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ANDROID MOBILE GAME MEDIA BASED ON EDUTAINMENT STRATEGY ON SPATIAL ABILITY

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Abstract

This study aims to develop an Android Mobile Game Based on Edutainment Strategy for class VII students of SMP Negeri 3 Pontianak who reach the level of validity, practicality, and effectiveness with the borg and gall model. The subjects in this study were students of class VIII SMP as many as 30 students and 3 media and material experts. The instruments used in this study were media expert validation sheets, teacher responses and student responses, and problem solving ability test questions. The results of validation research on Android Mobile Game Based on Edutainment Strategy are media validation with an average value of 94.28% from the three experts in the very good category. The second is the value of practicality, seen from the value of the questionnaire filled out by the teacher and all students who are accumulated so that a percentage of 92.40% is obtained with very practical criteria. Furthermore, the effectiveness, seen from the value of the results of student posttest work with the number of students who completed as many as 20 people out of 30 people and the average value of students calculated by the formula for the average score and percentage with in the overall student score so that a score of 85.20 was obtained based in the school's KKM score of 75, then the average student test results have complete criteria and are classified as very effective.

Keywords: mobile game, spatial ability, the flat wake

1. Introduction

Education is an effort to provide individual human beings with certain knowledge and expertise. Education can be used to improve and development science, technology, and human resources (Kartini, 2012). In the 2013 Curriculum, expect students to have knowledge and skills in accordance with the corecompetencies in learning mathematics, expect students to have knowledge and skills in accordance with core competencies in learning mathematics (Permendikbud No. 21 of 2016) In thiscase mathematics has an important role in supporting the advancement of science and technology.

The development of information and communication technology is currently growing very fast. This development causes changes in people's behavior and activities in daily life according to Aprilianti (2014). One technologythat is now developing very quickly is informationand mobile communication technology through smartphones. Mobile technology is currently not only use as a communication tool, but also as tool to facilitate users in living their daily lives (Daeng et al., 2017). This can happen because in mobile technologythere are many facilities in order for on each smartphone to be used, an operating system is needed. The operating system that is widely used today is the Android operating system.

Android is an operating system to smartphones and tablets. The operating system can be illustrated as a bridge between the device (device) and its use, so that users can interact with their device and run applications available on the device Satyaputra (in Meilana, 2017). Meanwhile, according to Purwantoro, et al (in Oktiana, 2015) said "Android is a software (software) used on mobile devices (running devices) which includes an operating system, middleware and core applications". The facility that attracts many users to the development of mobile technology is the game (mobile game).

Mobile game is a type of game that is designed and made specifically to be run on mobile devices such as smartphones and tablets David (2016). Game a system or program in which one or more players make decisions through control of objects in the game for a specific purpose. If you want to explore the use of animation, you understand game making or if you want to make games, you must understand animation techniques and methods, because the two are interrelated. According to Aprilianti (2014), games are a very popular service on mobile devices. For this reason, the game is also used not only as a fun services, but also a service that provides learning forthe players.

Games are only used as a means of entertainment, but now they have a wide function, for example, games can be used as learning facilities, business fields, and competed as oneof the sports by professionals (David, 2016). This is in line with the opinion of Jasson (2009), thegame is a system or program in which one or more players make decisions through control ofobjects in the game for a specific purpose. For thisreason, the game is also used not only as a fun service, but also a service that provides learning forthe players.

A fun learning process can be used as a game. By playing learning games, the time spent playing games will not be wasted. This type of game usually has game rules that force the player to think about how to complete the game perfectly. So that the packaging of interesting learning games will definitely get serious attention from people who play them. Hamruni (in Santoso, 2018) argues that the learning process is designed by harmoniously combining educational and entertainment content, so that learning activities take place in a fun way. Edutainment consists of two wordseducation and entertainment, education means education and entertainment means entertainment. In terms of language, edutainment means fun education (Shodiqin, 2016).

According to Sudirman and Fiki Alghadari (2020), to be able to develop spatial abilities, itis done in various ways that can be integrated in the learning process at school. Based on the results of previous studies, there are several ways to develop spatial abilities starting from the process of early childhood education on the high school, one of which is by playing video games. According to Martin, Saorin & Martin (in Sudirman, 2020) Video games are one way to develop spatial abilities. It isbased on an effective way to improve spatial ability, we can use students' hobbies as a valid training strategy, without any academic training. Inour pilot study, the use of video games in an intensive training course increased the development of spatial abilities.

In studying spatial ability on mathematics learning achievement, Smith (Nasution, 2017) concluded that there is a positive relationship between spatial ability and high-level mathematical concepts, but it lacks a relationship with the acquisition of low- level mathematical concepts such as counting. Theuse of spatial examples, such as making charts, can help student masters mathematical concepts. According to Newman, mathematics teaching methods that incorporate

spatial abilities such as geometric shapes, toys (puzzles) that relate spatial concepts to numbers, using spatial tasks can help with problem solving in mathematics Eliot (Nasution, 2017) the understanding of the concept of division, Clements states that the proportion depends on the spatial experience that precedes it (Tambunan, 2006). The indicators of spatial ability are the presence of perceptual thinking, image classification, logical consistency and the ability to identify images.

Based on the description above, the researcher intends to conduct research on "Development of Android Mobile Games Based on Edutainment Strategies on Students' Spatial Ability in Building Flat Materials in Class VII SMP Negeri 3 Pontianak." so this study aims to see the initial picture of the initial product, find out its validity, practicality and effectiveness and see the final product after being revised from the Development of Android Mobile Game Based on Edutainment Strategy Against Students' Spatial Ability in Waking Up Material.

2. Method

The research method used in this research is Research and Development or commonly referred to as research and development methods. The research design used in this R&D research is a modified Borg and Gall development model.

The test subjects in this study were seventh grade students of SMP Negeri 3 Pontianak. The data collection tools in the study were in the form of validation sheets, questionnaires, and spatial ability tests. This study aims to develop an Android Mobile Game based on edutainment strategies for students' spatial abilities

Writing research methods must be arranged into a story in paragraphs. The sentences used in the research method must be in the past tense, because the research process was carried out in the past. Research methods must be clearly written. The research methods section contains an explanation that explains the method, model, design, subject and location of the research carried out, research procedures, sources and data collection techniques, as well as data analysis that was actually carried out by the researcher.

This research method section describes the steps for solving the problem. Describe clearly the research procedures carried out. The method chosen must be adapted to the type of research. For example, experimental research, research design, population and sampling as well as research implementation procedures must be clear. Procedures should be detailed from planning, implementation of action, observation, evaluation-reflection, which are recycled or cyclical.

3. Result and Discussion

3.1 Result

Potential and Problems

The main potential in this research is the ineffective use of technology teachers in carrying the teaching and learning process and the lack of students' ability to solve picture problems. Based on interviews with mathematics, teachers that have been conducted at SMP Negeri 3 Pontianak, class VII, it was found that class VII students had difficulties in the material, one of which was the material of flat shapes. In this flat shape material, students have difficulty in drawing questions, students still have difficulty solving the problem, but most students cannot compose, complete, and think through image transformations on the flat shape material due to a lack of understanding of the questions given by the teacher.

In problems like this, teachers must be able to find solutions so that all students' potential can develop well in the learning process. Based on the results of the study obtained data, so it is necessary to develop learning media that can facilitate students in solving problems and improve the spatial abilities of students. Seeing this problem, the researcher took the initiative to develop an edutainment strategy-based android mobile game media on students' spatial abilities in the flat shape material. With media, it is hoped that students can practice their spatial abilities, as well as generate students' motivation in solving flat shape problems.

Data Collection

After analyzing the potential and problems, the researchers collected the data obtained, data collection was carried out to support researchers in designing the product to be developed, namely android mobile games based on edutainment strategies. Collection data is also adjusted to the objectives that will be included in the Android-based mathematics education game based on student problems obtained from potential problems. The data obtained by researchers when conducting interviews and field observations include:

a. In learning, teachers still rarely use existing technology, teachers only use power point media to support learning. This makes researchers want to make android mobile games based on edutainment strategies to

trainstudents' ability to solve problems.

b. Students cannot compose, solve, and think through image transformations on the flat material due to a lack of understanding of the questions given by the teacher. So that makes students' spatial ability low.
c. Almost all students already have a privately owned Android cellphone.
d. The KKM applied by the school for mathematics is 80.

This data becomes a reference for researchers to design an android mobile game based on edutainment strategies. It is hoped this media can train students' ability to solve problems.

Product Design

After finding potential problems and the required data, the next step is to make a product design or product design. In this design, steps are needed to design an android mobile game based on an edutainment strategy. In this case, it is necessary to design innovative applications in order to improve students' spatial abilities. The product development step is carried out through several stages including:

a. Determine the application used to create android mobile games based on edutainment strategies.
b. Choose the right tool
c. Making flat material questions
d. Determine the name, design the appearance of the game. Mathematical education games that were developed were named spatial games.The games developed are designed as attractive as possible.
e. Creating a programming language. The researcher translates the programming language into construct 2 using a programminglanguage, both letters, numbers and symbols that make up a program that is used to run the game.
f. Checking games on android. The appearance of the Spatial Game is as follows:

Figure 1. Game Initial Display

Figure 2. Display of Spatial Ability Level Options in the Game

Figure 3. Final Score Display

Design Validation

After the initial product design is completed, it is then submitted to the validator to be assessed for validity to see the feasibility of the game so that it can be used for research in schools. In addition, expert validation is useful for anticipating errors during field trials.

In this study, validators who are competent in their fields are selected who can assess well-made products and provide input for products so that the products used can be effective and practical for students.

The selected validator will validate the media, the instruments to be used in the research, such as lesson plans, teacher and student response questionnaires, as well as questions about spatial abilities that will be given to students. The results of the validation by the validator are as follows:

a. Media Validation

Media validation is carried out to see the feasibility of an android mobile game based on an edutainment strategy before being tested in the field. This media validation contains 3 aspects including program aspects, design aspects, and visual communication aspects. With a total of 14 assessment statements filled out using a Likert scale.

Table 1. Media Validation Results

Research Instruments	Validator			Average Percentage Total Score
	I	II	III	
Media	92,85 %	94,28 %	95,71 %	94,28%
Criteria	Very Good	Very Good	Very Good	Very Good

From the results above, it can be seen that android mobile games based on edutainment strategies are included in the "Very Good" category and are suitable for use in research

b. Instrument Validation

The instruments used in the research must be validated first by the validator

Table 2. Result of Validation of Research Instruments

Research Instruments	Validator			Average Percentage Total Score	Criteria
	I	II	III		
Teacher Respons Questionnaire	100 %	100 %	100 %	100 %	Very Good
Student Respons Questionnaire	100 %	100 %	100 %	100 %	Very Good

From the results, it can be seen that the questionnaire research instrument for teacher and student responses is very good and suitable for use in research. The results of the validation by the three validators are also in the form of comments and suggestions on the android mobile game based on the developed edutainment strategy. The results of the validation, comments, and suggestions from the three validators are used by researchers to revise or improve the Android-based math educational game media developed.

Revision

The revision in question is an improvement of the product developed based on input, comments and suggestions from the validators. So that android mobile games based on edutainment strategies can be used for research purposes, in order to train users in improving mathematical understanding skills, and product specifications can be applied to a wider environment. In this study, the validator validates the android mobile game media based on the edutainment strategy and also the research instrument. The results of the revision are as follows:

a. Fixed a bug that occurred when pressing game buttons. When pressed, the button is attached and less comfortable.
b. Instrument questions are equipped with appropriate pictures.

Product Trial

After the android mobile game based on the edutainment strategy and the research instrument was declared valid by the validator by providing several revisions in it. Furthermore, the product is ready to be tested in the field. The trial was conducted at SMP Negeri 3 Pontianak with the research subject being class VII C students, totaling 30 students. The trial was conducted to see the practicality and effectiveness of android mobile games based on edutainment strategies. The practicality of the game is assessed from the response questionnaires given to students and teachers. While the effectiveness is seen from the results of students' test acquisition in doing spatial ability tests. From the results of the questionnaire, students get an average of 91, 18% in the Very Practical category.

While the results of the teacher's response questionnaire got a score of 103 with a percentage of 93.63%. This shows that from the responsegiven by the teacher, it can be seen that android mobile games based on edutainment strategies are very practical to use. The total percentage of teacher and student questionnaire responses is as follows:

Table 3. Results of Teacher and Student Response Questionnaires

Response Questionnaire	Average Percentage Total Score	Criteria
Teacher	91,18 %	Very Practical
Student	93,63 %	Very Practical
Average		92,40%
Categori		Very Practical

The results that are seen next are the results of the effectiveness of android mobile games based on edutainment strategies. The results of the effectiveness are seen from the acquisition of student scores when completing the spatial ability test after working on problems using games in learning.

Judging from the average post-test scores of students are above the KKM, which is 85.20. Where the KKM of the school is 80. This shows that the android mobile game based on the edutainment strategy as seen from the results of the spatial ability test given to 30 students is in the effective category.

Product Revision

After the trial was carried out, the next stage was product revision, but because there was no input and suggestions for Android-based math educational games by students so that the product that had been given was the final product and the final product was the last step in this research due to time constraints, costs and power. However, this research can be continued by other researchers to the next stage, namely steps (8) trial use, (9) Product revision, and (10) mass production.

3.2 Discussion

This study aims to develop an android mobile game based on an edutainment strategy using the Research and Development (R&D) research method using the Brog and Gall development model. In this model there are 7 steps out of 10 carried out including (1) potential and problems, (2) data collection, (3) design validation, (5) design revision, (6) product testing, (7) product revision. The purpose of this study was to examine the validity, practicality, and effectiveness of android mobile games based on edutainment strategies.

Android mobile game based on edutainment strategy on students' spatial abilities in the material of flat shapes in class VII SMP Negeri 3 Pontianak is declared valid after being validated by media experts. The result of media expert validation is 94.28% with valid criteria. In this case, an android mobile game based on an edutainment strategy on students' spatial abilities deserves to be tested in a research school by revising some suggestions from media experts.

After the android mobile game based on the edutainment strategy on the students' spatial abilities was declared valid. Furthermore, field trials were carried out to see the practicality and effectiveness of android mobile games based on edutainment strategies. Practicality can be seen from the questionnaire responses given by teachers and students. From the results of the questionnaire obtained an average percentage of 92.40% with practical criteria. As for the effectiveness, it can be seen from the results of the post-test of students' spatial abilities. The average post-test result of students got a score of 85.20 and the score was above the KKM. This shows that android mobile games based on edutainment strategies on students' spatial abilities are effective for students.

This research is in line with the research conducted by Tri Heru Hadi (2021) entitled the development of edutainment-based android mobile games on numerical abilities to the use of products, Android mobile games based on edutainment for numerical abilities are categorized as very practical to be used by fresh graduates to train numerical skills. Used as an exercise before taking an academic potential test or the like.

Furthermore, the research conducted Mila (2019) with the research title "Android- Based Media Development in Realistic Mathematics Learning". In his research, android- based media had a significant impact on students. The media is categorized as valid with an average score percentage of 87% with details of the value of 92.8% from media experts, 76.47% from material experts, and 91.8% from user experts. Media is categorized as practical because it fulfills two aspects of practicality. The media is declared practical in theory with category B or the media is stated to be usable with slight revisions. Practical media in practice with the acquisition of the average score percentage of student responses of 85.20%. The media is categorized as effective based on the minimum completeness of classical learning outcomes after learning using the media that has been developed with the achievement of an average score of 81.25%.

4. Conclusion

The development of android mobile games based on edutainment strategies on students' spatial abilities in the material of flat shapes in class VII

SMP Negeri 3 Pontianak reached a level of validity with a very valid category with a validity reaching 94.28%

The development of android mobile games based on edutainment strategies on students' spatial abilities in the material of flat shapes in class VII SMP Negeri 3 Pontianak reached the level of practicality with very practical criteria as indicated by the student response questionnaire which reached a value of 91.18% and the response questionnaire given by the teacher reached value 93.63%.

The development of android mobile games based on edutainment strategies on students' spatial abilities in the material of flat shapes in class VII SMP Negeri 3 Pontianak reached the level of effectiveness with effective criteria based on the completeness value determined by the school. The test results show the average value of students getting a score of 85.20so developed students' problem-solving abilities.

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