Android-Based Educational Game Of Triangular And Rectangular Area As A Measurement Learning Media For Elementary Students

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Abstract: Android technology is commonly used in the learning process and the students love all kinds of games in it. This research was aimed to develop android-based educational game as a measurement learning media in elementary school, describing the media properness, and the effectiveness of media usage in mathematic learning on two-dimensional figure area material for the 4th grade students of State Elementary School Sampangan 01 Semarang. The type of this research is Research and Development. The suitability level of the learning media was determined by the validation tests of the experts and the trial run. The result shows that the percentage of the suitability level obtained by the experts is 73% in suitable category. Percentage that is obtained by the media experts is 77% in suitable category. Percentage that is obtained by the lesson plan experts is 79.4% in suitable category. The increase in learning result can be seen from the big-scale test result in the given pre-test and post-test with 0.32 in medium criteria as the result. The students' activity in media usage in the learning process shows that the students become more active. The conclusion of this research is android-based educational game of "Triangular and Rectangular Area" has the specification of form-guessing and adventure. This educational game is suitable to be used as a learning media and is effective to be used in measurement learning in elementary school.

Keywords: android, area measurement, educational game, elementary school

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1 INTRODUCTION

A new generation is born in a digital environment, called the native digital generation. This new generation can access digital gadgets easily from previous generations. They can adapt and use technology more easily than ever, and with the presence of the Internet, it makes them easier to access information from a variety of sources quickly. On the other hand, Android technology development is increasing and much of the content in Android apps gives users the ability to select the desired application [1]. There are also educational and instructional approaches that are already integrated with learning and already developed and experienced for inside and outside classes. It is undeniable that students love the usage of technology usage in their learning [2]. Some previous researches shows the positive effect of android technology in students' learning result [3]–[5]. Moreover, in a research by [6], it is stated that ICT directly affect the mathematic learning in elementary school, especially if the learning is based on constructiveness. By noticing the children's development stages, the pedagogical approach with games also considered important [7]. Mathematics in elementary school covers numbers, data management, geometry and measurement

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All of these materials are important and interrelated to be taught to elementary school students. Measurement is the assignment of a numerical value to an attribute of an object [8]. For measurement covers concept that is often faced and needed in daily life and related to other materials in mathematics, so measurement is taught since elementary school [9]. Therefore, this research was conducted to check the benefits of modifying android-based educational game in measurement material learning in elementary school.

2 METHOD

This development research used ADDIE model. The steps in ADDIE are: Analysis, Design, Development, Implementation, Evaluation [10]. This educational game development is guided by the concept of educational game which is a game that designed so the students could learn about a certain subject, expand concept, and reinforced development [11]. So, every steps of this ADDIE model is guided by this educational game concept. The research was done to the 4th grade students SD Negeri Sampangan 01, Semarang, Indonesia. The data gathering was done by need analysis questionnaire, media scoring sheet, post-test and observation.

3 FINDINGS AND DISCUSSION

The result of Android-based Educational Game of "Triangular and Rectangular Area" development research as a measurement learning media for early grade elementary school covers some things: (1) the Android-based Educational Game of "Triangular and Rectangular Area" development process; (2) the result of suitability analysis, servings and language of Android-based Educational Game "Triangular and Rectangular Area" by experts; (3) the result of final data analysis in the form of media effectiveness in learning process.

3.1 The Development Process of Android-based Educational Game

The development of Android-based Educational Game is adjusted with the teachers and students' needs. The

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mentioned media development is the development from the side of display, coloring and interesting animations that can draw the attention of the students toward the learning material so that the students can be more motivated in learning. This design step was done after the researchers obtained the data from the teachers and students' need analysis, then the researchers adjusted the data with the characteristics of two-dimensional figure area media that will be developed. The design that has been designed by the researchers aimed to give a picture from the series of process or procedure of media usage to make it easier to understand for the user to use the android-based two-dimensional figure area learning media. The material is served in android-based two-dimensional figure area media covers triangle and rectangle area material. Two-dimensional figure measurement learning is important in elementary school because in area measurement there is a change happening from measurement using tools to measurement using formula [12], so this material become very important to learn. Media learning can solve the students' problem in self-learning that can build the students' understanding in learning mathematics. Guided by five main keys of educational game, which are built by learning principles, involving the students, has the possibility for the students to learn individually, teaching 21st century skills, enable authentic scoring [13]. So the main menu display design of the Android-based Educational Game served in 10 icons that have their own respective functions. Those icons are guide, curriculum, figure, material, exercise, independent task, game, profile, exit and settings.

Fig 1. *The Design of Main Menu Display*

The result of the media development is the design process of Android-based Educational Game realization as a good learning media. Generally, the inside of this educational game are (1) curriculum part that consists of competence, learning goals and practice, (2) the game itself consists of two parts, which are two-dimensional figure guessing and adventure.

Fig 2. *Main Menu Display (1) and Android-based Rectangular Area (2) and Triangle (3) Media Material Menu*

The games in this educational game consists of two kinds of games, which is correspond with the mission of this educational game, which are structured, has competitive activity and played in story context [11]. In this research, the game developed so that students can compete in guessing names of various triangles and quadrilateral. In addition to adventure games, students are invited to compete to the top after passing six stages of the game to be won. Where at each stage students work on routine problems with the non-routine of measuring triangular area and quadrilateral.

Fig 3. *Game order (1) two-dimensional figure guessing (2) and adventure (3) educational game*

3.2 The Result of Suitability Analysis of Android-based Educational Game
The media result that has been made then consulted to the material, media and practitioner experts and teachers and students' responses toward the media. The result is in the form of suitability category as in table 1.

Table 1
The Suitability Scoring Percentage by Experts

Experts	Score	Max. Score	Suitability	Criteria
Material Experts	46	60	73%	Suitable
Media Experts	58	75	77 %	Suitable
Practitioner Experts (lesson plan & trial run questions)	28	40	70 %	Suitable
Teachers and students' response	471	500	94,2 %	Very Good

The result of percentage of suitability scoring by the experts are 46 in score with 73% in suitable criteria by material experts, 58 in score with 77% in suitable criteria by media experts, 28 in score with 70% in suitable criteria by practitioner experts, and 471 in score with very good criteria by teachers and students' responses. Based on the result of the suitability scoring percentage by the experts, it can be concluded that Android-based Educational Game "Triangular and Rectangular Area" is suitable to be used. Although not all students have their own Android, they enthusiastically participated in learning with an educational game based on Android. This is demonstrated by the acquisition of teacher response scores and students achieving excellent categories (94.2%). Android ownership is not a barrier factor. The more important thing is teachers should have training and support abilities in integrating these devices, as well as strategies for classroom management that enable teachers to feel confident in their classroom learning environment [14].

3.3 The Effectiveness of Android-based Educational Game in Measurement Learning

The effectiveness of Android-based Educational Game "Triangular and Rectangular Area" is obtained by the cognitive learning result through formative test in the form of pre-test and post-test. The researcher conducted the average N-Gain increase test to know the increase in learning result between pre-test score and post-test score after doing the previous calculation by t-test. The main goal of the technology usage in learning is to increase the learning result, because when compared to the traditional learning, technology-based learning produce a better learning result [15]. The result of big group test research on the usage of Android-based Educational Game is effective towards the students earning result, marked by the increase of average score of the pre-test as much as 50.64 and post-test as much as 65.67. The data that big group test is distributed normally is obtained from the normality test, then the increase in students' learning result was calculated with N-Gain that resulted a score of 0.32 and included in the medium increase category. The researcher also conducted hypothesis test by using t-test. The obtained tcount is 5.45 bigger than ttable which is 2.045. it can be concluded that Ho is rejected, so the usage of Android-based Educational Game effectively increasing the learning result of the 4th grade students in SD Negeri Sampangan 01.

4 CONCLUSION

From the findings and discussion, it can be concluded that: The development of Android-based Educational Game as a learning media is based on the potential and problems found. The media development in this research is a two-dimensional figure area material learning media development with the specification of guess the picture and adventure. The suitability level of Android-based Educational Game is based on the scoring of material and media experts, with three scoring aspects, which are content, language and writing, and evaluation tools. The scoring percentage from the material experts are 73% with "suitable" criteria. While the scoring result from the media experts in the aspect of suitability, display, usage and excellence shows the percentage of 77% with "suitable" criteria. The use of Android-based Educational Game as a

learning media shows an increase in the learning result that can be seen from the pre-test and post-test result. The effectiveness of learning media can be seen from the increase of students' learning result in small group big group test that shows an increase in the learning result after the use of media. On the small group test, it shows an average of 54.6 in pre-test while the average of average in the post-test is 69.4. The N-Gain calculation shows medium criteria of 0.66. The result of students' response sheet gives the conclusion that learning media developed in the very suitable criteria with the percentage of 94.2%. On the big group test, the average score of the pre-test is 50.6 while the average of the post-test is 65.6. The N-Gain that has been obtained is 0.32 in the medium criteria. Therefore, it can be concluded that the use of Android-based Educational Game as a two-dimensional figure area learning media is effective to be used in elementary school learning.

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