

Development of Educational Games for The Introduction of Fruits and Vitamins

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(Received: December-2018; Reviewed: February-2019; Accepted: March-2019; Published: April-2019)



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ABSTRACT

Indonesia is one of the developing countries with the world's most abundant fruit and vegetable production. Indonesia is supported by geographical conditions that have two seasons, namely summer and rainy season. This condition causes fruits and vegetables to flourish in Indonesia. Fruit is a healthy food source for humans. Fruit is very beneficial for humans and contains lots of vitamins. The introduction of fruit benefits must be started early on from children. From the results of the pre-test, it found that there were still 32% of elementary school students who knew of the vitamins contained in the fruit. To overcome this, researchers made an educational game application for the introduction of fruit and vitamins based on Android. From the results of the post-test, 72% of students understood the type of vitamin on the fruit. From the results of this post-test, the application developed can help improve children's abilities by 39% from the prior state. In terms of application usability, get an average rating of 82%. Appraisal of application the five factors: understandability, learnability, operability, attractiveness, and usability compliance with the percentage values of 81%, 77%, 76%, 84%, and 93% respectively.

Keywords: game education; fruit; vitamin; android; software engineering.

INTRODUCTION

Indonesia is an agrarian country with environmental conditions in the agricultural, fishery and forestry sectors (Dewi, Darsono, & Agustono, 2018). Indonesia has abundant natural wealth. With its geographical conditions where Indonesia has two seasons, namely heat and rain it is possible for people to live and work as farmers and grow crops (Julianto, 2017). Many Indonesians work as farmers (Hapsari & Kinseng, 2018).

In farming, farmers grow vegetables and fruit. Vegetables and fruit are distributed from producers to consumers with the aim of meeting needs (Nurchayati & Hikmah, 2014). Vegetables and fruit are healthy food sources that contain vitamins, minerals, and antioxidants. By

consuming fruits and vegetables can reduce the burden of disease (Dampang, Kustiyah, & Dwiriani, 2018). Therefore the consumption of fruits and vegetables must start early on from children.

From the previous research data obtained that children are still very lacking in consuming vegetables and fruits. The close impact of the lack of consumption of vegetables and fruits is the emergence of constipation, while in the long term the diseases that arise are cardiovascular, diabetes, colon cancer, stroke, and dyslipidemia (Damayanti, Murbawani, & Fitranti, 2018).

The ignorance of children about the importance of the benefits of vegetables and fruit causes children not or even less to consume vegetables and fruit because children prefer to consume sweet, savory foods that are in snacks

(Bujuri, 2018). Nowadays children like to play digital games when compared to playing traditionally (Munawar & Amri, 2018).

Digital games dominated by smartphones, where Indonesia is the largest market share in the world, reaching the US \$ 624 million (Statista.com, 2019), besides the price of the smartphone is low and achieved by Indonesian people (Saputro, 2018).

The use of digital educational games in Indonesia has been carried out by many researchers. Dwiyono in 2017 uses the game as an interactive learning media to describe the use of hand tools and power equipment. In his research, Dwiyono got the results, that the educational game built was feasible to be used as a learning media (Dwiyono, 2017). Sulistyowati and Andy Rachman in 2017 used 3D virtual reality technology as a learning media for mathematics for elementary school children, wherein this study the application was built to get a user satisfaction rating of 93.59% and the material made received an assessment of 80.84% where the application tested on the show UN-Habitat Precom 3 and Indonesia Shari'a Economic Festival (ISEF) 2016 (Sulistyowati & Rachman, 2017). Tirtamayasandi in 2018 presented his research on the use of educational games in understanding science-based straight-motion material at Klaten Muhammadiyah I Middle School. In this study, Tirtamayasandi stated that effective educational games were used to improve the understanding of learning material (Tirtamayasandi, 2018).

Software engineering is a process of making software sequentially and systematically based on a software development process model (Sarkar, 2018). The process is a sequence of activities that must be done to get the goals to be achieved (Yu, 2018). Games are one type of software used for entertainment and education, business, can also be used as health (Aleem, Capretz, & Ahmed, 2016). To make a software process a software process model is needed, some software process models currently available include a waterfall, spiral, v-shape, incremental (Egwoh & Nonyelum, 2017), scrum, extreme programming, kanban, and many more again (Aftab et al., 2018).

From the background above, several things underlie the researchers building educational game applications using incremental models, among others: Children consume fewer vegetables and fruit, Children are not familiar

with the vitamin content in the fruit, Children today play digital games more than playing traditional games, and Digital games based on educational games used as learning media.

METHOD

In this study, the research carried out several activities, namely Literature Study, Survey, Pre-Test, Application Making, Testing Application, and Post-Test. The research method carried out can be seen in Figure 1.

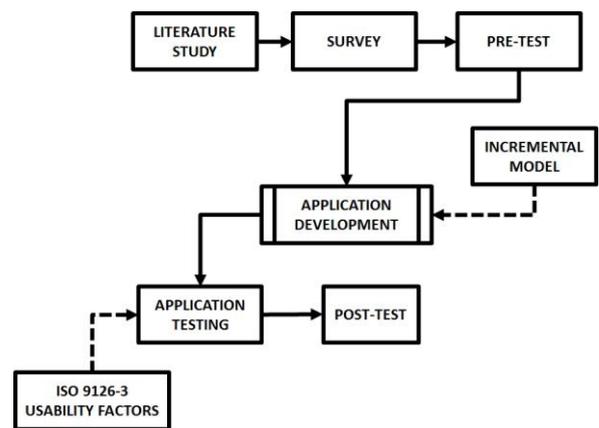


Figure 1. Research Methods Conducted

The first step of the research is the Literature Study. Researchers conducted the literature study at the initial stages of research. Here researchers are looking for information about matters related to research methods that can be used to solve problems and problems of children who do not understand about fruit consumption.

The second step is the researcher surveyed the Public Elementary School (SDN) I Geluran Sidoarjo. The target of this study was grade 2 elementary school students (SD). The researchers met with two stakeholders namely the teacher as the material maker and second-grade elementary students as the research target.

The third step is to conduct a pre-test in connection with children's knowledge of fruits and vitamins and the consumption of children's fruit every day. The pre-test held on 30 grade 2 elementary school students in the form of a written test in connection with the condition of fruit consumption, type of fruit, and vitamins in the fruit. There were ten questions in the pre-test consisting of 2 questions about fruit consumption habits, two questions about fruit types, and six questions about fruit vitamins.

The fourth step is to build an educational game application. To create this application, researchers use an incremental model. The

Incremental model has five main activities, namely requirements, design and development, testing, and implementation as shown in figure 2.

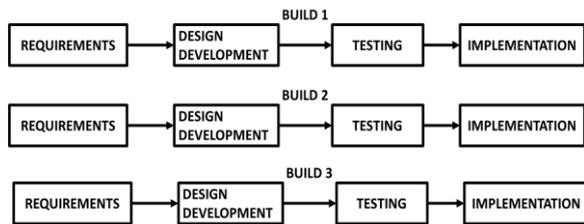


Figure 2. Model of Application Development Process

The fifth step is to test the application. This process to do after the application creation phase is complete. Students should play the game for 10-15 minutes every day within three months. After three months the researcher gave an application feasibility survey where the researcher used the usability factor guide from ISO 9126-3. The usability factor of ISO 9126-3 has five sub-characteristics namely, understandability, learnability, operability, attractiveness, and usability compliance.

The sixth step is to do a post-test. Post-test is a test of understanding of elementary school students in grade 2 students after playing an educational game for three months. Post-test questions are no different from the pre-test questions where there are ten questions.

The results of the pre-test, post-test, and feasibility of the educational game application were collected and calculated using the Likert. Oi scale.

RESULT AND DISCUSSION

Result

In this study, we have built an educational game about the introduction of fruits and vitamins named "Fruit Seller." This educational game has three different types of games, namely puzzles, catching fruit, and guessing pictures. In a puzzle game (figure 3), the player must be able to arrange the real problem to fit the desired image; if it is true, then the player will get the winning information and the bonus he gets. Otherwise, it will fail.



Figure 3. Puzzle Game in "Fruit Seller" Game

In the second game (figure 4), the player must be able to catch the fruit that falls from above. The fruit that captured must be by the existing mission image.



Figure 4. Game Catch Fruit in the "Fruit Seller" Game.

To find out the usefulness of the application, in the initial part of the activity the researcher conducted a pre-test on 30 grade 2 elementary school students. It show at Table 1.

Table 1. Pre-Test question for student.

No	Question	Pre-Test Question Result	
		True	Fail
1	What vitamins are in a rose apple.	15	15
2	What vitamins are in Avocado.	0	30
3	What vitamins are in strawberry.	25	5
4	What vitamins are in Tomatoes.	18	12
5	What vitamins are in the grapes.	0	30
6	What vitamins are in the mangosteen.	0	30

From the pre-test results (Table.1), it found that there were about 32% of grade 2 elementary school students who could answer questions about vitamins contained in the fruit.

After pre-test, elementary school students in grade 2 try the application that the researcher has built. Students do the game for 10-15 minutes. They must play the game education for three months. After three months, the researcher conducted a post-test operation for the same child.

Table 2. Post-Test Questioner

NO	QUESTION	POST-TEST QUESTION RESULT	
		TRUE	FAIL
1	What vitamins are in a rose apple.	25	5
2	What vitamins are in Avocado.	13	17
3	What vitamins are in strawberry.	26	4
4	What vitamins are in Tomatoes.	26	4
5	What vitamins are in the grapes.	21	9
6	What vitamins are in the mangosteen.	18	12

From the results of the post-test, it found that 72% of correct answers about vitamins in fruit. It can see at Figure 5. From the results of the post-test and pre-test, it can see that there was an increase in the understanding of the types of vitamins in Class 2 Elementary Students by 39%.

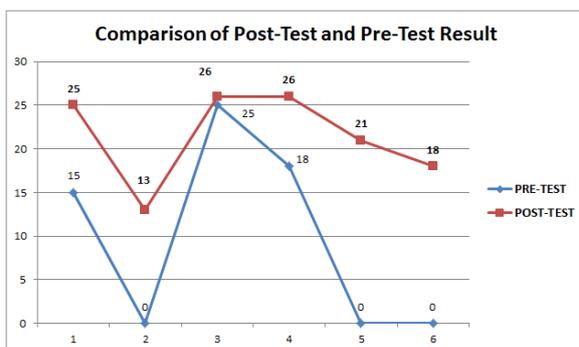


Figure 5. Comparison of the post-test and pre-test result

For appropriateness, the application used as a learning medium. The researcher measures the suitability of the application using the ISO 9126-3 standard where the teacher assists the researcher in getting answers to questions given to Elementary School Teacher Class 2. List of educational game feasibility question can be seen in table 1 below.

Table 3. List of Education Game Feasibility Questions

No	Question
1	Ease of games understood
2	The ease of the game is learned
3	Ease of game operation
4	How exciting is the educational game
5	Game compatibility for learning media

From the results of the application feasibility test, on the characteristics of understandability, the application gets a value percentage of 81%. On the attributes of learnability, the app receives a value percentage of 77%. On the characteristics of operability, the app gets a value percentage of 76%. On attractiveness characteristics get a value of 84%; and on usability compliance characteristics, the app receives a percentage value of 93%. The average total value obtained for the usability factor characteristic is 82%.

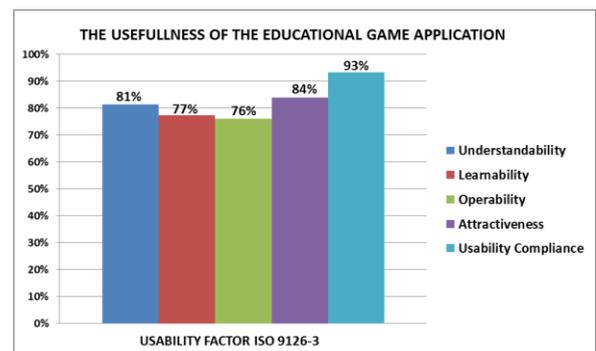


Figure 6. Assessment of Educational Game Applications

Discussion

Digital games are an alternative solution for the teaching and learning process in schools. Nowadays children prefer to play using digital media rather than playing traditionally. Some parents in Indonesia still have the opinion that digital games can fool children and cause a decrease in test scores or student achievement. For this reason, we are building an application that focuses on the introduction of vitamins contained in fruits. From the results of our research, it turns out that by using digital games children can better know and understand vitamins contained in fruits. From the results of the post-test conducted by researchers, the application was able to help children understand nuts provided in vitamins by 72%. There was an increase in children's ability by 39% from the condition before playing digital games built by

researchers, and self-built applications get the application usage level of 82%, which means that the app is very useful in helping the learning process.

The success of researchers in building educational games has also carried out and proven by previous researchers: Nada Gamlo (2019) in his research entitled "The Impact of Mobile Game-Based Language Learning Apps on EFL Learner's Motivation" has also used educational games as an alternative means of learning English. (EFL) At King Abdulaziz University (KAU). Nada Gamlo (2019) focuses on KAU students aged between 18-20 years. In his research, Nada Gamlo recounted that KAU students had difficulty and lacked motivation in learning English. Therefore he built a learning application that could help students in learning foreign languages (English) using being able to continue to the next semester students must be able to complete the game he made. With this motivation students finally managed to learn English (Gamlo, 2019). Anastasiadis F, et al. (2018), In his research entitled "Digital Game-Based Learning and Serious Games in Education" did the same thing, where in his study he developed a game as a learning medium, and by Anastasiadis, et al. (2018) was also called the serious game. They develop games because children today are influenced by digitizing an era where children inadvertently from their personalities that are affected by information technology. Children today need a more interactive and exciting learning experience. The researcher succeeded in developing a game-based learning application by being given additional student motivation and involvement in each activity which eventually could make game-based learning successful (Anastasiadis, Lampropoulos, & Siakas, 2018).

CONCLUSIONS AND SUGGESTIONS

From the above research activities, it can be concluded that: Researchers have succeeded in building educational game-based learning applications that focus on the introduction of fruits and vitamins. The claim that was made was able to help children understand the fruits and benefits of vitamins in fruits by 72% with an increase of as much as 39%. Educational game applications built by researchers also get an average rating of 82%, which means the app is handy as a learning media.

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