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Interactive Content Development for Kid's Healthy Food Mobile Application

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ABSTRACT: "Kid's Healthy Food" is a novel mobile application-based learning for kids and parents to learn about the healthy food that are important for them growing up. The application was developed for children aged between 6 to 12 years old and also can be used by their parents. The proposed application contains four modules, which are Healthy Food for Kids, Diseases and Malnutrition, Calories of Foods and Activities. This project combines four elements of multimedia which are text, graphic, audio and animation. This project was developed using Adobe Animate CC. There are three objectives for this project which are to study on the healthy foods importance to kids, to design and develop an interesting application for educating children on the healthy foods and to investigate the effectiveness of the mobile application on the healthy foods to kids and their parents. The methodology used to develop this application is Agile Development for the System Development Life Cycle. The challenges in producing this mobile application are verified medical contents and product acceptance. It is envisaged that this mobile application on kid's healthy food would be useful for kids and also parents in order to educate and give an awareness to them about the importance of healthy food.

Keywords: Mobile Application, Kids, Healthy Food.

Abbreviations: ADHD, Attention Deficit Hyperactivity Disorder; CC, Creative Cloud; UTeM, Universiti Teknikal Melaka Malaysia.

I. INTRODUCTION

Children have their own unique nutrient needs and meeting those needs is vital for a child to grow up and healthy. A child's diet should consist of a variety of foods that contain a range of nutrients. Nutrients are the substances in food that the bodies process to enable it to function. The nutrient requirements are influenced by factors including age, growth stage and activity. Nutrients can generally be broken onto two categories: which are macronutrients, comprises of carbohydrates, protein, fats; and micronutrients, comprises of vitamins and minerals such as calcium, iron and vitamin C [1].

In this project, mobile application-based learning which entitled "Kid's Healthy Food" is developed to help kids between the aged of 6-12 years and to educate about the healthy food in easy and fun way. The objectives that could be achieved while implementing this project is to make it easier for the kids to learn about the healthy food in a fun and interesting way. This application is about learning the healthy food for the kids. Besides, this application also contains fun activity or mind test on healthy food for kids, hence kids can test their understanding of what have they learned from the application. This project is an application which equipped with some of the interactive learning elements such as activities, graphics and stories that can teach kids about what to eat and not eat. The deliverable of this project is using mobile phone which easier to bring and browse by the kids or the parents at anywhere and anytime.

The key to healthy eating is to enjoy a variety of nutritious foods from each of the five food groups. The Australian Guide to Healthy Eating presents the five food groups on a plate, in the proportion that you should be eating them throughout your day [2]. If you eat a variety of foods from each of these groups, your body will receive all the nutrients and vitamins it needs to function. The first group consists of dairy products, while the second group consists of fruits. Meanwhile, the third group consists of grain foods, for example, cereal and the fourth group consists of lean meats, fish, eggs, tofu and nuts. The last group consists of vegetables, legumes and beans [1].

Healthy eating has many benefits for children. It can stabilize their energy, improve their minds, even out their moods, help them maintain a healthy weight and help prevent mental health conditions. These include depression, anxiety and ADHD. Moreover, having a healthy diet and focusing on nutrition are some of the simplest and most important ways to prevent the onset of disease. Healthy eating can help prevent many chronic diseases including obesity, heart disease and high blood pressure. It is important to learn about healthy eating habits, especially for child because the habits are more likely to stay until they have grown up [3].

Currently, there are only a few conventional ways, such as poster to spread the information about the diseases that affects kids, what should they eat and not to eat and also the food nutrients and food pyramid for the kids. Kids are not fully aware about what they should take to consume the required food nutrients. In addition, there is also lack of interesting healthy food awareness campaign that can attract younger generation like kids about the right food to take and foods to avoid. Therefore, this application aims to give an easy and attractive way for the kids to learn about the healthy

foods for them. Besides, this mobile platform will allow kids to access the information effectively because the device is convenient to carry anywhere as it is a hand-held device.

The first objective of this project is to study awareness level of healthy foods importance to parents. The second objective is to design and develop an interesting application for educating children on the healthy foods for parents. The other objective of the proposed project is to investigate the effectiveness of the mobile application on the healthy foods to parents for their kids.

There are four modules presented in this application which are, Healthy Food for Kids, Diseases and Malnutrition, Calories of Foods and Activities include mind test, storyline and puzzle.

II. EXISTING SYSTEM

Nowadays, there are some application that provide information on healthy food for kids that can be downloaded in Apple Store and Google Play. All the applications focus on making a mini kind-of-game that allow kids to interact and play the game and at the same time they can learn about the healthy foods.

Time to Eat, a mobile-phone-based game, aims to motivate children to practice healthy eating habits by letting them care for a virtual pet. Players send the pet photos of the food they consume throughout the day; the food's healthiness determines the game's outcome. An examination of the game's design provides insight into the potential of deploying health games on mobile phones [4].

In addition, another mobile application named Eat and Move-O-Matic, helps the understanding of calories to the kids and provide the comparison of number of calories required for activity. Moreover, this application provides healthy alternatives to replace high-calorie snacks and meals [5].

There are few existing systems which similar or related to the proposed system. They are Healthy Eating Animation for Kids, I Will Never Not Ever Eat a Tomato book and Healthy Heroes 1 & 2: Nutrition for Kids application.

Healthy Eating Animation for Kids is a linear video that use animation and language that easy to understand. This application gives a simple explanation about the healthy foods for the kids [6].

Meanwhile, a book entitled I Will Never Not Ever Eat a Tomato is useful for kids that is picky about eating healthy foods. It is a story about siblings that create fun name to the healthy food [7].

Healthy Heroes 1 and 2: Nutrition for Kids is one of the examples of mobile application that provides a game for kids to play. As the healthy heroes in this game, kids are charged with saving the city from the Hungry Monsters. Through 36 levels of game play, kids fend off the Hungry Monsters with healthy foods like fruits and vegetables. Junk foods will make the monsters angry and prevent advancement. As a result, kids will learn to recognize healthy foods throughout the game [8].

The comparison of these systems are presented in Table 1. Different images, audio, animation and interface design have been proposed. These applications are produced as an educational learning involving the healthy foods. Based on Table 1, it can be concluded that there are variety types of application to deliver the healthy foods information. One of the existing systems presented is a mobile application that teach kids about the healthy foods. However, this mobile application does not offer related information about healthy food for kids before the kids can play with the games provided. The proposed project presents a novel interactive mobile application to educate kids and parents about the healthy foods. Besides, novel content verification on the food pyramid, malnutrition and foods calorie by the medical doctor are presented. In addition to these mobile applications, there are some mobile application developed for kids presented in [9-13].

III. DEVELOPMENT

This project is using Agile Development methodology for the System Development Life cycle (SDLC) approach. This method is chosen because it allows changes in the development process. In the following sections, all requirements will be further analyzed in detail.

A. Analysis

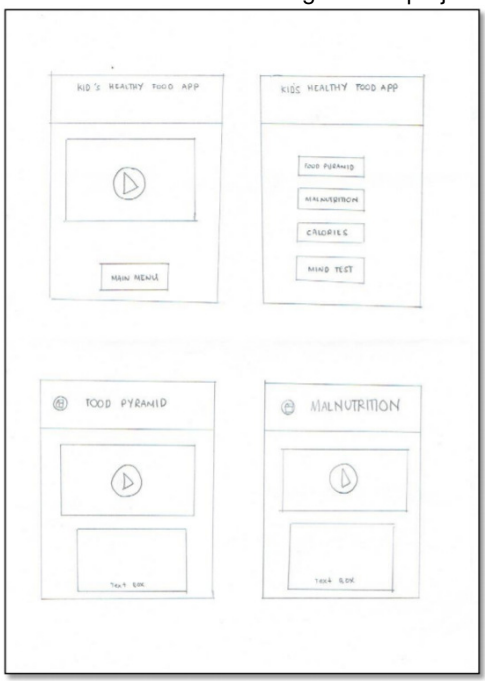
The requirement analysis is crucial to the success of a project development. The data are collected through the interview session with the medical doctor at UTeM Health Centre. Table 1 shows the details of data collection process.

Table 1: Content verification.

Expert	Medical Officer
Content	- Food Pyramid for kids - Malnutrition - Calorie

B. Design

During the design phase, the project is designed to satisfy the requirements that identified in the previous analysis phase. Storyboard is a complete documentation which explains all the components of multimedia elements that relates to the application. Fig. 1 shows the storyboard for this application. Meanwhile, Fig. 2-10 shows the interface design of this project.



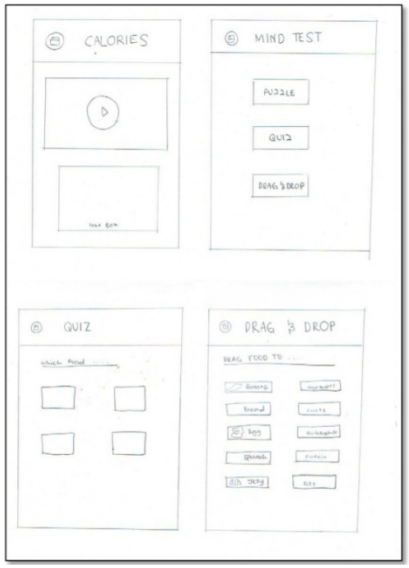


Fig. 1. Storyboard design.

C. Implementation

The media creation includes the making of texts, images, sound, video and animation. The font of the text used for title of home page and title of menu page are Berlin Sans FB and Broadway respectively. Meanwhile, the font of text used for title of menu, subtitle and title of button are Nyala. Text is used to give information and explanation of each of the module.

The graphics or images used in this project are in Portable Network Graphic (PNG) format and JPEG format. All of the images are vector images in 2D form. Those vector images have been drawn and edited by using Adobe Illustrator. Then, those designed and edited images were later imported to Adobe Animate for animate purpose. The audio for the background music is downloaded from Internet. The royalty free sound effect was acquired from Free sound. For the production of animation, Adobe Animate CC is used to create the 2D animation.

Table 2: Comparison of existing systems.

Existing Systems / Features	Healthy Eating Animation for Kids	I Will Never Not Ever Eat a Tomato	Healthy Heroes 1 & 2: Nutrition for Kids
Type	Video	Book	Mobile Games
Interaction	Interactive	Less Interactive	Interactive
Scope	A linear video that used animation and easy to understand language. It gives simple explanation about healthy foods.	This book is presented with clear illustration and simple explanations about the healthy foods.	Kids can see diagrams for each level.
Color and Image	Simple combination of color and image	- Not interesting - Image is static	Character very cute and have a good color
Type of visualization	2D	- Material book - Illustration on paper	2D
Multimedia Element	- Text - Image - Audio - Video - Animation	- Text - Image	- Text - Image - Audio - Animation

Fig. 2. Main menu.

Fig. 3. Menu.

Fig. 4. Food pyramid.

Fig. 5. Malnutrition.

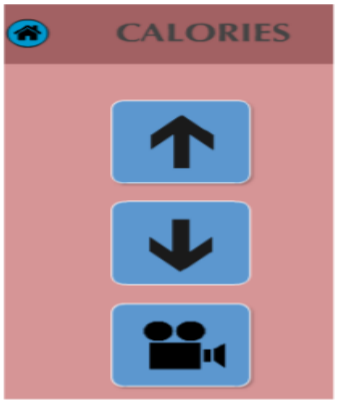


Fig. 6. Calories.

Fig. 7. Mind Test.

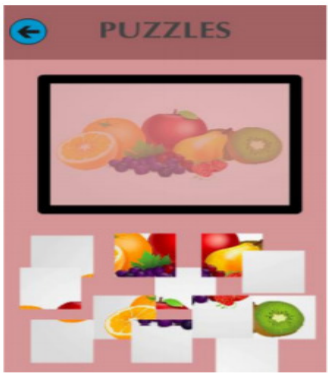


Fig. 8. Puzzles.

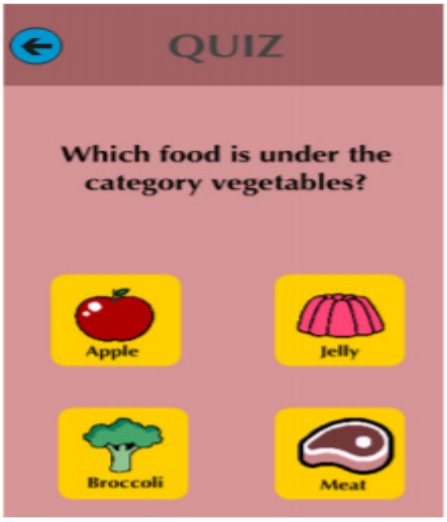


Fig. 9. Quiz.

Fig. 10. Drag & Drop.

IV. TEST RESULTS AND ANALYSIS

The testing stage for this project convoluted with three different target groups. Parents that have 6 to 12 years old kids are chosen as the primary target user and expert who are familiar with multimedia environment and lastly, the medical officers from UTeM Health Centre.

Parents evaluated the application basically on the general questions and their understanding on using the application. They were requested to fill the online questionnaires on Google Form provided. For the second group of respondents, which are the multimedia lecturer from Faculty of Information and Communication Technology, UTeM, evaluated on the functionality of the application, in addition to the design, navigation and other multimedia aspects. Medical officers from UTeM Health Centre evaluated on the contents where the contents provided in the application should be correct and helping the users in understanding the application developed. The summary of the testing respondents is shown in Table 3. The testing performed are usability, user interface, functionality and acceptance testing.

Table 3: Testing Summary.

	User Acceptance Testing	Usability Testing	Functionality Testing	User Interface Testing	Unit Testing
Tester	Parents	Multimedia Lecturer			Medical Officer
Number of testers	69	3			3
Venue	Online	Faculty of Information & Communication Technology, Universiti Teknikal Malaysia Melaka			UTeM Health Centre

User acceptance testing is completed by parents, where they are required to answer an online questionnaire on Google form. This testing is done to acquire their perspective and assessment on the application. Table 4 shows the testing questions for parents.

Based on Fig. 11-13, the graphs show the result of the acceptance testing tested by the parents. From the graphs, it shows that majority of the testers agree that the application is easy to use and understand, also the content and information provided are useful and appropriate.

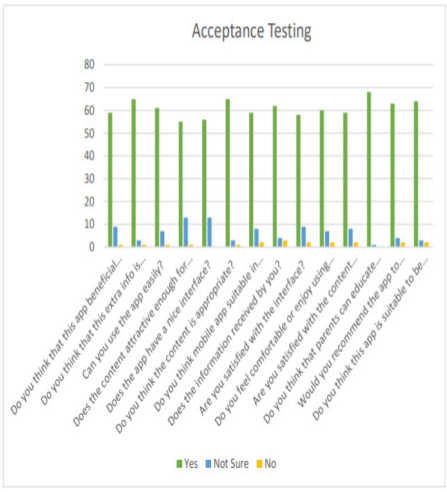


Fig. 11. Acceptance Testing Result-i.

Table 4: Question for Acceptance Testing.

Question 1: Do you think that this app beneficial for your children?
Question 2: Do you think that this extra info is helpful for you as an adult/parent?
Question 3: Does the information provided too simple or too crowded?
Question 4: Can you use the app easily?
Question 5:Does the content attractive enough for user to use?
Question 6: Does the app have a nice interface?
Question 7: Do you think the content is appropriate?
Question 8: Do you think mobile app suitable in delivering the content of app?
Question 9: Does the information received by you?
Question 10: Are you satisfied with the interface?
Question 11: Do you feel comfortable or enjoy using the app?
Question 12: Are you satisfied with the content provided?
Question 13: Do you think that parents can educate their child in terms of healthy food?
Question 14: Would you recommend the app to your friend/colleague?
Question 15: Do you think this app suitable to be used for kids and parents itself?
Question 16: How would you rate the quality of the application?
Question 17: How would you rate your overall satisfaction of the app?

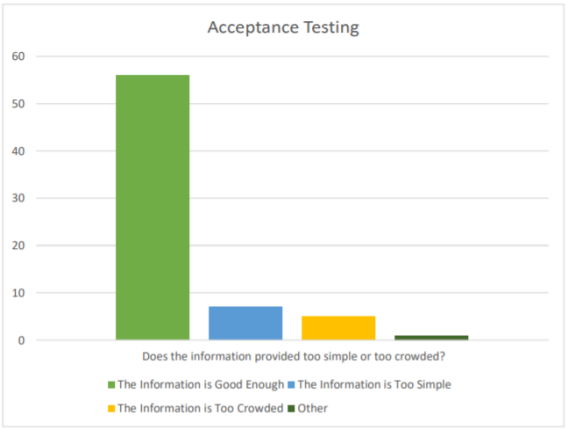
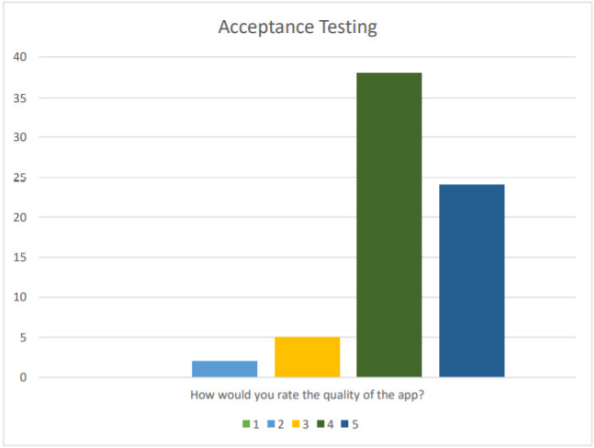


Fig. 12. Acceptance Testing Result –ii.



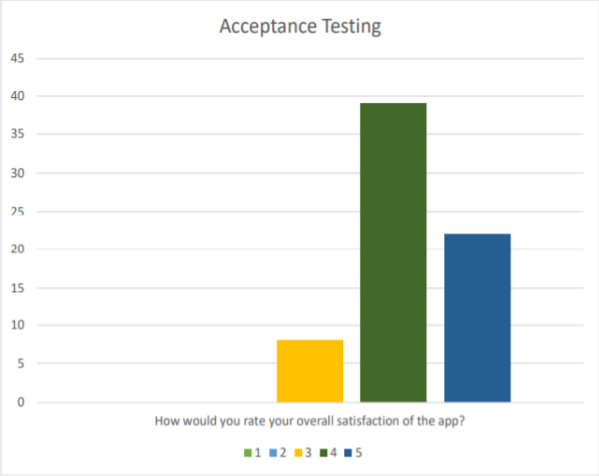


Fig. 13. Acceptance Testing Result –iii.

Unit testing is done by the medical officer at UTeM Health Centre. This testing is performed to evaluate whether product implemented is producing the expected results and also content and information used in this application are from the valid sources. Table 5 shows the unit testing questions for the medical officer.

Table 5: Question for Unit Testing.

Question 1: What do you think of the content?
Question 2: Does the content follows the proper medical terms/guidelines?
Question 3: Does the content attractive enough for user to use?
Question 4: Does this app helps user in increasing their knowledge?
Question 5: Is the content easily understandable or too complicated?
Question 6: Do you easily use the app?
Question 7: Do you think the app suitable to use for kids and parents itself?
Question 8: Does this app will help public to know more about healthy food?
Question 9: Does the interface looks pleasant and attractive?
Question 10: Does the navigation button of the app accurate?
Question 11: Does the flow of the app simple and easy to understand?
Question 12: Does the information provided correct and valid?
Question 13: Does the information provided is sufficient for the public knowledge?
Question 14: Does the explanation of the healthy food is clear and easy to understand?
Question 15: Does the interactive mobile apps attracts you to know more about the information of kid's healthy foods?

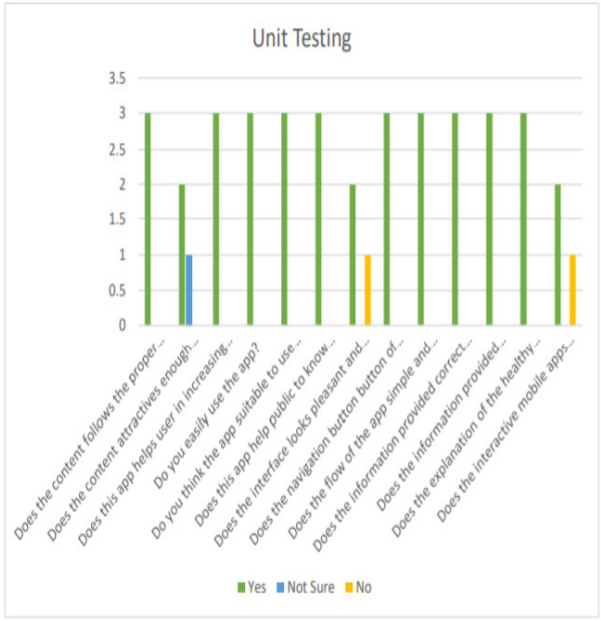
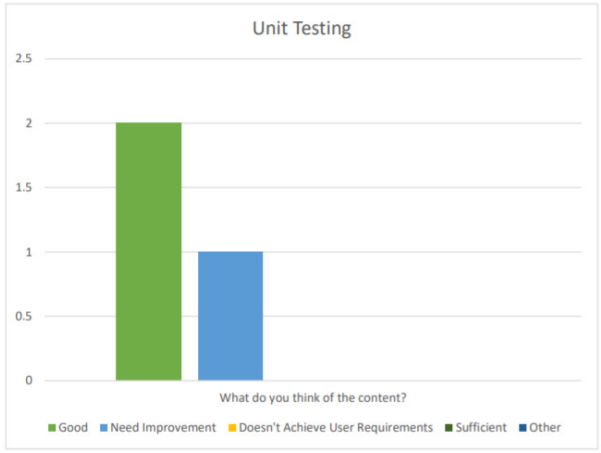


Fig. 14. Unit Testing Result -i



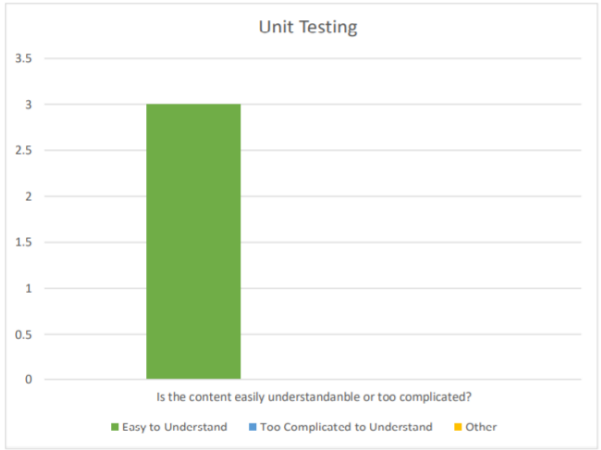


Fig. 15. Unit Testing Result –ii.

Figs. 14 and 15 show the result of the unit testing evaluated by the medical officers. This testing covers about the content and functionality of the application. From these graphs, they show that majority of the

respondents agree that the content of the application is easy to understand and the navigation buttons are accurate, also the flow of the application is simple and easy to understand.

The functionality, usability and user interface testing questions which were answered by the multimedia lecturers are presented in Table 6. Fig. 16 shows the functionality testing result. It can be seen from Fig. 16 that majority of the respondents agree that the application functions like it supposed to be and the navigation buttons of the application are clickable. The respondents also agree that the application and the on-screen system are easy to access. Meanwhile, from Fig. 17 which visualize the result of usability testing, it shows that all the respondents agree that the navigation works accurately. For the explanation and content of the healthy food for the kids, only one respondent agree that the explanation and the content are easy to understand. Regarding the organization of information of the application, the same result gathered where one respondent agree. For the user interface testing, it shows that all the respondents agree that the user interface designed is appealing. Besides, this type of testing also evaluates the theme, the user interface, the colour and the on-screen text to the font used in the application.

Table 6: Question for Functionality, Usability and user Interface Testing.

Functionality
Question 1: Does the app function like it should be?
Question 2: Does the navigation buttons of the app are clickable?
Question 3: Does the app functions smoothly?
Question 4: Is it easy for you to access and use this app?
Question 5: Did you find your way around the on-screen system easily?
Usability
Question 1: Does the explanation of the healthy food for kids easy to understand?
Question 2: Does the information organized logically?
Question 3: Does the navigation of the app works accurately?
Question 4: Does the content of the app easy to understand?
Question 5: Do you think the app is useful to give information to parents for their kids?
User Interface
Question 1: Do you like the theme of the app?
Question 2: Do you think the user interface is suitable for kids and parents?
Question 3: Does the colour of the app used is suitable?
Question 4: Did you find the on-screen text easy to read?
Question 5: Does the font used in the app is readable?
Question 6: What do you think of the animations in the app?

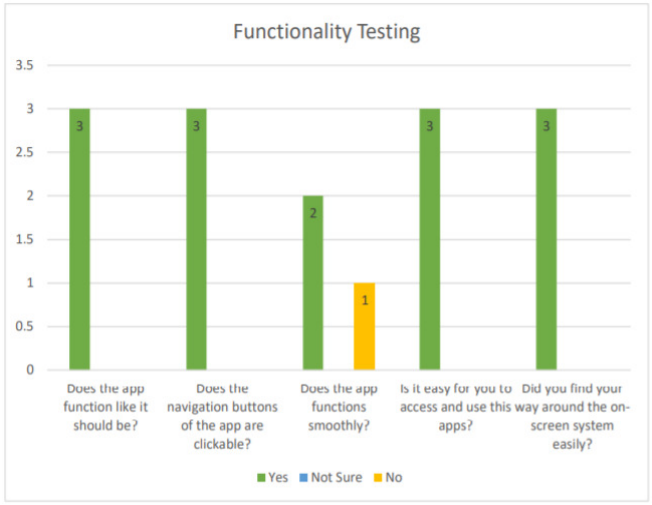


Fig. 16. Functionality Testing Result.

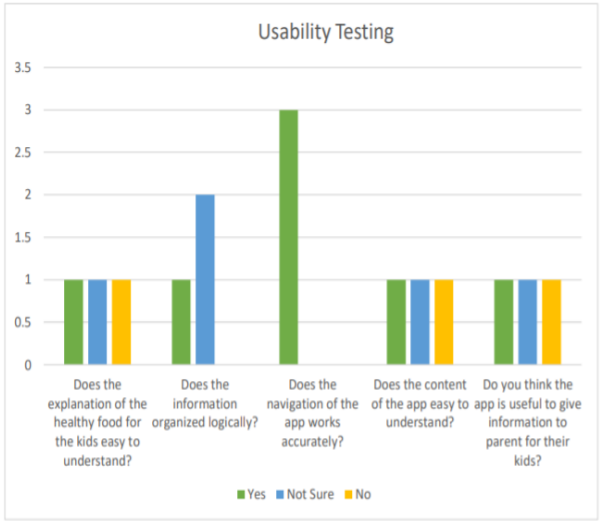
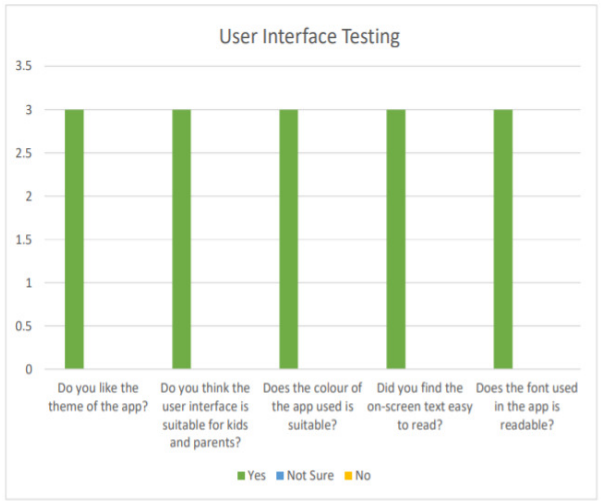


Fig. 17. Usability Testing Result.



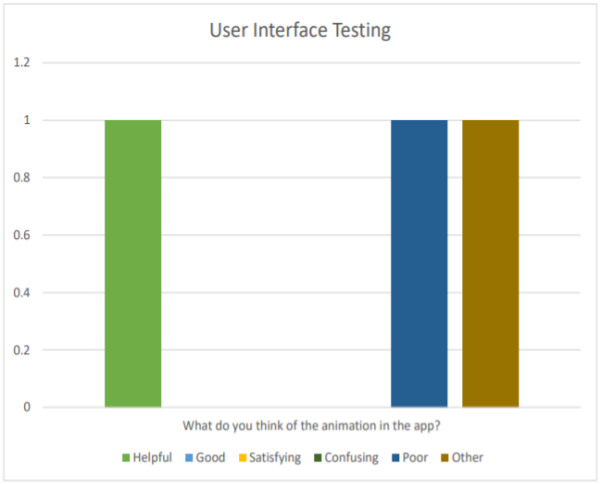


Fig. 18. User Interface Testing Result.

V. DISCUSSION

The strength of this application is it can be used as a platform to deliver knowledge and information to users. There are couple of infographics and videos about the healthy food for kids presented. However, the application would be better if music background is added into the application. Besides, there is also lack of animation and should be added more in order to make it interesting to attract users. It can be summarized that this novel mobile application produces a different sight of teaching and learning platform, also as an edutainment medium compared to others existing products, which presented in [1-8].

VI. CONCLUSION

In conclusion, the healthy food for kid's mobile application has been successfully developed. It is envisaged that the proposed interactive mobile content development would greatly contribute to increase the understanding and awareness of healthy foods to the public, especially kids and parents. This paper covers the analysis, design, development and also the testing and evaluation of the interactive mobile content to evaluate the effectiveness of the kid's healthy food mobile application to the users. This mobile application could be one of the teaching tools that will help users get information on kid's healthy foods. It is hoped that this product will bring benefits in terms of information about the healthy foods to the public.

VI. FUTURE SCOPE

There are some suggestions for the improvement of the application. The graphics used in the application need to be fixed to make it more interesting. In addition, this product can be enhanced by adding more elements to produce a more fun and interesting application. Besides, the voice audio should be recorded and included into the application to produce an interesting product. Therefore, the users can have two options whether to read the information or to listen to the audio. Next, more animation should be added into the application to attract users in learning and reading more about the information. Moreover, the application should be added with more contents and information so that users can gain more benefit when using the application.

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Conflict of Interest. There is no conflict of interest.

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