GAME DEVELOPMENT OF INTRODUCING HEALTHY AND UNHEALTHY FOODS ON ANDROID PLATFORM

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ABSTRACT

Food consumed by the body is very influential on the health of the body itself. Foods consumed should be healthy food for health to stay awake. In this modern era, appear fast food or commonly called junk food. Junk Food is an unhealthy food that has little nutritional content and is very danger to the health of the body and can bring various diseases. Based on the results of questionnaires 93% of children in the city of Bandung like to consume junk food. The purpose of this study is to build educational games as a medium to introduce healthy and unhealthy food to children. The method used in building this application is GLDC which includes the stages: pre-production, production, testing, post-production. The results of research conducted in the form of educational game "Foody" in which there are two types of gameplay that is sports and eat regularly. Based on the results of user responses test results obtained overall response of respondents are on very positive category of education or information received from the game being played.

Keywords: Educational Game, Junk Food, Kids, GLDC, Android.

1. INTRODUCTION

1.1. Background

Food is the main ingredient needed by humans to provide energy or energy so as to help provide endurance and as a determinant of the quality of growth. Food is very influential on the health of the body so to support good health the body needs to consume healthy food and harmless to health.

Changes in lifestyle and diet of modern society has led to the rise of unhealthy foods or better known as Junk food. Junk food is an unhealthy fast food and has little nutritional content and is harmful to health as well as bringing various diseases.

The habit of eating junk food tends to be done by children. The availability of junk food and the ease of access to get it give a big influence on the eating habits of junk food in children. Based on the results of questionnaires that have been distributed to 80 respondents, the general population in random Bandung city, it can be concluded that 93% of children like to consume junk food and 57% of children do not know the dangers of junk food.

Introducing and teaching healthy and unhealthy foods to children is necessary. So that later children can sort and distinguish between healthy food with unhealthy food so avoid unwanted disease. Therefore, an alternative solution is needed to introduce healthy and unhealthy food to children. Surely in a familiar way, that is by playing. For play is a fun activity for children. One effective way to introduce and teach children is with educative games.

According to a study conducted by Fitri Yeni in 2013 entitled "The Effectiveness of Educational Games To Increase the Ability of Addition for Children Learning Difficulties" concluded that educational games are effective for improving learning ability in children because educational games are not only educational but also attractive to children done while playing. So that children are more motivated in learning.

Based on the problems that have been exposed, it is necessary to build an educational game that can overcome the problems so that children can recognize healthy and unhealthy food and increasingly understand the importance of health. The results of this study will be described in the final batch of titles with the title of educational game development of the introduction of healthy and unhealthy food on android platform.

1.2. Formulation of The Problem

Based on the background that has been described, then formulated a problem that is how to build educational game introduction of healthy and unhealthy food for children.

1.3. Purpose and Objectives

The purpose of writing this final task is to build an educational game for media introduction of healthy and unhealthy food for children. And the goal is introduce to children about healthy and unhealthy foods.

1.4. Limition of Problem

In order the research is more targeted and reach the target, so it is necessary to scope of problem. These is limit problem in this thesis.

1. Android based games.
2. Game is offline.
3. Game system is single player.
4. Game built with 2D
5. Target users of children aged 5 to 15 year.
6. Food items used in the game in accordance with data from Bandung City Health Office.
7. Game Engine used is Construct 2.
8. Support tools is Adobe Photoshop.

1.5. Research Methodology

This research method is based on qualitative research by using descriptive method. Descriptive method is a method in examining the status of a group of people, an object, a set of conditions, a system of thought, or a class of events in the present.

1.5.1. Method of Software Development

The method used to build this application is the GDLC (Game Development Life Cycle) method. According to Heather Chandler [5] GDLC method consists of four steps namely Pre-Production, Production, Testing, Post-Production.

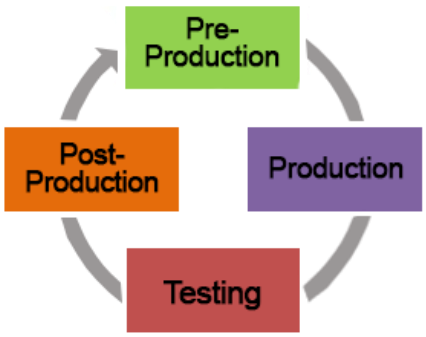


Figure 1. GDLC Method

2. RESEARCH CONTENTS

2.1. Theoretical basis

As a basis for reporting, it is necessary to explain the theories related to the problem and the scope of the discussion.

2.1.1. Foods

Food is a basic human need that is needed at all times and requires good and proper management in order to benefit the body. According to WHO, the intended food is: “Food include all substances, whether in a natural state or in a manufactured or preparedform, wich are part of human diet.”

2.1.1.1. Benefits of Food for the Body

In general, there are 3 benefits of food for the human body. Benefits or uses include food as a source of energy (carbohydrates, fats, proteins), food as a source of builders (protein, water), and food as a source of regulators (vitamins, minerals). [1]

2.1.1.2. Healthy Foods Criteria

Healthy foods are foods that contain balanced nutrition, rich in fiber and substances needed for the development of the body. Healthy food criteria are as follows.

1. Quantity enough
   The amount of food depends on the needs of each person according to the type and duration of work, weight, sex, and age
2. Proposal
   The amount of food consumed should match the proportion of healthy-balanced eating, ie 60% carbohydrate, 25% fat, 15% protein, and enough vitamins, minerals, and water.
3. Quality enough
   Foods that contain nutrients consisting of carbohydrates, fats, proteins, vitamins, minerals, and water.
4. Healthy and hygienic
   Food should be sterile and free of germs that can trigger the disease.
5. Natural fresh food
   Fresh vegetables and fruits are healthier when compared to plant foods.
6. Vegetable foods
   Vegetable foods are healthier than animal foods.
7. Cooked not excessively
   Over-cooked food can lead to the loss of some vitamins and minerals.

2.1.1.3. Unhealthy Foods

Unhealthy food (Junk food) is fast food that has little nutritional content and is harmful to health. Examples of junk food are ice cream, instant noodles, candy, fried, hamburger, pizza, hot dogs, sausage, fried chicken, to chocolate and soda drinks. The diseases caused by junk food is like malnutrition, obesity, diabetes, and problems in the digestive system.

2.1.2. *Game*

Game comes from the English word which has the basic meaning of "Games". The game in this case refers to the art of intellectual playability. Game can also be interpreted as the arena of decisions and actions of players. There are targets and missions for the players to reach. Intellectual agility, to some extent is a measure of the extent to which the game is interesting to play to the fullest. [2]

From several sources of books and research, the notion of games is as follows:

1. According to IGDA (International Garne Developers Association) Education SID, Game is an activity with some rules or rules. Games are a form of play which often (but not always) involves conflicts, either with other players, with the game system itself, or with random / fate /

fortune. Most games have goals, but not all (Example: The Sints, SimCity). Most games have also determined starting and ending points, but not all (Example: World of Warcraft).
2. The definition of the game according to J. Huizinga in his classic work Homo Ludens (1938) gives the definition of pennainan is an activity that takes place in several constraints of space and time, in a visible sequence, based on rules that are freely accepted and beyond the scope of needs.

2.1.3. *Educational Game*

Educational games are games specifically designed to teach users to a particular learning, conceptual and understanding development and guide them in training their abilities, and motivate them to play it. [3]

2.1.3.1. Education Game Criteria

According to Hurd and Jenuings, good design must meet the criteria of the educational game itself. Here are some of the criteria of an educational game, namely:

1. Overall Value
2. Can be Used
3. Accuracy
4. Appropriateness
5. Relevance
6. Objectives
7. Feedback

2.2. System Analysis

System Analysis is the process of decomposition of a whole system into its component parts with a view to identify and evaluate problems, constraints and expected needs so that proposed improvements can be proposed.

2.2.1. Problem analysis

Problem analysis that arises in this research are:

1. The number of children who like fast food (junk food). This is caused by junk food itself is delicious, its unique-unique, and fast in the presentation. As a result many children tend to choose fast food rather than healthy food.
2. Many children who have not been able to distinguish or sort out unhealthy foods. This is because not innovative media or means of delivering information about the nutritional content in food. As a result children do not understand the impact or disease due to consuming the food.

2.2.2. Analysis of Current System

Analysis of Current System is a stage that gives an idea of the system that is running now. This analysis aims to give a more detailed picture of how the current system works.

Here is the flow of community procedures to get socialization about the dangers of junk food.

1. Puskesmas coordinate with Head of Village related to activity plan of socialization of danger of junk food.
2. Village heads approve socialization activities.
3. Puskesmas determine socialization schedule.
4. Once the schedule has been determined, the village head will announce and invite the community to attend the socialization event of junk food hazard to be implemented by the Puskesmas.
5. Communities receive information and socialization invitations.
6. Puskesmas then make socialization materials.
7. Puskesmas then also make stickers, posters, famplet as a medium or means of delivering material about the dangers of junk food.
8. After the arrival of the appointed day, the socialization activities are carried out.
9. Puskesmas convey material about the dangers of junk food to the community.
10. People receive socialization materials.
11. After the delivery of the materials, before the event ends, Puskesmas distributes stickers, posters, famplet about the dangers of junk food to the community.
12. Society receives stickers, posters, and famplet about the dangers of junk food.
13. Puskesmas end socialization activities.

2.2.3. Analysis of Developing Games

In this section will be explained about the analysis of games that will be built.

2.2.3.1. Game Consept

The concept of the game to be built can be seen in the following figure.



Figure 2. Concept of The Game to be Built

2.2.4. Analysis of Non-functional Requirement

Non-functionality requirement analysis describes the need beyond the system needed to run the built application. The non-functional requirements in this Foody game include hardware requirements, software requirements and system users who will use the application.

2.2.4.1 Analysis of Hardware

Required hardware analysis based on minimum requirements that must be met to run the application on smartphone devices can be seen in the following table.

Table 1. Hardware Requirements for Application Users

Device	Minimum specifications
Operating System	Android 4.2 (Jelly Bean)
Screen	4' (inch)
RAM	512 MB
Processor	Dual core

And from the developer side, the minimal requirement that the hardware needed to build this system can be seen in the following table.

Table 2. Hardware Requirements for Application Development

Device	Minimum specifications
Processor	1 GHz
Monitor	14 inch
RAM	512 MB
Hardisk	160

2.2.4.2. Analysis of Software

The minimum requirement of software used to build game Foody can be seen in following table.

Tabel 3. Software Requirements Application Development

No	Software	Minimum specifications
1	Operating System	Windows XP Service Pack 3
2	Game Engine	Construct 2
3	Tools support	Adobe Photoshop

2.2.5. Analysis of Functional Requirement

Functional requirements analysis describes the process of activities that will be applied in a system and explain the needs of the system needed for the system to run properly and in accordance with needs.

2.2.5.1. *Use Case diagram*

Use case diagram describes the interaction between the user who acts as the actor with the system on the application usage. With the use case, the user can know what can be done so that simplify the user in the use of the system.

Use Case Diagram in educational game Foody can be seen in Figure 2 below.

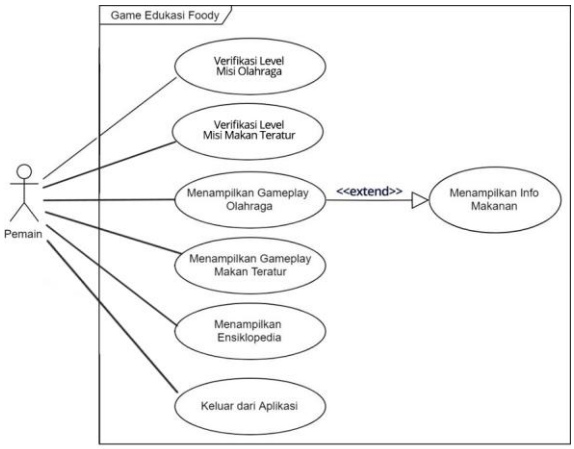
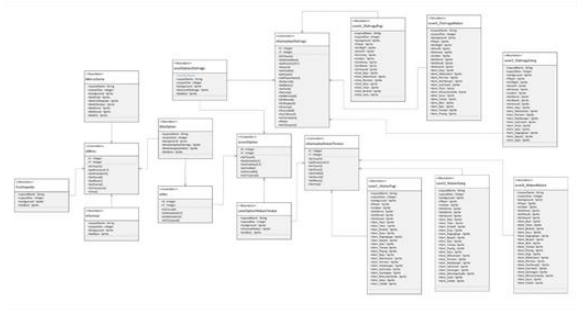


Figure 3. *Use Case* Diagram Foody Game

2.2.5.2. *Class* Diagram

Class Diagram describes the structure and relationship between the objects that exist in the system. The structure includes the attributes and methods that exist in each class, while the relationship includes the inheritance of the association, generalization. The following class diagram of the game Foody shown in the following picture.



Gambar 4. *Class* Diagram

2.3. Design of System

System Design is the stage of designing the application to be built. Stages starting from the design of menu structure, interface design, and semantic network

2.3.1 Design of Menu Structure

Perancangan struktur menu *game* Foody dapat dilihat pada gambar berikut.

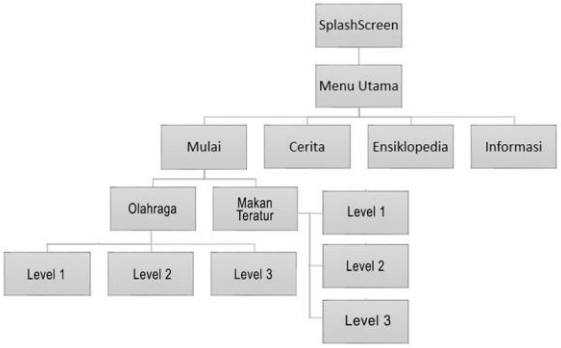


Figure 5. Menu Structure

2.4. Implementation of Interface

Implementation of the interface is done with each program display built. The following is the implementation of the Foody game interface that was built.

2.4.1. Interface of Main Menu

Implementation of the main menu interface can be seen in Figure 6.



Figure 6. Main Menu Interface

2.4.2. Interface Of Select Missions

Implementation interface select mission can be seen in Figure 7..



Figure 7. Interface Select Missions

2.4.3. Interface of Select Level

Implementation interface select level can be seen in Figure 8.

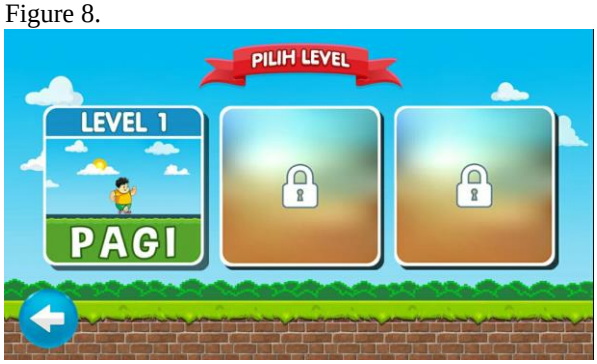


Figure 8. Interface Select Level

2.4.4. Interface of Level 1 Sports

Implementation of level 1 sports interface can be seen in Figure 9.

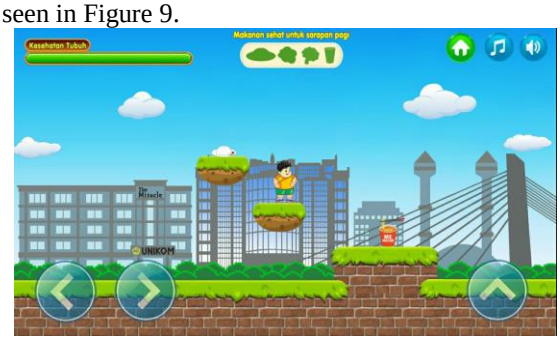


Figure 9. Interface of Level 1 Sports

2.4.5. Interface of Level 2 Sports

Implementation of level 2 sports interface can be seen in Figure 10.



Figure 10. Interface of Level 2 Sports

2.4.6. Interface of Level 3 Sports

Implementation of level 3 sports interface can be seen in Figure 11.



Figure 11. Interface of Level 3 Sports

2.4.7. Interface of Level 1 Breakfast

Implementation of level 1 breakfast interface can be seen in Figure 12.



Figure 12. Interface of Level 1 Breakfast

2.4.8. Interface of Level 2 Launch

Implementation of level 2 Launch interface can be seen in Figure 13.



Figure 13. Interface of Level 2 Launch

2.4.9. Interface of Level 3 Dinner

Implementation of level 3 Dinner interface can be seen in Figure 14.



Figure 14. Interface of Level 3 Dinner

2.4.10. Interface of Encyclopedia

Implementation of the encyclopedia interface can be seen in Figure 15.



Figure 15. The Encyclopedic Interface

2.4.11. Interface of Information

Implementation of information interface can be seen in Figure 16.

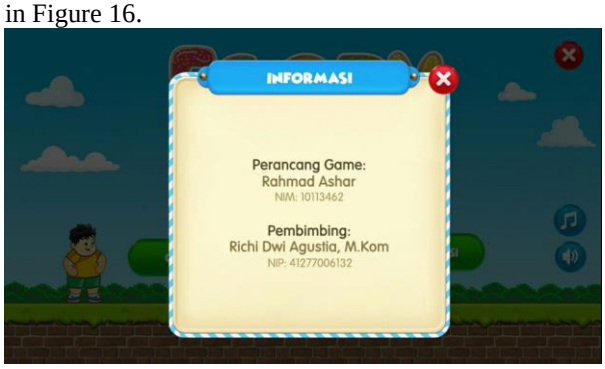


Figure 16. Information Interface

2.4.12. Interface of Application Exit

Implementation of the application exit interface can be seen in Figure 17.



Figure 17. Application Exit Interface

2.5. System Testing

There are 2 type of testing in this case, those are testing device and user feedback.

2.5.1. Device Testing

Testing Device is testing of android device used. In this stage the device being tested is Asus Zenfone 2 Laser and Lenovo Vibe K4 Note. Here are the hardware specifications of both in table 4 to 5.

Table 4. Hardware Specification of Asus Zenfone 2 Laser

No	Hardware	Specification
1	Processor	Quad-core 1.2 GHz Cortex-A53
2	Operating system	6.0 Marshmallow
3	Screen	5.0 inchi 720 x 1280 pixels
4	RAM	2 GB
5	Storage (Free Space)	2 GB
6	Multitouch	Yes

Table 5. Hardware Specifications Lenovo Vibe K4 Note

No	Hardware	Specification
1	Processor	MediatTek MT6753 1,3GHz
2	Operating system	6.0 Marshmallow
3	Screen	1920 x 1080
4	RAM	3 GB
5	Storage (Free Space)	3 GB
6	Multitouch	Yes

2.5.1.1. Scenario of Device Testing

Here is the test scenario of the device of each device. Shown in table 6 to 9.

Table 6. Hardware Testing Scenario Asus Zenfone 2 Laser

No	Hardware	Specification	Result
1	Processor	Quad-core 1.2 GHz Cortex-A53	Pass/Fail
2	Operating system	6.0 Marshmallow	Pass/Fail
3	Screen	5.0 inchi 720 x 1280 pixels	Pass/Fail
4	RAM	2 GB	Pass/Fail
5	Storage (Free Space)	2 GB	Pass/Fail
6	Multitouch	Yes	Pass/Fail

Application testing scenarios in Asus Zenfone 2 Laser are shown in the following table.

Table 7. Application test scenarios in Asus Zenfone 2 Laser

Test	Result
Animation	Pass/Fail
Character	Pass/Fail
Checkpoint	Pass/Fail
Music & Sound	Pass/Fail
Splashscreen	Pass/Fail
Intro	Pass/Fail
Background	Pass/Fail
Select Mission	Pass/Fail
Select Level	Pass/Fail
Sport Gameplay	Pass/Fail
Eating Gameplay	Pass/Fail
Encyclopedia	Pass/Fail
Information	Pass/Fail
Game exit	Pass/Fail
Popup	Pass/Fail

The following is a Lenovo Vibe K4 Note hardware scenario

Table 8. Scenarios Hardware Testing Lenovo Vibe K4 Note

No	Hardware	Specification	Result
1	Processor	MediatTek MT6753 1,3GHz	Pass/Fail
2	Operating system	6.0 Marshmallow	Pass/Fail
3	Screen	1920 x 1080	Pass/Fail
4	RAM	3 GB	Pass/Fail
5	Storage (Free Space)	3 GB	Pass/Fail
6	Multitouch	Yes	Pass/Fail

Application testing scenarios in Lenovo Vibe K4 Note are shown in the following table.

Table 9. Application test scenarios in Lenovo Vibe K4 Note

Test	Result
Animation	Pass/Fail
Character	Pass/Fail
Checkpoint	Pass/Fail
Music & Sound	Pass/Fail
Splashscreen	Pass/Fail
Intro	Pass/Fail
Background	Pass/Fail
Select Mission	Pass/Fail
Select Level	Pass/Fail
Sport Gameplay	Pass/Fail
Eating Gameplay	Pass/Fail
Encyclopedia	Pass/Fail
Information	Pass/Fail
Game exit	Pass/Fail
Popup	Pass/Fail

2.5.1.2. Case and Result of Device Testing

Here are the results of device testing of each device. Shown in table 10 to 13.

Table 10. Result of Asus Zenfone 2 Laser Hardware Testing

No	Hardware	Specification	Result
1	Processor	Quad-core 1.2 GHz Cortex-	Pass

No	Hardware	Specification	Result
		A53	
2	Operating system	6.0 Marshmallow	Pass
3	Screen	5.0 inchi 720 x 1280 pixels	Pass
4	RAM	2 GB	Pass
5	Storage (Free Space)	2 GB	Pass
6	Multitouch	Yes	Pass

The application test results in Asus Zenfone 2 Laser are shown in the following table.

Table 11. Application Test Results In Asus Zenfone 2 Laser

Test	Hasil
Animation	Pass
Character	Pass
Checkpoint	Pass
Music & Sound	Pass
Splashscreen	Pass
Intro	Pass
Background	Pass
Select Mission	Pass
Select Level	Pass
Sport Gameplay	Pass
Eating Gameplay	Pass
Encyclopedia	Pass
Information	Pass
Game exit	Pass
Popup	Pass

The following are the Lenovo Vibe K4 Note hardware results

Table 12. Hardware Test Results Lenovo Vibe K4 Note

No	Hardware	Specification	Result
1	Processor	MediatTek MT6753 1,3GHz	Pass
2	Operating system	6.0 Marshmallow	Pass
3	Screen	1920 x 1080	Pass
4	RAM	3 GB	Pass
5	Storage (Free Space)	3 GB	Pass
6	Multitouch	Yes	Pass

The results of application testing on Lenovo Vibe K4 Note are shown in the following table.

Table 13. Application Testing Results In Lenovo Vibe K4

Test	Hasil
Animation	Pass
Character	Pass
Checkpoint	Pass
Music & Sound	Pass
Splashscreen	Pass
Intro	Pass
Background	Pass
Select Mission	Pass
Select Level	Pass
Sport Gameplay	Pass
Eating Gameplay	Pass
Encyclopedia	Pass
Information	Pass
Game exit	Pass
Popup	Pass

2.5.1.3. Conclusion of Device Testing

From the testing devices performed on the smartphone Asus Zenfone 2 Laser and Lenovo Vibe K4 Note can be concluded that this application runs according to hardware specifications and functions of the game is running.

2.5.2 Testing of User Response

Testing user feedback is a test performed by the user in order to know know the opinion of the system that has been built. This test was conducted by giving questionnaires to 30 respondents.

Table 14. Likert Scale Criteria

Answer Category	Score
Strongly agree	5
Agree	4
Enough	3
Disagree	2
Strongly Disagree	1

To know the response of respondents as a whole can be done with the following stages.

1. Determining the Score

To determine the score can be calculated by the following formula

a. Define Maximum Score
   Score answers * Number of respondents
   = 20 * 30
   = 600
b. Specifies the Minimum Score Total
   Score answer min * number of respondents
   = 4 * 30
   = 120
c. Determining the Median Value
   (Maximum total + minimum total)/2
   = (600+120)/2
   = 360
d. Determining the Quartile Value 1
   (minimum score + median)/2
   = (120 + 360)/2
   = 240
e. Determining the Quartile Value 3
   (max total score + median)/2

= (600 + 360)/2
= 480

Tabel 15. Score

Score	Score Total
Minimal	120
Quartiles 1	240
Median	360
Quartiles 3	480
Maximum	600

2. Determining the Score Limit

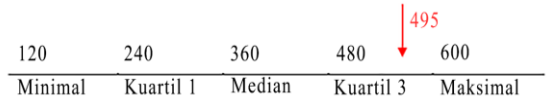
To determine the score limit for each response, then determined the category of response that can be seen in the following table.

Table 16. Score Limit

Score Limit	Response Category
$480 \leq x \leq 600$	Very Positive Response
$360 \leq x < 480$	Positive Response
$240 \leq x < 360$	Negative Response
$120 \leq x < 240$	Very Negative Response

3. Determining the Total Score of the Respondents

Based on the scores obtained the total score of respondents is 495.



4. Conclusion of User Feedback Testing

Based on the results of questionnaires to 30 respondents with 4 questions can be concluded that educational game introduction of healthy and unhealthy foods based on android with a range between 480-600 categories is very positive which means that the overall respondents viewed this application very well.

3. CLOSING

3.1. Conclusion

Based on the results of the implementation and testing of educational games Foody can be concluded as follows:

1. Based on the results of user response test results obtained with a very positive category. Then game edukasu "Foody" is declared eligible to be played.
2. Through this educational game "Foody" children are able to recognize healthy and unhealthy food (junk food).

3.2. Suggestion

Education game "Foody" which is built is still a lot of deficiency. For that, below there are some suggestions that can be given to support the development of this game:

1. This game can be developed into 3D by adding additional features that are more interesting.
2. In this game only made two choices of gameplay that can be played. It would be better plus the choice of gameplay so players do not get bored in playing this game.
3. This game can be developed to be played on a platform other than android.

REFERENCES

[1] D. P. Irianto, Pedoman Gizi Lengkap, Yogyakarta: ANDI, 2016.

[2] Astrid N.P dan Siti Asmiatun. Belajar Membuat *Game* 2D dan 3D Menggunakan Unity. Yogyakarta: Deepublish, 2017

[3] A. Trisnadoli, "Analisis Kebutuhan Kualitas Perangkat Lunak Pada Software *Game* Berbasis Mobile," Jurnal Politeknik Caltex Riau, vol. 2, pp. 67-74, 2015.

[4] Supardi Yuniar. Semua Bisa Menjadi Programmer Android, Jakarta: PT. Elex Media Komputindo, 2011.

[5] D. Triady, Bedah Tuntas Fitur Android, Yogyakarta: Jogja Great! Publisher, 2013.

[6] Rosa A. S dkk (2014). Rekayasa Perangkat Lunak Terstruktur dan Berorientasi Objek. Bandung: Informatika.

[7] Simarmata, Janner. (2010). Rekayasa Perangkat Lunak. Andi: Yogyakarta.

[8] Wahono, R.S., & Dharwiyanti, S. 2003, Pengantar Unified Modeling Language (UML), Ilmukomputer.com.

[9] R. Roedavan, Construct 2, Bandung: Informatika Bandung, 2017.

[10] Wahana Komputer, 25 Kreasi Foto Gokil Dengan Photoshop CS6, Jakarta: PT. Elex Media Komputindo, 2012.

[11] M. Nazir, Ph.D, Metode Penelitian, Bogor: Ghalia Indonesia, 2014.