal preparation. Maccoby (1999) suggests that a coercive style of parent-child relationship may have many limitations, such as children's power of counter-coercion and their practical inability to obey. She believes that the exercise of parental coercive power should be a minor element in parent-child relationships (Maccoby 2199). On the other hand, Duncan et al. (2009) introduces a model of "mindful parenting" in which parents pay full attention when interacting with their children, act in a self-regulatory way during the interactions, and remain nonjudgmental to their children's behaviors. The study suggests that the model could improve the quality of parent-child relationship by intentionally bringing moment-to-moment awareness to both parties (Duncan et al. 2009). Since cooking with children falls into the category of parenting, establishing a cooperative relationship where children feel less subordinated to parents and have more control over the process of cooking is crucial.

Lin et al. (2020) on the other hand studied the effect of Pokémon GO on parent-child interaction. According to the study, Pokémon GO creates a common topic for the family and fosters children's independence with its gaming features, notably the assignments of missions. It improves parent-child interaction by building up a cooperative environment at which they have shared responsibilities (Lin et al. 2020).

With the insights gained from the research above, I've come up with a new interaction model for parents to cook with children (Figure 2.2). Instead of letting parents to play the role of instructor, a third party gives out instructions to both the parent and the child, strengthening the notion of team in between them. Throughout the cooking process, parents perform their mentorship in a cooperative manner where children's freedom to explore meal preparation is ensured. Without the feeling of subordination and obedience, It is believed that children would be more willing to be involved in meal preparation.

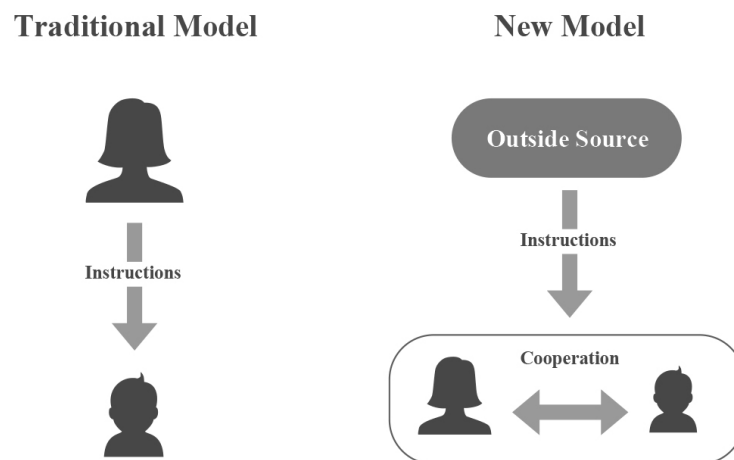


Figure 2.2 Transition in the Interaction Model for Cooking with Children

## 2.2. Related Works

To confirm the precedent effort made by others in the area of children's cooking and food education, I looked into related works in the market. These works might not directly be the tools for cooking with children, but they do have some inspiring features which I could refer to during the design process.

### 2.2.1 Issa's Edible Adventures

Issa's Edible Adventures is an iOS application designed to teach children diversity, social studies and global citizenship under the theme of cooking. The app comprises of episodes in which children follow young Chef Issa's journey around the world and eventually back to her Mom's restaurant. In the app, knowledge on the ingredients (Figure 2.3) and cooking techniques of various cuisines (Figure 2.4) are being taught across episodes, enabling children to develop intimacy towards cooking and food. Issa's Edible adventures is a great example of how to teach children food appreciation in a way that fits the digital age.

However, unlike Little Chef, the app is not intended to be used during the





Figure 2.3 Teaching Children the Origin of Ingredients (Issa's Edible Adventures)



Figure 2.4 Teaching Children the Basic Techniques of Cooking (Issa's Edible Adventures)

process of cooking. The animation-powered demonstration of the cooking process is overly abbreviated that it only serves the purpose of giving children a rough idea on how the food is made. Instead, when children complete the storyline of a cuisine, a text-based recipe with more details are generated so that parents could cook with children following along that specific recipe. The episode itself does not contain the involvement of parents. Although Issa 's Edible Adventures is a great app for food education, it does not innovate the way of cooking with children.

### 2.2.2 Yibu

Yibu is an iPad app connected to a series of playful wooden sensors, developed by Frog Design Shanghai (Figure 2.5). It connects gamified digital experiences to the real world, emphasizing the importance for kids to explore the environment around them. For example, if a polar bear inside the iPad is suffering due to the increasing temperature, the player needs to put the corresponding sensor to a place as cold as the freezing chambers of a refrigerator.

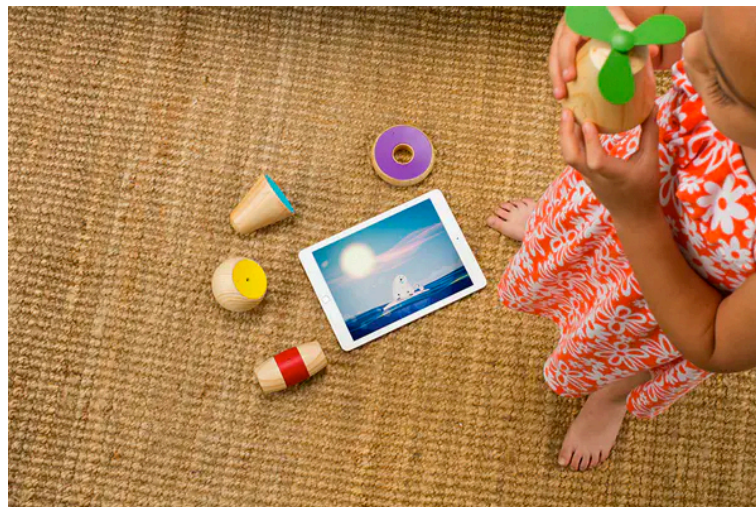


Figure 2.5 A Child Playing with Yibu (Frog Design Shanghai)

Although Yibu is irrelevant to cooking, it is nevertheless a great inspiration to me. Yibu 's concept that digital experiences should play the role of enhancing real-life experiences is applicable to the subject of cooking with children. Through

designing the touchpoints between the digital experiences and the real-life cooking practices, Little Chef could set itself apart from other cooking apps for children where children stay on the screens all the time.

### **2.2.3 The Boiled Eggs**

The Boiled Eggs is a simulation game which resembles the process of boiling eggs in kitchen. It requires players to “boil eggs” in multiple pots at the same time during the game. Players need to constantly keep track of the conditions of different pots and adjust different factors, such as temperature, from time to time to keep everything in order. Unlike other cooking games which teach children abstract ideals such as “fast food is bad” or “get to know the origins of ingredients”, this game focuses on hands-on techniques of real cooking. Although it is relatively simple, The Boiled Eggs has a very strong connection with the scenario of boiling an egg in a real-life context. For instance, it reminds players that a person working in a kitchen may need to keep track of numerous things at once. The Boiled Eggs serves as a great reference for me to develop a game which teach children hands-on techniques that they could really use when they cook in real-life.

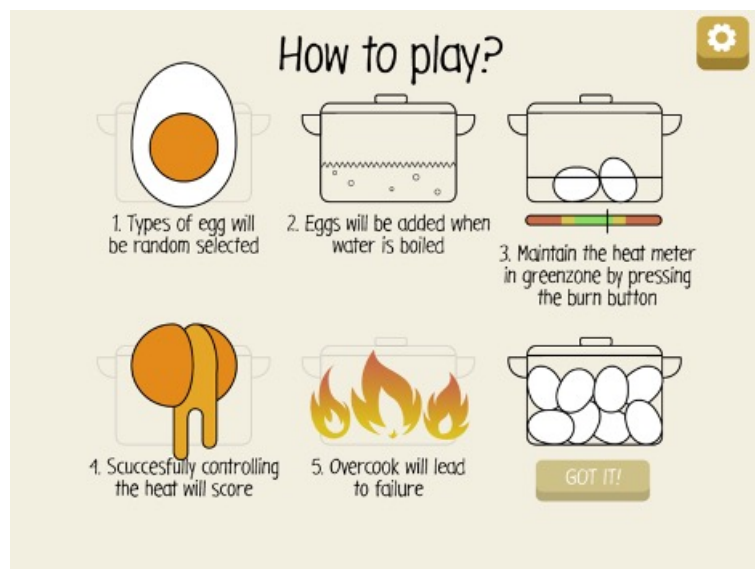


Figure 2.6 The Boiled Eggs

# Chapter 3

## Design

### 3.1. Introduction

As briefly introduced in the first chapter, “Little Chef” is a gamified interactive recipe which aims to make cooking together a smooth and pleasurable experience for both parents and children. The design targets children aged 3-5, as 3 is an age where children develop sufficient cognitive ability to carry out the work, and 5 is an age just before children start to attend schools. From the initial launch of the project in October 2019 to the completion of the final prototype in November 2020, the design of Little Chef has experienced two iterations, with the second iteration built on the lessons learned from the first.

### 3.2. The First Design Research

#### 3.2.1 The Origin of the Project

The project first started with a common opinion shared between me and two of my classmates from the Global Innovation Design Program, that the food culture in the United Kingdom, especially in homes, is lacking variety. From informal chats with local people, we have also realized that a few types of cooked food, such as fish and chips, spaghetti and pancakes, were increasingly dominating dining tables within families. Since nutritional balance is crucial to children’s growth, we began to wonder whether this pattern of unvaried diet is harmful to child development. Such a concern has eventually turned into a project. To acquire more information on the problem, we conducted two deep interviews with local residents who have one or more children at home aged from 3-5.

### 3.2.2 Local Interviews

The first interview was held with Dr. John Stevens from Royal College of Art on October 17, 2019. He is the director of the GID program, but also the father to two boys. The interview took place in a studio at Royal College of Art, and lasted for approximately 40 minutes. To collect as much information as possible in the beginning phase of the project, we did not set a specific interview agenda with a set of prepared questions. Instead, we asked Dr. Stevens about how he handled preparing meals for his children at home, and then asked further questions when we wanted to know more about his answers.



Figure 3.1 A Photo of the GID Group. The Last Row, First from the Left, Dr. John Stevens

From the interview, we have made two important discoveries. First of all, both of Dr. Stevens's children have a strong preference over what is usually considered “unhealthy”, including McDonald's, biscuits, cakes and sweets. The reason, according to Dr. Stevens, is that he and his wife were both busy working, and thus they did not have enough time to prepare organic and healthy meals. After eating too much “unhealthy food” and other ready meals, a certain degree of addiction over these types of food could be seen in the dietary practices of his children. The second important discovery is that both children did not have many opportunities to be educated on how different kinds of food are prepared, and thus did not view properly eating on the dining table as something important. Although Dr. Stevens and his wife both have a certain level of cooking ability, they did not have the culture of exploring new recipes from time to time, nor did they have experiences in educating their children on food. They usually stick to

a few recipes they are familiar with when they cook for their children.

The second interview was held with Melanie Williams (Figure 3.2), an independent glass artist who lived with her husband and her 4-year-old son near the Kensington Area. Melanie was my landlord in London, and we've managed to have the interview conducted on October 19, 2019 at her home for approximate an hour. Like the interview conducted with Dr. Stevens, we did not set a specific agenda with prepared questions, but adopted the style of open discussion.



Figure 3.2 Interviewing Melanie Williams

Different from Dr. Stevens who had limited time to spend on preparing meals for his children, Melanie cooked for her family almost on a daily basis. Furthermore, as she cares about the intake of healthy food of her son Kenneth, Melanie was used to exploring new recipes that are usually organic and consisted of fruits and vegetables. She allowed Kenneth to eat “unhealthy” food as rewards for his achievements, such as getting good grades.

However, Melanie also shares a major pain point which Dr. Stevens has, which is her son's lack of respect to the meals she prepared. According Melanie, although

she was careful about Kenneth's diet at home, the boy often eats fast with many leftovers on his dish, ignoring her words on how precious the food is. Melanie was worried about such a phenomenon which became even more noticeable after Kenneth started to attend a boarding school. She wanted to find a way to keep her son on the table during meals and have him eat more mindfully.

### **3.2.3 Summary of the Local Interviews**

From the interviews, we were able to define the two major problems which we wanted to solve:

- A new strategy needs to be adopted to promote healthy diet for children at home, yet it cannot be simply verbal teachings from parents. Children should be motivated on their own to develop a healthier eating habit.
- inexperienced parents need to be empowered to carry out the responsibility of guiding their children on healthy dietary practices, yet such a guidance should not contain a strong sense of hierarchy in which children would feel uncomfortable with.

## **3.3. The First Prototype Iteration**

### **3.3.1 Design Direction and Value Proposition**

With the problems defined, we conducted desk research on how to improve children's dietary practices, as shown in 2.11. Based on the research, we decided to involve children in cooking to strengthen their understanding and appreciation of food. After a few brainstorm sessions, we came up with the idea of a gamified interactive recipe which parents could utilize when they teach their children how to cook. The design has two core values (Figure 3.3):

- Provide a fun and engaging experience for children to participate in meal preparation.
- Serve as a supplementary material with guiding tips which parents could freely utilize to involve children in meal preparation.



## Initial Value Proposition

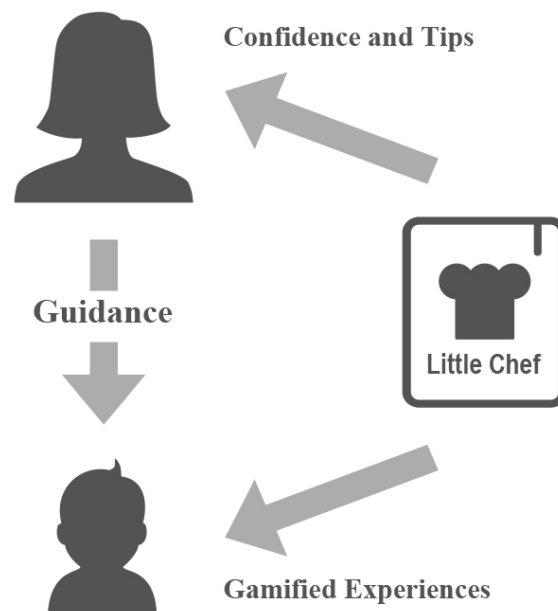


Figure 3.3 The Initial Value Proposition of Little Chef

The first step of making a prototype is to choose the recipes we want children to try out. After research and discussions, we have decided to adopt two recipes that have the potential of arousing children’s interests: Chinese wonton and Japanese Sushi. The common advantage of these two recipes is that the making process consists of interesting steps which children could enjoy. Furthermore, the boundaries between steps in these two recipes are relatively clear, making it possible to design a step-oriented prototype resembling the entire cooking process. After trying out the recipes on our own (Figure 3.4), we have created the structure of the game and specified the steps of each recipe. With that in mind, we designed entertaining interactions that could replicate the steps we have specified and translate them into fun experiences helping children to better comprehend the cooking process.



Figure 3.4 Trying out the Sushi Recipe

### 3.3.2 Design Artifact

Two prototypes of the gamified interactive recipes available on iPad were made using Adobe Illustrator and Principle (Figure 3.6, Figure 3.7). The two recipes have 12 steps and 13 steps respectively, and each step has interactive elements corresponding to real-life actions that needed to be done in that specific step. The interactive recipes are designed to be used before the actual cooking process (Figure 3.5). First, a parent teams up with his or her child and go through every

step of a recipe by playing the game. Then, when the child has a rough idea on how to cook from the recipe, the team of two perform real cooking in the kitchen. The prototypes we made were exhibited in Darwin Building at Royal College of Art (Figure 3.8).

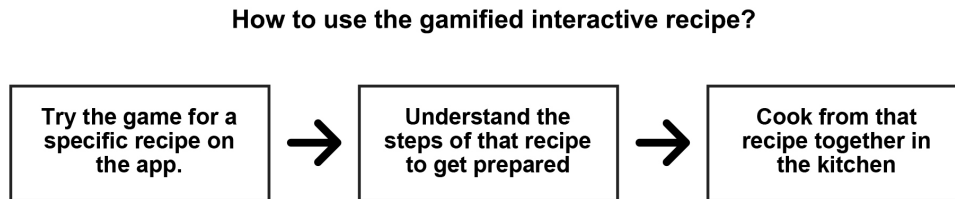


Figure 3.5 How to Use the Gamified Interactive Recipe?

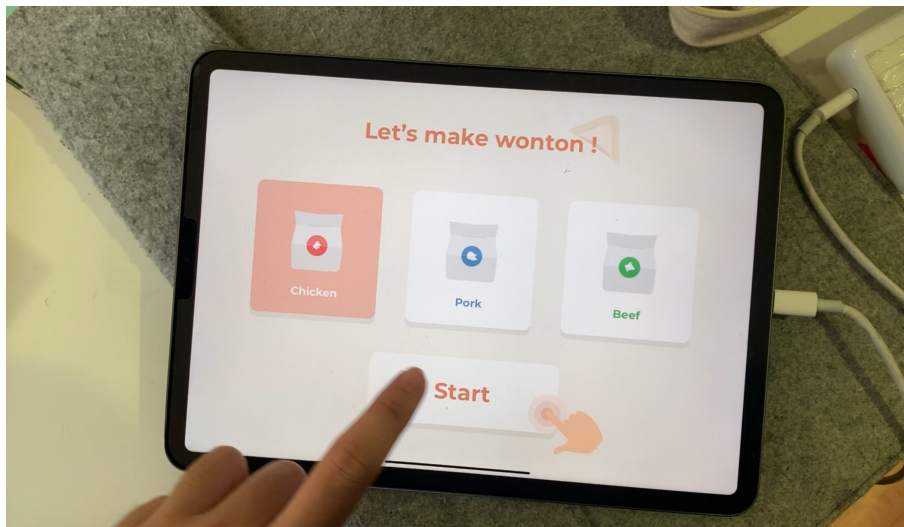


Figure 3.6 The First Prototype Iteration

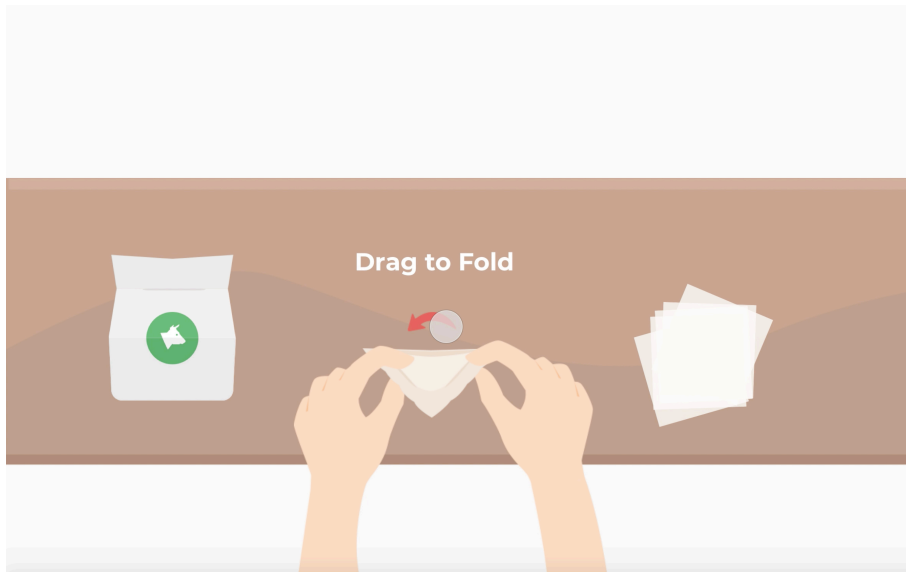


Figure 3.7 In-Game Screenshot of the First Prototype Iteration



Figure 3.8 The Project Exhibited at Royal College of Art

### 3.3.3 Feedbacks

Because of the constraints in time and resources, we did not have the opportunity to test our prototypes in a real cooking scenario. However, we received constructive feedbacks from visitors to the exhibition who tried our prototypes. Several students from the school reflected that the recipes are difficult to understand only with the graphics presented, if they are not being shown in the middle of cooking from that recipe. A few visitors had trouble with some unintuitive interactions when they were playing the game. They doubted that children will be able to complete the game by themselves. A professor from the textile department commented that it would be difficult for her 4-year-old daughter to remember the steps after playing the game, and that it would be easier to have the prototype used in the middle of cooking.

We also received feedbacks on our design from visiting Melanie Williams on December 18, four days after the exhibition. Since we didn't have the opportunity to try the prototypes with Kenneth who was studying at a boarding school, we asked Melanie to evaluate the prototype instead. Although she liked the idea of gamifying the recipe to involve her son in the process of meal preparation, Melanie was worried about some parts of the design after trying out the prototype. First, she pointed out that there is a clear disjoint between the cooking activity itself and playing the game. The reason why we had the game played before meal preparation was to free children from the screens when they cook. However, Melanie thinks that if she plays the game with Kenneth beforehand, the entertaining elements will be completely missing from the later cooking process. It is likely that Kenneth will be attracted by the game instead of meal preparation itself. Moreover, Melanie felt that the design did not enable her to “have fun” with Kenneth. She thinks that the game still puts her in the position of an instructor which she has to give out orders. In her opinion, the game should create a greater degree of companionship between Kenneth and herself.

## 3.4. The Second Design Research

The second iteration for Little Chef was planned in September 2020, after the GID exchange program was over. The goal was to solve the following pain points

which the first prototype has neglected:

- Parents want to develop a more engaging way of cooking with children that is characterized by companionship, not hierarchy.
- Lack of understanding on children's mentality.
- Lack of an integrated experience combining the digital recipe with the physical world.

Clearly the design research conducted in the UK wasn't able to cover the pain points listed above. To iterate the design, another round of research needed to be performed to acquire sufficient information for the next iterative design.

### **3.4.1 Research Background**

Due to the outbreak of COVID-19, my research location for the second iteration was limited to Shanghai, the city I stayed at during the pandemic. The design research was carried out in the form of a 2-day fieldwork, in which I visited 2 Chinese families, labeled A and B. I conducted interviews with them, as well as observed their lifestyles. Family A has a 3-year-old son at home, while family B has a 5-year-old daughter. The reason for the selection of ages was due to the necessity of testing my prototype with the top and the bottom lines of the designated age range. While Keeping the identified pain points in mind, I focused on three main objectives during the research:

- Create mental models for children aged 3 and 5 to lay a solid foundation for the upcoming design work.
- Find the opportunities which could bring parents and their children closer together during the process of cooking.
- Get to know the cooking habits and processes of Chinese families as my second prototype will be tested in China.

### 3.4.2 Day 1: Visiting Family A

Ya-Ling Zhang is a housewife living with her husband and her 3-year-old son at Huang-Pu District, Shanghai. She was previously a marketing specialist working for a luxury brand. After giving birth to her son Yun-Zheng Luo, Ya-Ling withdrew from her career and became a full-time housewife. She enjoys cooking, and sees meal preparation as a way to strengthen the familial bonds between herself, her husband and her son. To acquire more information, I visited Ya-Ling on October 29, 2020. Different from the interviews I have done in the UK which aimed to gather as much information as possible in the beginning phase of the project, I prepared a set of guiding questions to gain straightforward insights on the research goals I have set. The three major directions for the questions are as follows:

- The child’s cognitive ability, social emotions, language used, and body movements. What are some of the content-based activities that have been effective to him? What kind of digital products does he usually play with?
- How would the parent characterize her relationship with the child? What is her aspiration in such a relationship?
- The parent’s cooking habits, cooking environment and her stance on involving the child in meal preparation.

The fieldwork lasted for approximately 90 minutes, with many observations being made. Through talking to Yun-Zheng and his mother, I interpreted the mental model of a 3-year-old child based on my findings (Figure 3.9). For cognitive ability, Yun-Zheng is able to understand the concept of health. He can draw complicated shapes and carry out instructions consisting of multiple steps, which is reflected from the games and toys he usually plays with. Ya-Ling is a subscribed member for a Japanese toy vendor named *Benesse Corporation*. The company delivers toys and digital contents from the famous cartoon series *Shima Shima Tora no Shimajirou* to her on a monthly basis. Yun-Zheng enjoys playing with the toys which often times require him to draw, build or describe. Unfortunately, since he has not yet formally attended an educational institution, Yun-Zheng still lacks the literacy to read sentences. For social emotions, Yun-Zheng clearly exhibited his

desire to make friends during our conversations. He described cartoon character Shimajirou as his friend, and strongly agreed with the fact that he wants to make more friends. Furthermore, from his expressions and words, Yun-Zheng demonstrated a high tendency to imitate the behaviors of his friends. For instance, after watching a video clip from the Shima Shima Tora no Shimajirou series in which Shimajirou showed the steps of washing hands thoroughly, Yun-Zheng began to wash his hands voluntarily on a daily basis. For communication, Yun-Zheng is capable of conveying his ideas clearly in simple words. He can also guess the meaning of sentences even when the message behind is not given directly. For movements, Yun-Zheng can smoothly perform dragging, long taps and swiping when he interacts with digital interfaces. He can also adequately perform simple actions such as pouring liquid and stirring, which could be useful in kitchen.

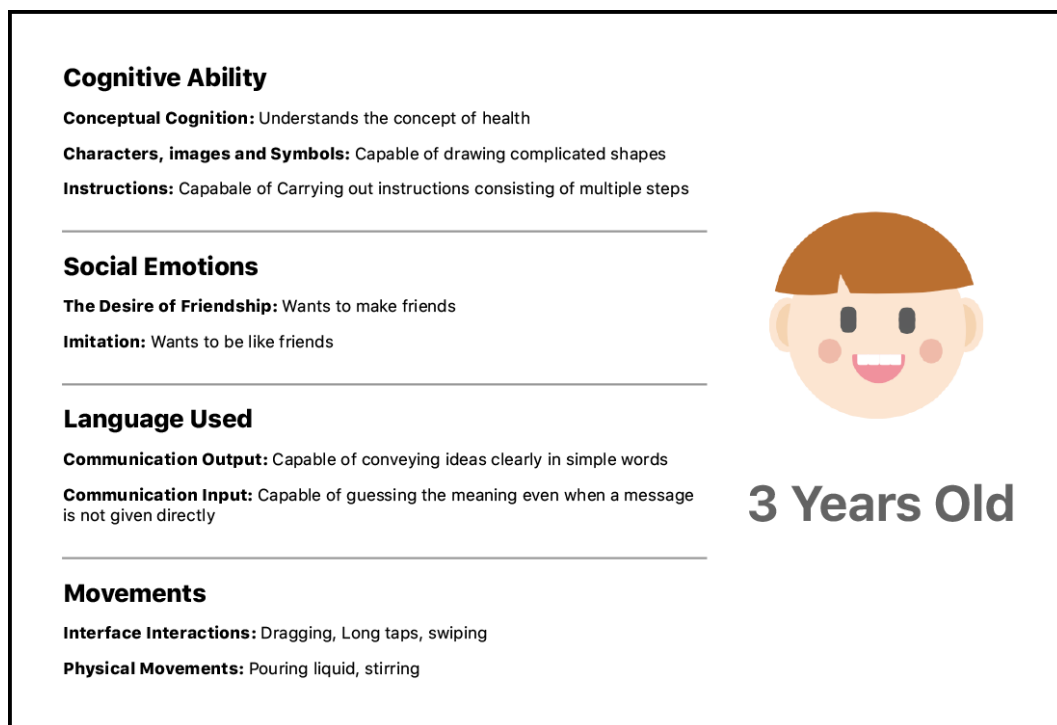


Figure 3.9 The Mental Model of a 3-Year-Old Child

I also learned tremendously from how Ya-Ling characterizes her relationship with Yun-Zheng. Ya-Ling was born in 1991, which makes her a “90-hou”, a



term which refers to Chinese born in the 1990's. The term carries significant cultural meanings in the Chinese context. As opposed to 80-hou and 70-hou who act more conservatively in general, 90-hou are heavily influenced by the ongoing globalization. On the matter of education and parent-child relationships, they are more liberal than people from the elder generations who possessed high parental academic expectations on their children. Instead of demanding children to achieve excellence in schools, 90-hou parents often times focus on overall child development. Influenced by the notion of individualism brought by globalization, they not only care about the children's performances at school, but also the development of their interests and health. The tendency of paying attention to the overall well-being of children makes the educational philosophy of 90-hou parents similar to the western world.

Ya-Ling encourages Yun-Zheng to explore his own passion. Although Yun-Zheng is still far from maturity, she respects his sovereignty over his own life. She sees herself as a mentor who provides supplementary guidance when Yun-Zheng needs it. Therefore, Ya-Ling does not place any kinds of enforcement on Yun-Zheng. She wants to develop a sense of companionship with her son, taking the role of both a mother and a friend.

From spending time with her son on a daily basis, Ya-Ling discovered that the companionship which she wants to develop is the strongest when they are challenging a task in the same team. For instance, there was once that Yun-Zheng asked Ya-Ling to help him in building a Lego tower, following a step-by-step graphic manual. After the tower was built, she felt that their bonds grew stronger since they have made an accomplishment together.

Lastly, I observed Ya-Ling's kitchen and learned about her cooking habits. Ya-Ling usually prepares Chinese food for her family, which often times involve frying and stewing. As fire is relatively dangerous to children, it would be difficult for Ya-Ling to involve Yun-Zheng in meal preparation if they stick to what she usually prepares, out of safety concerns. Thus, if Ya-Ling is to cook with her son, she would look for recipes involving more steps which Yun-Zheng can take part in. She also wants to try making exotic cuisines, since challenging something new could enhance her companionship with her son.

### 3.4.3 Day 2: Visiting Family B

On October 30, 2020, a day after meeting up with Ya-Ling Zhang and her family, I visited Rebecca Wong and her 5-year-old daughter Violet for the second part of the research. Rebecca was born in 1990, which means that she is also a “90-hou” parent. Her opinion towards child development is similar to that of Ya-Ling, especially on respecting the freedom of her child to explore personal interests. However, different from Ya-Ling who is a fulltime housewife, Rebecca has to work as a café manager during daytime, leaving her daughter to her parents who have recently retired. Because of that, Rebecca is even more eager to spend time with Violet after she returns from work. Also, she prepares dinner regularly for the family, unless incidents happen at her workplace causing her to arrive at home late.

The same set of prepared questions was used during the second family visit. Since Rebecca shares similar cooking habits and techniques with Ya-Ling, the focus of the research has been shifted to understanding the world of a 5-year-old child, as well as analyzing the relationship between Rebecca and Violet.

A mental model of a 5-year-old child was sketched from interacting with Violet and her mother (Figure 3.10). For cognitive ability, Violet can read and write basic words and sentence fragments. She has a significantly stronger perception of time compared to Yun-Zheng, and even demonstrated the ability to concentrate for a maximum of around 15 minutes. For social emotions, Violet shows a strong will to imitate the behaviors of adults, out of admiration. For example, she likes to play a game called “play house” in which she pretends to be the mother of dolls. For communication, Violet can narrate a complete short story. Furthermore, she can also adjust the words she says based on the cognitive capacity of the person she is talking to. She can even organize ideas and information about the future. For movements, Violet can freely use forks and knives without worrying her mother. Surprisingly, she has already been doing some housework in kitchen, such as washing dishes, from time to time.

As mentioned above, Rebecca’s stance on child-development is similar to that of Ya-Ling. However, she has a stronger motivation towards cultivating the living skills of Violet. When being presented with the first iteration of the prototype, Rebecca was concerned about the educational effect of the gamified interactive

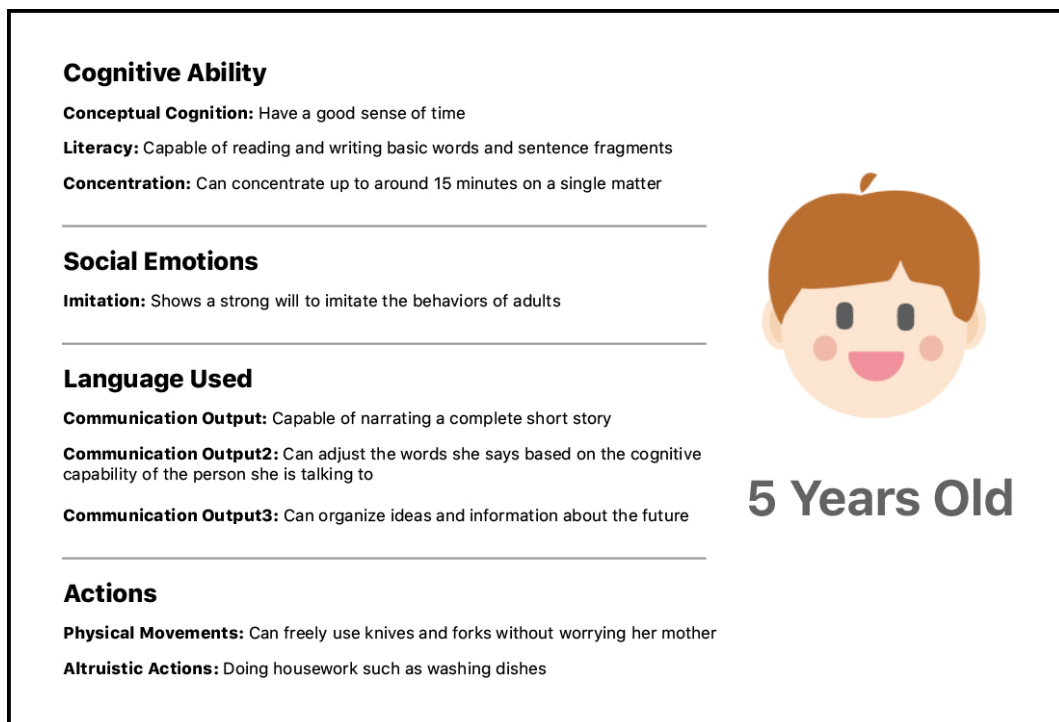


Figure 3.10 The Mental Model of a 5-Year-Old Child

recipe. She thought that the recipe focuses exclusively on how to follow the steps for preparing a specific meal, rather than teaching children the general tips for cooking. The outcome she expected from the prototype was not only Violet's growing interest towards meal preparation, but also the fundamental skills she acquires for her future involvement in real cooking.

#### **3.4.4 Summary of the Fieldwork**

I derived the design direction of the second iteration from the fieldwork, as follows:

- Design a task-based culinary curriculum that is performed during cooking with children. The curriculum should provide a collaborative environment enhancing the companionship between parents and children.
- Leverage children's tendency of imitating adult behaviors to motivate them in participating in meal preparation.
- Design characters to create a sense of friendship which would improve the engagement of children during cooking.
- Incorporate general cooking knowledge into the step-oriented game to create greater educational values.
- Ensure that the new user interfaces are intuitive enough to be comprehended by children aged 3-5.

### **3.5. The Second Prototype Iteration**

Based on the design directions listed in 3.44, two prototypes were created using ProtoPie, Sketch and Adobe Creative Suite (Figure 3.11, Figure 3.12). While the sushi recipe remains, the wonton recipe has been replaced with a hamburger recipe in the Chinese context, in order to create the atmosphere of challenging something new. The prototypes still take the form of gamified interactive recipes available on iPad (Figure 3.13), with the addition of the following new features:

- A new gaming process which leads children from the digital interfaces to the corresponding cooking steps.

- A clearer division of labor in the form of tasks, enabling children to take major responsibilities like adults during cooking.
- A guiding character who mentors the team of a parent and a child throughout the cooking process.
- Educational contents on food and cooking implemented to some steps of each gamified interactive recipe.

The two prototypes of Little Chef now have 33 steps and 31 steps respectively, demonstrating a greater focus on recipe details compared to the first prototype iteration.

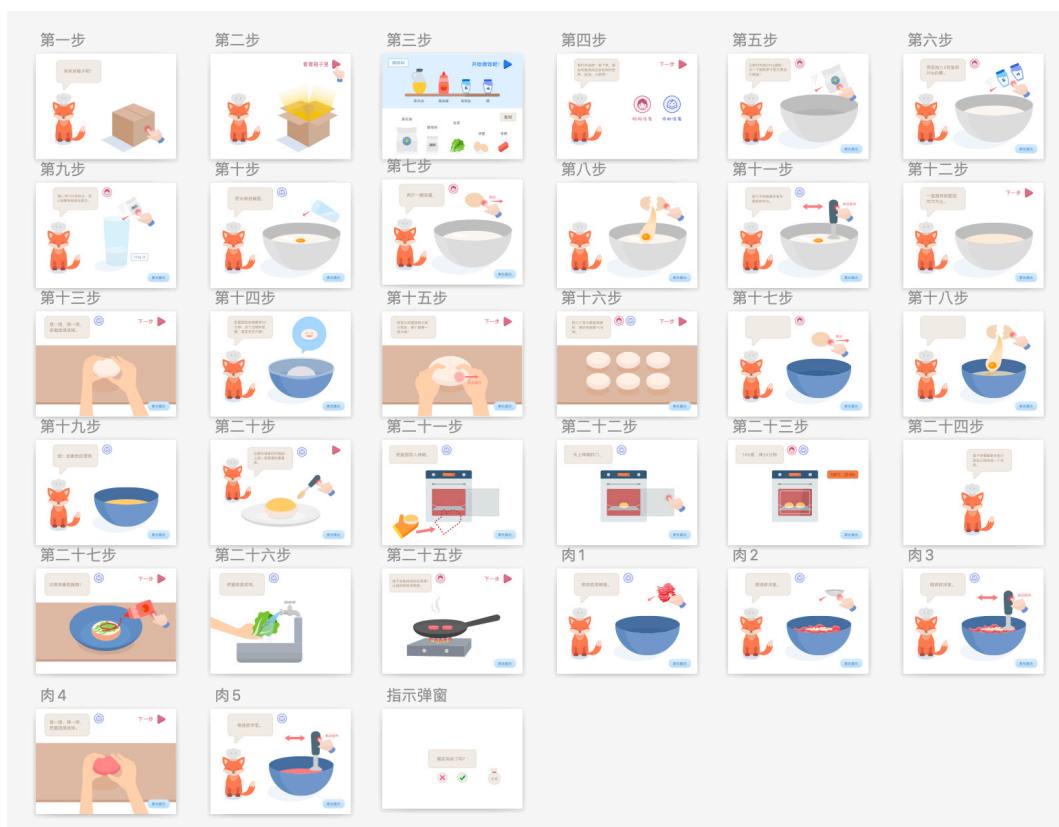


Figure 3.11 Screens of the Second Prototype Iteration (Hamburger Recipe)



Figure 3.12 Screens of the Second Prototype Iteration (Sushi Recipe)



Figure 3.13 The Prototype Displayed on iPad

### 3.5.1 Gaming Process and Tasks

Before starting to challenge a Little Chef recipe, a parent needs to form a team of two with his or her child. The child will be in charge of controlling the digital device, where he or she plays with the interactions on the interface to follow along the recipe. Then, in each step of the recipe, there are tasks given out to the team (Figure 3.14). The tasks are divided into “parents’ tasks” and “children’s tasks”. If a “children’s task” is given out, the child needs to complete the interactions on the interface, and perform the exact same action in reality. If a “parents’ task” is given out, the child needs to inform the parent what to do after completing the digital interactions. The structure of the game is designed to strengthen children’s responsibility throughout the cooking process, giving them the feeling of making achievements like an adult.



Figure 3.14 Example of a Task in Little Chef



### 3.5.2 Character Design

Fox Chef Duoduo is a guiding character designed to mentor the team of two throughout the entire cooking process for each recipe (Figure 3.15). It gives out instructions to the team in friendly manner and compliments the team after the completion of every single step. Duoduo also plays the role of a teacher when there are special cooking tips or interesting food facts available. The inclusion of him serves as a way to increase children’s engagement with the recipe. It also relieves parents from a hierarchical position of teaching children, enhancing the companionship between them.

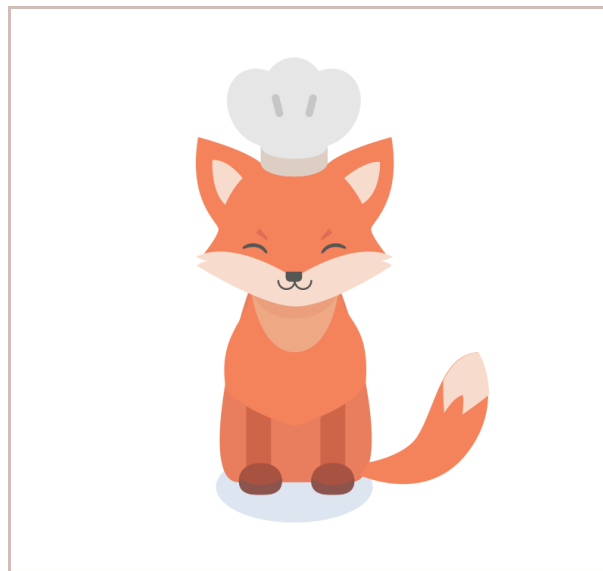


Figure 3.15 Fox Chef Duoduo

### 3.5.3 Educational Contents

For both recipes, children learn about the origin of the cuisine and the safety issues in kitchen. For the hamburger recipe exclusively, children learn about the process of fermentation, the importance of vegetables in terms of nutritional balance, and the basics of using an oven. For the Sushi recipe exclusively, children learn about basic seasoning, the role of rice as a staple, and the importance of washing hands

before cooking. The inclusion of educational contents can cultivate children's understanding of food and cooking, giving parents a greater sense of value after using the product.

# Chapter 4

## Experiment

### 4.1. Methodology

The method of comparative experiment was used to test the usability of the prototypes. In a comparative experiment, a standard treatment and a modified treatment are tested on a dependent variable, in which all of the conditions remain the same. After getting results from the experiment, differences are compared in the dependent variable for each treatment, indicating whether one treatment is more effective than the other, or that both treatments have similar effectiveness.

### 4.2. Variables, Groups and Measurements

The prototype of Little Chef serves as the independent variable added to an experimental group, consisting of a pair of parent and child preparing a specific meal. For the control group, a standard way of cooking with children is defined. Based on the fact that cooking from recipe apps has become one of the mainstream patterns of preparing meals at home, I set cooking with children using a Chinese recipe app called Xia Chu Fang as the standard treatment of the experiment.

As mentioned in chapter 1, the goal of Little Chef is to motivate children and to empower parents in the context of cooking together. In order to evaluate the effectiveness of the modified treatment on both sides, two separate dependent variables need to be measured. On the children's side, a concept called engagement rate is introduced as the dependent variable measured from the experiment. Since it is relatively difficult for children to provide reliable qualitative feedback, it would be more accurate to assess the usability of the prototype based on an objective numerical outcome derived from children's movements. However, on the

parents' side, qualitative feedback plays an important role in evaluating the usability of the prototype. While adults have sufficient physical capability to cook from the prototype, the degree of confidence they possess while guiding their children is crucial. To measure that, an evaluation system consisting of a Likert-scale questionnaire with five response options for each question is designed.

### 4.2.1 Engagement Rate

The concept of engagement rate may vary in different contexts, but its core idea usually remains the same. Engagement rate is the metrics tracking how actively involved a participant is with a provided content or an activity. In the case of Little Chef, engagement rate measures children's activeness while they participate in meal preparation using the prototype. The term "activeness" in this context stands for the duration time of a child making cooking-related movements on his/her own, or giving parents his/her full attention during the cooking process. If the child is not physically engaged in cooking, nor is he/she paying attention to the cooking-related actions performed by the parent, the duration time will not be counted as active participation time. Also, when counting the active participation time, breaking points which happen in seconds are rounded up to the nearest whole minute. The calculation of the engagement rate adheres to the formula as follows (Figure 4.1):

$$\text{Engagement Rate} = \frac{\text{Active Participation Time}}{\text{Total Participation Time}}$$

Figure 4.1 The Formula for Engagement Rate

### 4.2.2 Likert-Scale Questionnaire

A Likert-scale questionnaire is designed to measure the usability of the prototype for parents from a qualitative perspective. It is a modified version of the System

Usability Scale (SUS) invented by Dr. John Brooke in 1986, aiming to assess the usability based on ten subjective questions. For each question, there are 5 response options from strongly agree, represented by the number 5, to strongly disagree, represented by the number 1. The questionnaire is as follows:

1. I think that I would like to cook with my child frequently using this method.
2. I found this method of cooking with my child unnecessarily complex.
3. I thought the cooperation between me and my child was smooth.
4. I think that the support provided is not enough using this method to cook with my child.
5. I think my child enjoyed cooking with me during the process.
6. I think my child was not able to concentrate during the process.
7. I would imagine that most parents would learn to cook with children using this method very quickly.
8. I think most parents would find this method of cooking with children hard to perform.
9. I felt confident cooking with my child using this method.
10. I needed to go through complex preparations to get myself ready for this method.

The usability score is calculated after data is collected from the questionnaire. For odd-numbered questions, subtract 1 from the number of the response. As for even-numbered questions, subtract the number of the response from 5. After all responses have been converted into a value from 0 to 4, add up all the converted values, and multiply the total by 2.5. The new number stands for the usability score in a range from 0 to 100, which could be converted to a percentage-based rating.

	First Session	Second Session
Family A	Hamburger(std)	Hamburger(exp)
Family B	Sushi(exp)	Sushi(std)

Table 4.1 The Latin Square Experimental Design

### 4.3. Setting Up the Experiment

A Latin square design is used in this experimental study to reduce systematic errors that might lead to inaccurate results (Table 4.1). In the experiment, Family A (Ya-Ling and Yun-Zheng) and Family B (Rebecca and Violet) need to prepare the same meal using both the standard cooking method and the modified cooking method. The standard cooking method requires the participants to cook from a recipe app called Xia Chu Fang, and the modified cooking method requires the participants to cook from the prototype of Little Chef. For the recipe assignment, Family A is given the hamburger recipe, and Family B is given the sushi recipe. Each group is required to perform the two sessions of experiment in a different order. Family A goes through the standard treatment first, and then the modified treatment; while Family B goes through the modified treatment first, followed by the standard treatment. A two-hour break is scheduled in between the sessions in order to prevent tiring off the children which might affect the experimental results.

### 4.4. Experiment with Family A

The experiment with family A was conducted on November 28, 2020 (Figure 4.2). I visited Ya-Ling and Yun-Zheng with the following items prepared: An iPad pro for displaying the gamified interactive recipe, a laptop transferring the data of the prototype to the iPad, a printed copy of the Likert-scale questionnaire, and a box containing all the ingredients and tools for the recipe.

Before starting the experiment, I talked to Ya-Ling individually about how to use the prototype for approximately 15 minutes. Then, when the team of two is

ready, I set up a camera to record the entire cooking process. The camera is deliberately fixed at an angle where Yun-Zheng's movements and facial expressions can be easily observed.



Figure 4.2 Experiment with Family A

The first session for the standard cooking method started at 11:03 AM. Similar to my expectation, Ya-Ling had to take the role of teaching throughout the cooking process, since the recipe app was primarily consisting of texts. She read from the app, decided whether or not Yun-Zheng could handle a specific task, and told him what to do. It was evident that Yun-Zheng's participation was limited, because he could not interact with the text-based recipe app. Such a limitation has prevented Yun-Zheng from exerting ownership over what he is cooking. In the end, Yun-Zheng was able to do the following tasks:

- Stir the mixture of flour, oil, salt and sugar.
- Knead the bread dough.
- Wash the vegetables.

When the session was over, Ya-Ling was asked to fill out the Likert-scale questionnaire (Figure 4.3). The total time taken was 1 hour and 17 minutes, excluding the extra time for fermentation which was not counted in the total participation time.

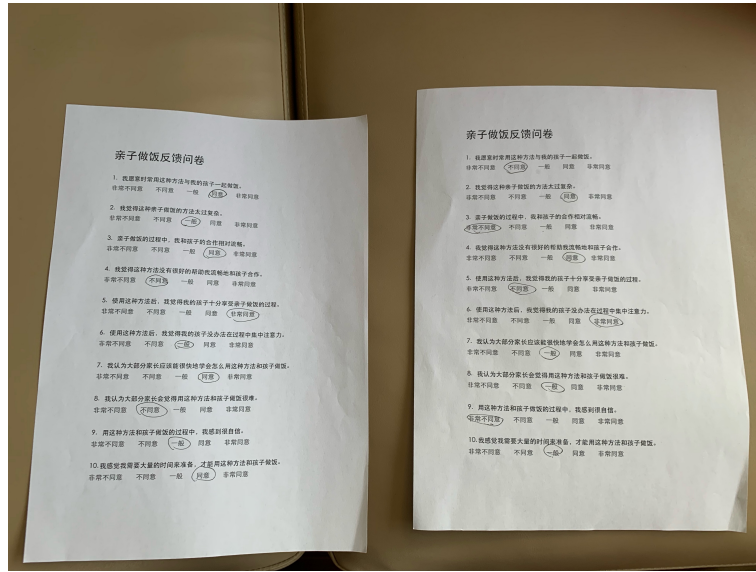


Figure 4.3 The Likert-Scale Questionnaires (Family A)

After 2 hours of break, the second session for the modified cooking method was launched. Different from the standard cooking method, Yun-Zheng became the person in charge of interacting with the recipe and telling his mother what to do. Although there were signs indicating that he was not able to fully comprehend the texts, the intuitive interactions and the voice instructions given by the character were able to inform Yun-Zheng on what to do in the cooking steps. Although Yun-Zheng might have been slightly bored from cooking the same food for a second time, his activeness was higher than the standard cooking method. This time, he was able to do the following tasks:

- Measure the amount of ingredients with Ya-Ling 's help.
- Stir the mixture of flour, oil, salt and sugar.
- Break an egg.
- Knead the bread dough.
- Wash the vegetables.



- Stir the seasoned minced pork.
- Press the buttons on the oven with Ya-Ling ' s help.

Again, when the session was over, Ya-Ling was given another Likert-scale questionnaire to fill out. The time taken was 1 hour and 33 minutes, excluding the time for fermentation.

## 4.5. Experiment with Family B

The experiment with family B was conducted on December 3, 2020 (Figure 4.4). I visited Rebecca and Violet to go through the same experimental process I did with Ya-Ling and Yun-Zheng, except that the Sushi recipe was used instead of the hamburger recipe. Also, to prevent ordering effect, I asked Family B to perform the modified cooking method first, and then the standard cooking method two hours after.



Figure 4.4 Experiment with Family B

Since Violet was older than Yun-Zheng, I included her when I explained how to use the prototype. When the team of two was ready, I set up the camera

again at a fixed position where Violet's movements and facial expressions could be observed.

To make sure that the conditions between the tested groups are the same, I started the first session at 11:03 AM, which was exactly the same time as Family A. The team of two smoothly followed Fox Chef Duoduo's instructions, and successfully made three sushi rolls. It was evident that Violet contributed greatly to the making of sushi rolls. Throughout the process, she was able to perform the following tasks:

- Wash the rice.
- Measure the sauce.
- Add soy sauce and fish sauce into boiled rice.
- Wash the vegetables.
- Cut vegetables and salmon slices.
- Break an egg.
- Roll the Sushi.

Like the first experiment with Family A, when the session was over, Rebecca was given a Likert-scale questionnaire to fill out (Figure 4.5). The time taken was 1 hour and 21 minutes, excluding the time for boiling the water.

The second session was carried out two hours after the first. The team of two made sushi using the standard cooking method with Xia Chu Fang, the Chinese recipe App. Although the tasks performed by Violet remained the same as she was already experienced, she showed a higher degree of disinterest throughout the process. For instance, she did not look at the recipe app for even once, although she could read simple sentences and learn the cooking steps from photos. Also, Violet performed nearly all the steps she could do based on what she remembered from the previous cooking session. This indicates that if the order was switched from the beginning, she might not be able to perform the exact same tasks.

When the session was over, Rebecca was given a Likert-scale questionnaire to fill out. The time taken was 1 hour and 8 minutes, excluding the time for boiling the water.

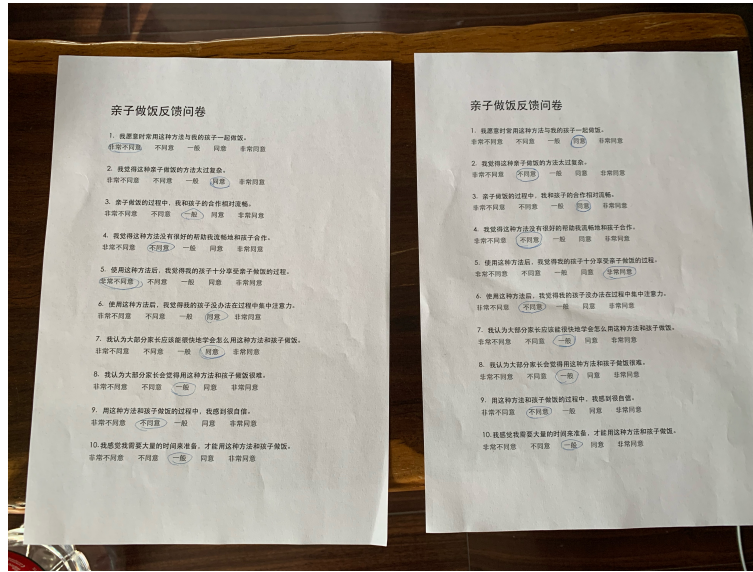


Figure 4.5 The Likert-Scale Questionnaires (Family B)

## 4.6. Data Collection

### 4.6.1 The Results of Family A

The prototype for the hamburger recipe is assessed from two aspects: the engagement rate measuring children's activeness, and the score derived from the Likert-scale questionnaire measuring parents' usability.

For the first session conducted by Family A using the standard cooking method, an active participation time of 43 minutes is observed from a total participation time of 77 minutes, leading to an engagement rate of 55.8% (Figure 4.6). It could be seen that children are not able to concentrate when there are consecutive steps needed to be performed solely by parents. On the other hand, the usability score calculated from the Likert-scale questionnaire is 37.5/100, which is considerably low.

For the second session, in which the modified cooking method was implemented, an active participation time of 69 minutes is observed from a total participation time of 93 minutes, leading to an engagement rate of 74.2% (Figure 4.7). The reason for the higher engagement rate is because of children's increased control

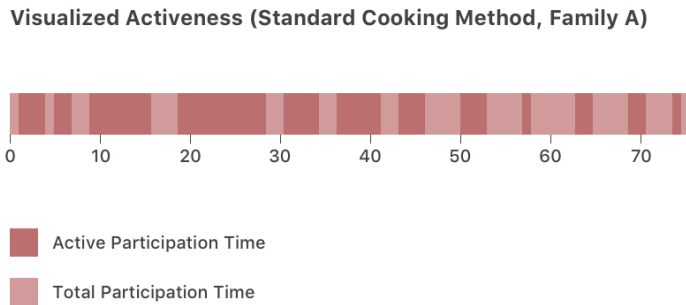


Figure 4.6 Visualized Activeness (Standard Cooking Method, Family A)

over the information source, which was the gamified interactive recipe. Although there are still consecutive steps which involved parents exclusively, the activeness of children retained during these steps, since they were the ones who told parents what to do. A sense of obligation to confirm whether the step is properly performed by the parent could be observed from the child. On the other hand, the usability score calculated from the Likert-scale questionnaire is 65/100. Although there are still spaces for improvements, the usability score is significantly higher than that of the standard cooking method.

### 4.6.2 The Results of Family B

Like the first experiment, the prototype for the sushi recipe is assessed from the engagement rate for children and the usability score for parents.

For the first session conducted by Family B using the modified cooking method, an active participation time of 62 minutes is observed from a total participation time of 81 minutes, leading to an engagement rate of 76.5% (Figure 4.8). It was observed during the experiment that the child could understand the division of labor which the prototype intended to emphasize. She expressed discontent when her mother attempted to intervene in a task which Fox Chef Duoduo has assigned to her. On the other hand, although the answers which the respondent has given to each question differ significantly from that of the first experiment with Family

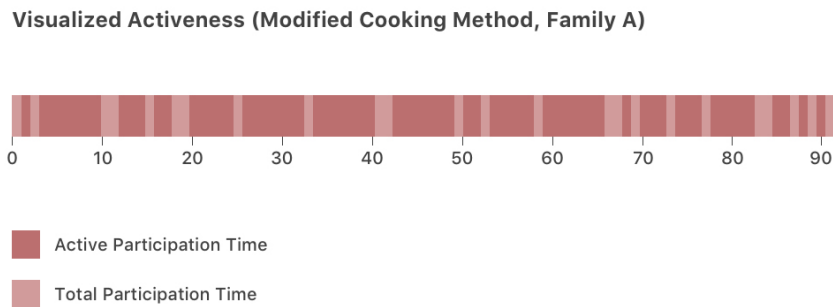


Figure 4.7 Visualized Activeness (Modified Cooking Method, Family A)

A, the final usability score surprisingly remains the same, which is 65/100.

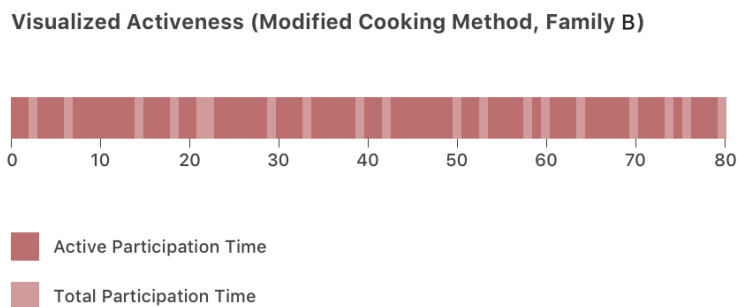


Figure 4.8 Visualized Activeness (Modified Cooking Method, Family B)

For the second session, in which the standard cooking method was implemented, an active participation time of 33 minutes is observed from a total participation time of 68 minutes. This leads to an engagement rate of 48.5%, which is the lowest among the four sessions (Figure 4.9). The main reason for the low engagement rate is because the child had to do the cook the same food when he was already tired from finishing the first session, yet without the playful atmosphere created

by the prototype. Moreover, the usability score calculated from the Likert-scale questionnaire is 25/100, which is also the lowest among the four sessions.

**Visualized Activeness (Standard Cooking Method, Family B)**

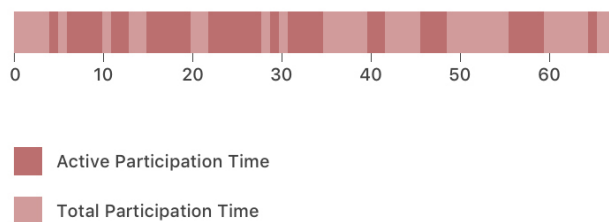


Figure 4.9 Visualized Activeness (Standard Cooking Method, Family B)

## 4.7. Summary

The results of the experiments performed with both families have demonstrated significant improvements in the engagement rate and the usability score. The features of the prototype, such as the task-based process, the guiding character and the playful interactions, have all contributed to a collaborative environment between parents and children. While cooking with the prototype, children expressed a high level of concentration and activeness. Parents felt accomplished and empowered by the fact that their children were devoting themselves to the cooking process. Thus, it is proven that using a “Little Chef” recipe can achieve a more fluent and pleasurable experience of cooking with children, compared to using a physical or digital copy of a traditional recipe.

# Chapter 5

## Discussion

### 5.1. Findings of the Study

Through the experiments conducted with the prototypes, it was proven that the usage of Little Chef recipes can effectively create a better experience for both parents and children when they cook together, as indicated by the higher engagement rate and usability scores. The design has three core accomplishments which led to such improvements: building a collaborative relationship between parents and children, enabling children to take responsibility like an adult, and allowing children to grasp a sense of friendship while participating in cooking. Since the ultimate goal of involving children in meal preparation is to help them develop healthy dietary practices, it is crucial to have a long-term culture of cooking with children installed within households. The betterment in experiences after using Little Chef recipes can effectively contribute to the retention of such a long-term culture.

### 5.2. Limitations and Extensibility

#### 5.2.1 An Integrated Experience without Attention-Shifting

Although the prototypes have achieved higher usability scores and engagement rate, there are still spaces for improvements in the usability aspect of the design. According to the SUS methodology which I derived my questionnaire from, a usability score over 68 is considered acceptable for a digital product. However, the prototypes of Little Chef only scored 65 from the experiments. The most obvious problem that might have lowered the score was children's inability to constantly shift their attentions between the screen and the reality. Since my target audience

is children aged 3-5, it is reasonable to assume that their cognitive capacities have not yet been fully developed to frequently shift attention while staying focus. Therefore, a more integrated experience liberating children from the screen is necessary in future designs to achieve a better usability.

In fact, holographic projection is a technology that might have the potential of solving the problem. There have been precedent examples demonstrating the usage of holographic projection in kitchen affairs. For instance, in 2015, IDEO has collaborated with IKEA to design the future kitchen in 2025. A central part of the design was the additional information displayed on the kitchen table through holographic projection while users prepare meals (Figure 5.1). Using similar technology in the future iteration of Little Chef can create a more integrated experience between the digital information and the physical world.

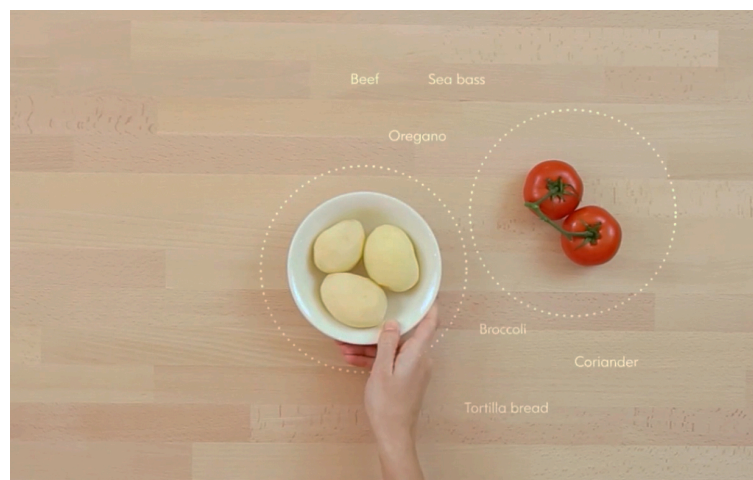


Figure 5.1 The Future Kitchen by IDEO and IKEA

### 5.2.2 From the Perspective of a Service

Since the prototype of Little Chef has just been tested, there is not yet a business model for the project. However, from observing children during the design research and the experiments, I realized that a clear reward system is crucial to the current design. In a larger picture, the gamified interactive recipe serves as a touch point



within a service system, but the service will not succeed without a reward system motivating children to challenge more recipes.



Figure 5.2 The Service Flow Map of Little Chef

When I was in London during the GID exchange program, my team and I came up with a service flow map for the Little Chef project (Figure 5.2). We designed a user flow starting from ordering meal kits online to cooking with children offline. According to the service flow, users scan the QR code attached to a specific meal kit to activate the corresponding Little Chef recipe. Moreover, recipes are divided into levels, in which children are to clear every recipe in a level and acquire new equipment to challenge the next. We have also designed part of the “equipment” used in the recipes we wanted children to challenge (Figure 5.3).

Since the prototype of the gamified interactive recipe is proven to be viable in this study, the next step could be defining the levels and the reward system in greater details. This can lead to the establishment of a service framework, eventually involving a feasible business model for the project.

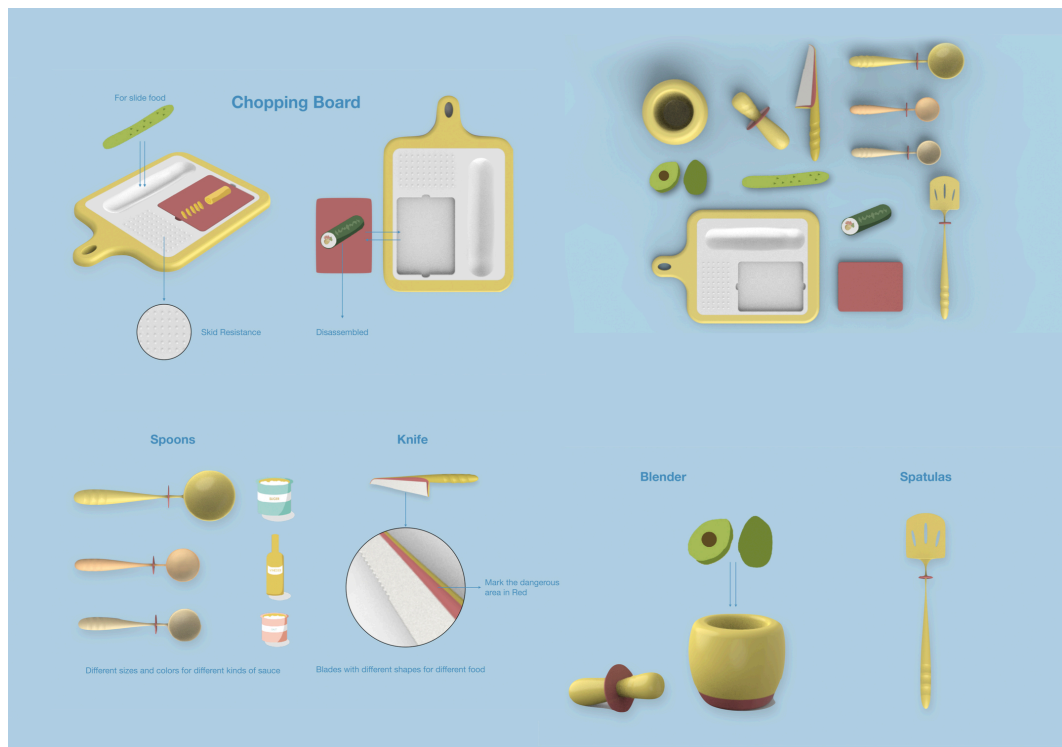


Figure 5.3 The Equipment Design of Little Chef

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