Educational Game “Mr. Foodi” Healthy and Nutritious Food for Children

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Abstract- Children really like food that makes them interested in trying it, but the food that makes them interested is likely to be one of them. Source of problems for his health. Food and drinks that do not know the manufacturing process have an impact on children's development. Therefore, an educational game was created to get to know healthy and nutritious food. This is so that children can know which food is good for them and which food is not good for consumption. In its implementation, game development can use Construct2. Construct2 is a device that is used specifically for making games for *platforms* 2D. Games that use construct2 can be applied to educational games about healthy and nutritious food using the method *finite state machine*. FSM is a game smart agent development in the field of artificial *intelligence*. Methods Finite state machine (FSM) is a control system design methodology that describes the behavior or the working principle of the system by using the three things, namely, *state*, *event* and *action*.

Keywords- Educational Games, Kids, Construct2, Finite State Machine, Healthy and Nutritious Food

I. INTRODUCTION

Children really like foods that make them interested in trying them, however the food that they are attracted to is likely to be a source of problems for their health. Due to the processing that does not meet the nutritional adequacy rate and the presence of mixtures such as artificial sweeteners, flavorings, preservatives and other causes can be a high risk to health if consumed continuously. This results in these foods not meeting the predetermined nutritional standards, where this needs to be avoided by consuming less of these foods.

If the food given to children does not contain good nutrition, it can interfere with the child's digestion and interfere with the child's growth process (Siti & Novita, 2017). Food and drinks that do not know the manufacturing process have an impact on children's development. For example, fried foods cause diarrhea, artificial sugars cause diarrhea and cramps / upset stomach, fibrous foods because bloating and gas, spicy foods cause indigestion and heartburn. Even food mixed with hazardous substances that are not known to the

manufacturing process, can cause children to be poisoned and at risk of death. Therefore, created *game* educational to get to know healthy and nutritious food. This is so that children can know which food is good for them and which food is not good for consumption.

II. LITERATURE REVIEW

A. Study of literature

According to a study conducted by (Saputro et al, 2018) from the Satya Wacana Christian University entitled "Development of Learning Media Using Construct 2 Applications in Class VII Algebra Material". The research objective was to develop a game platform based educational game learning media for seventh grade students of SMP. The benefits of this learning media are that the game platform-based educational game application helps students learn algebra, the display design and games are attractive to students so that they are not boring, and the material contained helps students understand algebraic concepts and solutions. The research method used was the research design *borg* and *gall* consisting of ten steps. The data collection technique consisted of observation, questionnaires and tests.

According to research conducted by (Kurniawaty, 2017) entitled "Increasing Knowledge about Healthy Food through Cooking Class Activities". The purpose of this study was to analyze and explain the implementation of cooking class activities to increase knowledge about healthy food. The benefit of this research is to increase knowledge about healthy food in grade 3 SDN Kebonsari I, Cimahi City. The research method used was the research developed by Kemmis & Taggart. The actions taken in this study consisted of two cycles; each cycle consists of two meetings. Each cycle consists of planning, action, observation, reflection.

According to research conducted by (Adiwijaya & Christyono, 2015) entitled "Designing an Android-Based Mathematics Learning Platform Educational Game Using construct 2". The purpose of this learning media is to make educational and interesting games so as to increase interest in learning and make it easier to learn mathematics. The benefit of this learning media is that it is good for learning comprehension at this time or before, more emphasis is placed on visual education that looks attractive with

additional images and sounds. The research method used is the prototype method because this model is a classical model that is systematic in nature. In order to facilitate this design, the things that need to be considered are the concepts consisting of content, text, and graphics. Then design using the method *unified modeling language* (UML) which functions to describe the limitations and functions of the system in general, made using *use case diagrams*, *activity diagrams*, *sequence diagrams*, *class diagrams* and *actors* (Jubilee, 2012).

According to research conducted by (Yustin et. al, 2016) from the University of Tanjungpura entitled "Designing a Mathematics Learning Educational Game Application Using Construct 2". The purpose of this learning media is to be able to make alternative media that can be used by children in learning basic mathematics which is fun and can improve children's abilities in learning basic mathematics. From this, the researcher made a learning alternative in the form of an educational game in which there was material on the operation of basic mathematical numbers.

According to research conducted by (Widodo, 2017) from Universitas Nusantara PGRI Kediri entitled "Designing an Android-Based Mathematics Education Game for Classes 4-6 Using Construct 2" the purpose of this research is to increase knowledge about mathematics and also hone the speed of thinking for SD students Class 4 - 6 TPQ BAITUL ABIDIN Jln. Melati, Suwaluh, Sambirejo, Pare - Kediri using the "Mathematics" educational game media. The method used is Rapid Application Development (RAD) or rapid prototyping. RAD is a software development process model that is classified as an incremental (multilevel) technique.

Table 1. Comparison of Research Journals

Authors	Year	Title
Titon Agung Saputro, Et. al	2018	Learning Media Development Using Construct2 Applications in Class VII Algebra Material
Lia kurniawaty	2017	Increased Knowledge About Healthy Food Through Cooking Class Activities
Mohamad Adiwijaya, Et. al	2015	Designing Educational Games for Android-Based Mathematics Learning Platforms Using Construct2 Designing
Jada Ario Yustin, Et. al	2016	Mathematics Learning Educational Game Applications Using Construct2
Danang Wahyu Widodo, Et. al	2017	Design of an Android-based Mathematics Education Game for Class 4-6 SD Using Construct2

B. Multimedia

Multimedia, in terms of language, consists of 2 words, namely multi and media. Multi means many or more than

one. While media is the plural form of medium, it is also defined as a suggestion, container, or tool. The term multimedia itself can be interpreted as data transmission and manipulation of all forms of information, whether in the form of words, images, videos, music, numbers, or handwriting where in the computer world, this form of information is processed from and in the form of digital data (Darma, et al. 2009)

C. Game

Game comes from the English meaning game. In each game, there are different rules for starting the game, making the types of games more varied. Because one of the functions of games is as a stress reliever or a feeling of boredom, almost everyone likes to play games, whether small children, teenagers or adults, maybe only different from the types of games they play. (Ridoi, 2010).

D. Educational Games

Games that have educational content are better known as educational games, this educational type game aims to provoke children's interest in learning subject matter while playing games, so that with happy feelings it is hoped that students can more easily understand the subject matter presented. This type actually refers more to the content and purpose of the game, not the actual type. *Games* are an effective tool for teaching because they contain learning principles and instructional techniques that are effective in strengthening difficult levels. (Yustin et. al, 2016)

E. Construct2

Construct2 is an HTML 5 based game maker tool specifically for *platforms* 2D developed by Scirra. *Construct2* does not use a special programming language, because all the commands used in the *game* are arranged in *Eventsheet* which consists of *Events* and *Actions*. (Ridoi, 2010)

F. HTML5

HTML is (*Hypertext Markup Language*). The meaning of each word that makes up the HTML abbreviation is: (Jubilee Enterprise, 2014)

1. *Hypertext* is text which when clicked will take you from one document to another. In practice, *hypertext* is in the form of a *link* that can take you to the world of the *internet* which is very broad.
2. *Markup* is a *tag* (a kind of code) that regulates the *layout* and visual appearance that we see on a *website*, including *fonts*, text colors, images, and so on.
3. *Language* which is a sign that HTML is a kind of *script* programming.

G. Finite State Machine

Finite state machine or better known as FSM is a model that has been used for years for the development of intelligent game agents in the section *artificial intelligence*. A *finite state machine states* is a device or model that has a limited number of at a certain time and can operate on the input either by transitioning from one state to another causing an *output* or action to decide

something. *Finite state machines* can only be used for one condition at each event (Asmiatun & Putri, 2017).

Development of formal language can be viewed as an abstract entity, namely a set of *symbol alphabet strings* certain. However, language can also be viewed as *entities* abstract that can be recognized or generated through a computation engine. Machines that can recognize the language of this class are *finite state machines*.

There are several definitions of *finite state machines* (FSM) or often referred to as finite state automata (FSA).

1. FSM is defined as a computation device that has an *input* information of a *the string* and an *output* which is one of two values that can be *accepted* and *rejected*.
2. *Finite automata* is a mathematical model of a system with inputs and outputs *concrete*. The system can reside in one of a finite number of internal configurations called *state*.
3. FSM is a control system design methodology that describes the behavior or working principle of the system by using the following three things: *state*, *event* and *action*. The system can switch or transition to *state* another if it gets input or *events* certain, either from external devices or components in the system itself. (Asmiatun and Putri, 2017)

H. Healthy and Nutritious

Food Healthy food is food that is free from harmful ingredients and contains nutrients that are beneficial to our bodies. The dangerous ingredients in question include *msi* dyes, preservatives and artificial sweeteners. Meanwhile, nutrients that are beneficial to the body, such as those containing protein, carbohydrates, fats, vitamins, water, and minerals.

Nutritious food is food that meets the nutritional needs of our bodies. God created man with such a perfect order that he also needed complete nutrients as a constituent (protein, carbohydrate, fat, vitamins, water and minerals). Nutritious food is unnecessary and not always expensive, but it must be healthy and nutritious which also contains various substances that are beneficial to our bodies.

III. RESEARCH METHODS

A. Time and Place of

This research was conducted in 002 Public Elementary School, Bukuan / Palaran Samarinda Seberang area. The research time will be carried out in the odd semester of 2019 - 2020 and will be carried out for a period of approximately 6 (six) months, starting from October 2019 - March 2020. This includes activities such as preparation, research, writing thesis proposals, data collection, and application development and preparation of reports.

B. Research Tools and Materials

System requirements in this study use the following tools and materials.

1. *Hardware specifications* used in making *this game* educational are as follows.
 - 1) Laptop Acer Aspire 3
 - 2) *Processor* AMD A4 - 9120E
 - 3) Memory (RAM) 4GB DDR4

- 4) HDD 500 GB
- 5) Monitor 14 *inch*
- 6) VGA: AMD Radeon R3 Graphics
- 7) Stationery
- 8) Printer

2. The Specifications *software* used in making *this game* educational are as follows.
 - 1) Operating System *Windows* 10
 - 2) *Adobe Corel Draw* X7
 - 3) Application *Construct2*
 - 4) *GiveYourFontsMono*
 - 5) Website.2.APK.Builder v4
 - 6) access *Internet*
3. Materials used are as follows.
 - 1) *Object* visuals in PNG and GIF format.
 - 2) *Music* and *Sound*
 - 3) Short material about the knowledge of healthy and nutritious food.

C. Research Procedures The

Multimedia development methodology Picture 1 consists of six stages, namely *concept* (drafting), *design* (designing), *material collecting* (material collection), *assembly* (making), *testing* (testing), and *distribution* (distribution). These stages can be performed sequentially and can be performed sequentially. Even so, the *concept* stage is the very first stage to work on (Dharwiyanti & Wahono, 2003).

Picture 1. Multimedia Development

1. Concept

Stage The concept stage (conceptualization) is the stage for determining the objectives and who is the user of the program (audience identification). The goals and end users of the program affect the multimedia nuance as a reflection of the identity of the organization that wants information to reach the end user.

2. Design

Design (designing) is the stage of making specifications regarding architecture *program* style, appearance, and requirements *material material*/such as making characters *game* and *game* backgrounds.

3. Material collecting

Material collecting is the stage of collecting materials according to the needs that are done. These materials include textbooks, images *clip art*, photos, animation, *video*, *audio*, etc. which can be obtained

free of charge or by ordering from other parties according to the design. This stage can be done in parallel with the stage *assembly*.

4. Assembly

Stage *assembly* is the stage of making all objects or multimedia materials. Making applications is based on the stage *design*, such as *storyboards*, flowcharts, and the structure or flow of a *program*.

5. Testing

Phase *Testing* (testing) is performed after completing the stage of manufacture(*assembly*) by running an application or *program* and seeing if there is a mistake or not. The first stage in this phase is called the alpha testing stage(*alpha test*), the testing done by the manufacturer or the manufacturer's own environment. After passing testing *alpha*, beta testing involving end use will be carried out. When testing *beta*, the method used is the method *User Acceptance Testing* (UAT).

6. Distribution

At this stage, the application will be stored in a storage medium. If there is not enough storage media to accommodate the application, compensation for the application will be made. This stage can also be called the evaluation stage for developing finished products to make them better. The results of this evaluation can be used as input for the stage *concept* of the next product.

D. The design concept

1. Use Case

In the picture below about the *use case diagram* Picture 2 is a process flow introduction of healthy and nutritious food through *games* educational.

Picture 2. Use Case Game

2. Diagram Activity

Activity Diagram flow depicting various activities within the system that is being designed, from the beginning of flow, *decision* that happens, and how it ends. Below are some *diagrams of the activity* of each flow which is directly related (Rusli et. al, 2017).

1) Controller The

the first thing Picture 3 that the user does is control the object, which consists of jumping, forward, and backward, then the system will start moving the object's character.

Picture 3. Game Controller Activity

2) Activity Diagram The

The first thing Picture 4 the *user does* is to open the level view, then the user / player will choose the level, after the game is over, the system will display the *score* that the *user/* player can get.

Picture 4. Game Activity

3) Sequence Diagram The

The sequence diagram Picture 5 in the game that will be created illustrates the behavior of objects in the *use case* by describing the lifetime of objects and *messages* to be sent and received between objects.

Picture 5. Sequence diagram of play menu level 1

IV. RESULTS AND DISCUSSION

The following are the results of the application to *Game Educational Know Healthy and Nutritious Food* based on Android. This display is made in such a way as to support everything needed by this software to run properly.

A. Display of the splash screen

page on the page splash screen in Picture 6 there is an animation of moving characters and loading.

Picture 6. Display of the splash screen

B. Story Game Page Views

On the page *game story* in Picture 7 is a page that displays the story of the game characters and the missions the player will play.

Picture 7. Story Game Page Views

C. Display Main Menu page

is no main menu page in Picture 8 which contains the name of the game and there are a few buttons, the *PlayButton*, *Button Encyclopedia*, *Button*, *Main Hint* *ButtonMusic*, *SoundButton*, *Button info*.

Picture 8. Display Main Menu page

D. Pageviews Encyclopedia

On page encyclopedia on the image object 9 which contains a summary of healthy and nutritious food objects in the game, and there is a *button*, *Back music button*, *sound button*.

Picture 9. Pageviews Encyclopedia

E. Display Play Guide Page

On the play manual page in Picture 10 which contains a brief explanation of the game and instructions for playing the *game*. The *button* back functions to return to the main menu page, the *buttons* right and left function to change each *slide* in the image.

Picture 10. Display Play Guide Page

F. See page Level

Page *level* in the image 11 is a page that serves to provide *Opera- levels of the game*, where *level* this made up of five *levels*. If the *level* can be completed then it will go to *level*, its next automatically opens *level* is locked.

Picture 11. See page Level

G. Pageviews Games

page *level 1* on the image 12 Players must complete the obstacle by pointing characters using *button control game* to get past the enemy to get to the flag, players must complete *level 1* first so they can continue to *level 2*. Each *level* has a difficulty level - starting from the *level* lowest or easy to high *level* or difficult. At *level 1* or easy the obstacles that are traversed are like easy steps to get through, as well as *the levels* next, until at *level 5* or difficult the

stepping is getting more difficult and the enemy is getting more and more.

Picture 12. Pageviews Games

V. CONCLUSIONS

This educational game application to recognize healthy and nutritious food is made using the Construct2 game engine which helps the teacher learning system in grade V elementary schools through educational games that can be implemented to students and provide a new atmosphere of learning via Smartphone.

From the test results of respondents for SD Negeri 002 Palaran, Samarinda Seberang, it can be concluded that the results of the UAT application get an overall value of 87%, thus the application tested is feasible to use.

Game development "Mr. Foodi" uses 6 stages of multimedia development, namely, concept, design, material collection, assembly, testing and distribution. Application of the method *finite state machine* to *players* to determine the response of behavior *players* to changing conditions that occur in *players* and in the game environment. In this game the player /*user* can control the *player* and pass the obstacles in each *level*.

This application can only run on one *platform*, namely Android. This weakness is a reference so that it can be developed again so that it can be used on several *platforms* such as PC and iOS.

The addition of these food objects can help teachers in learning methods for elementary school students using media *smartphones*.

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