Design Adventure Education Mathematics Game to Improve The Ability of Creative Thinking in Mathematics

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Abstract

The very rapid development of technology is slowly appearing in the world of education. Educational games are a form of multimedia that packages learning programs in the form of games, so besides being games, they are also educational. The use of game education technology as an interactive learning medium is one of the right ways to improve students' mathematical creative thinking skills. This educational game is expected to eliminate the feeling of boredom and fear of learning mathematics and can facilitate the learning process on geometry material for SMA / MA. This study aims to develop an Android-based educational game that can be operated on various smartphones with the Android operating system and to test the feasibility of using adventure games as a medium for learning geometry. This game can be used as an alternative medium for learning geometry in changing conventional learning methods to learning game simulations, so as to improve students' mathematical creative thinking abilities, because in educational games it has elements of challenge, accuracy, reasoning and ethics. The methodology used in this research is the research development method or Research and Development (R & D) using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model with the following activity stages: (1) Analysis, gathering information; (2) Design, designing multimedia-based animation media and validating media designs; (3) Development, improvement of media design; (4) Implementation, media testing; (5) Evaluation, product revision.

Keywords: educational games; learning media; android;

1. Introduction

The use of Android-based *smartphones* has increased tremendously in Indonesia and in general the use of smartphones is the most prevalent among students. technological development has become an asset to master science. Learning using a *smartphone* needs to be done, because students use it almost every time. Designing games to create a new media as a means of education can be used as props or alternative media on geometry material and can increase students' interest in learning mathematics, because games are entertaining or entertaining. Game is a game that functions as a *warming up,* eliminating boredom in tiring material, supporting mentoring participants to be more actively involved and give a response (Susanto, 2009: 19). game play can be used as therapeutic healing and motor development.

Educational games are games that contain educational material presented in the form of interactive games to train creativity and increase student intelligence. This Math Adventure educational game features an adventure game where the user controls a character who follows a storyline by facing various challenges and puzzles. -teki, while for the educational elements that will be applied to the math education game, the user will be given a question and the user must answer the question correctly. The purpose of this study, namely this study aims to make students like learning mathematics, especially in geometry material by developing an Android-based educational game that can be operated on various smartphones with the Android operating system. The use of educational game technology as an interactive learning medium is one of the right ways to improve students' mathematical creative thinking skills. This educational game is expected to eliminate boredom and fear in learning mathematics and can simplify the learning process on geometry material for SMA/MA.

One of the studies related to mathematics learning media (Utami, 2014). In the report, it has been reported that students achieve mastery learning scores on the rectangular material. Unfortunately, learning

using the Geometre's Sketcpad learning software can only allow students to find answers directly on the computer screen which is done by the software. Students do not participate in trying to think and use their knowledge. (Brecht 2012) from the results of his research it can be concluded that in order to be able to play learning videos so that students can watch them, teachers have been downloading videos from the internet, where they use online videos as a learning resource. However, these videos are often not very relevant to the needs of the students themselves, less actual and contextual. On the other hand, teachers in general have not been able to produce their own learning videos due to various shortcomings including the absence of skills, no software that is easy to operate and other supporting facilities that are still limited.

(Clark, R. E. 2006) The Massachussets Institute of Technology (MIT) succeeded in proving that through a game project called Scratch, games are very good and useful for improving students' logic and understanding of a problem. Based on the results of previous research, there is no doubt that educational games can support the educational process. (Donald Clark. 2006) Educational games are superior in several aspects when compared to conventional learning methods. One of the significant advantages is the animation that can improve memory so that children can store subject matter for a longer time than conventional teaching methods. The math adventure game design developed in this study has advantages compared to some of the lessons previously mentioned. Developing interactive learning media by designing math adventure games with the aim that mathematics learning on geometry material will be more easily accepted by students and students will be more enthusiastic in participating in learning, not bored and bored with monotonous learning so that it can improve students' creative thinking skills.

2. Discussion

Geometry is a mathematical material that is taught at every level of education, both in primary and tertiary education. Geometry is a part of mathematics around students, because almost all objects that are near students are geometric objects. Geometry can be said to be one of the materials that are considered important in mathematics. Usiskin (1982) explained the reason why geometry needs to be taught, namely that geometry is the only field of mathematics that can relate mathematics to the physical form of the real world. Freudenthal (Afgani, 2011) states that geometry is a space where children live, live and move. In that space the children must learn to know, study (to explore), fight to win (conquer), plan and organize life (in order to live), breathe and do better (move better). in it). According to Bobango (Abdussakir, 2010), one of the objectives of learning geometry is so that students can become good problem solvers. As stated by Adolphus (2011), mathematics material that is considered difficult and feared by students in mathematics is geometry material. This results in students feeling lazy to learn geometry and in the end the goal of learning geometry to develop students' creative thinking skills cannot be achieved.

According to van Hiele (Ikhsan, 2008) in studying geometry, a person will pass through a hierarchical level of thinking. Hoffer (Burger & Shaughnessy, 1986) describes the stages of students' thinking levels in geometry, namely: recognition (level-0), analysis (level-1), sorting (level-2), education (level-3) and rigor / accuracy (level-1). -4). The description of the level of development of thinking in the 2006 curriculum (BSNP, 2006) states that students really need creative thinking skills to master science in the future. Mathematical creative thinking ability is a dynamic process that requires the birth of a variety of complex ideas so that understanding increases. According to Jamaludin (2013), the ability to think creative mathematically is a dynamic process that requires the birth of a variety of complex ideas so that there is an increase in understanding. This opinion shows that when a person formulates a problem, solves a problem, or wants to understand something, he will carry out a thinking activity .. According to Munandar (2009: 195). To measure the ability to think creatively can be measured from the aspects of creative thinking, namely: thinking fluently, thinking flexibly (flexible), original thinking, detailed thinking (elaboration). Rahman (2008: 453) states that learning success is determined by the variable personal characteristics of students.

Learning media is basically used as a means to convey messages or information in order to be well received. Arsyad (2013: 11) states that the use of media at the learning orientation stage will greatly help the effectiveness of the learning process and the delivery of the learning content message. According to Rusman (2013: 153), BAVA (British Audio Visual Aids) research results show that learning outcomes that do not use media are only absorbed 13% of the total material provided. By using learning media, the acquisition of teaching materials that were absorbed could be increased up to 86%. Interactive learning media is a combination of text, sound, images, video delivered via a computer that can be controlled interactively.

Designing games to create a new media as a means of education can be used as props or alternative media on geometry material and can increase students' interest in learning mathematics, because games are entertaining or entertaining. Game is a game that functions as a warming up, eliminating boredom in tiring material, supporting mentoring participants to be more actively involved and give a response (Eko Susanto, 2009: 19). Educational games are games that contain educational material presented in the form of interactive

games to train creativity and improve student intelligence. Educational games are given through practice (learning by doing) which is supported by interesting games and makes students active so that it will have an impact on increasing mathematical creative thinking skills. This Math Adventure educational game features an adventure-shaped game where the user controls a character who follows a storyline by facing various challenges and puzzles, while for the educational elements that will be applied to math educational games, the user will be given questions and the user must answer the questions. correctly.

A good educational game is one that has a clear concept and purpose. This concept is usually presented in the form of a storyboard. Story board is a sketch of an image that is arranged according to the script. (Pradana: 2016) states that through story boards, story ideas and game lines can be conveyed to other people. One method that can be applied to create storyboards is balanced design. Designing games based on Game Development also does not have to have expertise in programming because this game engine has click and click functions. Educational games are games that integrate and combine subject matter into the game components (Riva, 2012: 12). According to Cahyo (2011: 19) a game (game) is said to be educational if the game can utilize and hone the ability of the left brain function properly.

3. Research Design

This research was carried out in several places, namely designing an educational game carried out in the Mathematics education study program at Almuslim University Matangglumpangdua and the feasibility test at SMA Negeri 2 Bireuen and MAN Term. . The research design used in research is a research and development method or Research and Development (R&D). Overall this study was conducted in two years. In the second stage, this is to develop an android based math adventure education game. The activities carried out are as follows.
First stage

1. Math adventure game design
2. Validation of the design of teaching materials is carried out to determine the strengths and weaknesses of the teaching materials that have been designed. Design validation is carried out by presenting experts or experts. Each expert is asked to assess the design, so that further strengths and weaknesses can be found from the design teaching materials.
3. Design improvements
4. Limited trial
5. More extensive trials
6. Evaluation and improvement
7. Computer based game education products
8. Export Developer to WEB install on android
9. Implementation of learning using android based game education
10. Android based final game education products

Second Stage
The second stage is a continuation of the first stage which is carried out in the second year. In the second stage, this is to develop an android based math adventure education game. The activities carried out are as follows.
11. Export Development to WEB install on android
12. Implementation of learning using android based game education
13. The final android based game education product

In more detail, the steps and targets of the math adventure game design research are presented in the following figure 1.
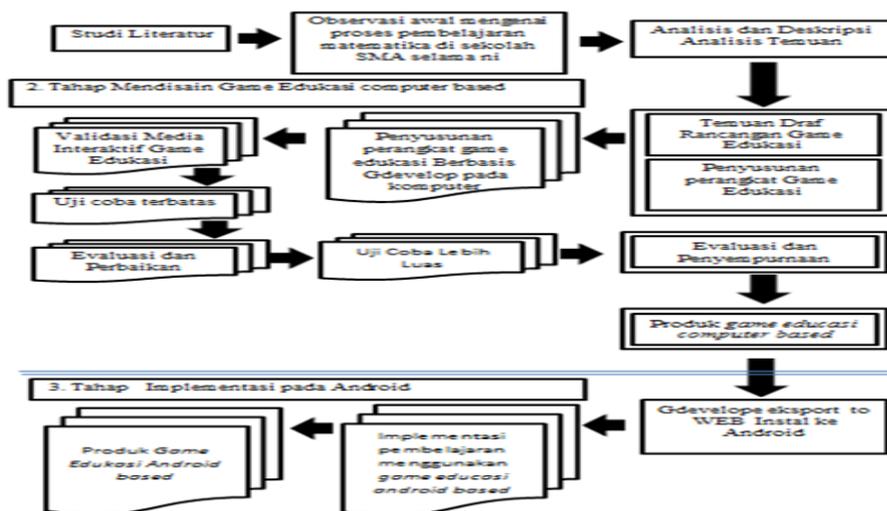
Figure 1. The stages of research and development activities for the Geometry Adventure education game design

3.1 Data analyst techniques

Several techniques were used to collect data such as tests of mathematical creative thinking skills, questionnaires, and observation sheets. This test is used to analyze mathematical creative thinking skills in geometric material. The questionnaire was used to determine the attitudes of students in terms of the teaching and learning process and the concept of mathematics. The observation sheet was used to determine the level of the learning model by using games that were applied in the classroom to teachers and student activities in the learning process. The data problems in this study can be visualized in the Fishbone Diagram below:
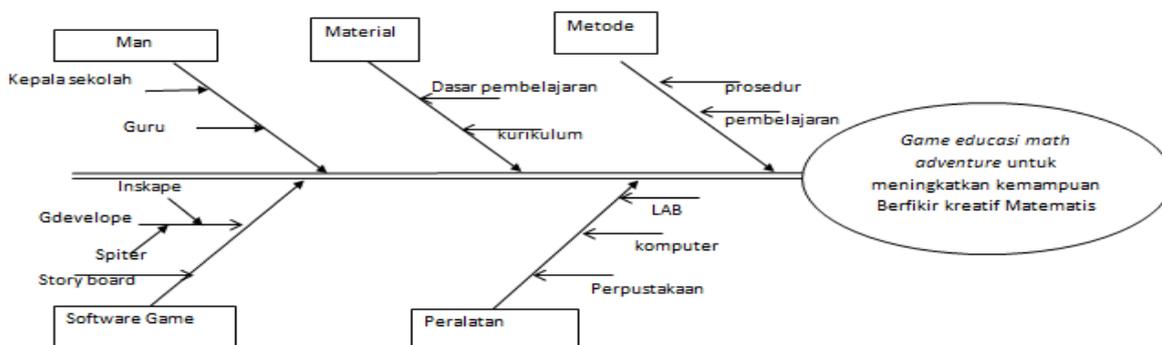

Figure 2.

3.2 Results of the Media

Expert's Assessment The media expert's assessment was used to obtain validation of the feasibility of the math adventure computer based game media on the resulting geometry material. Media is assessed by a media expert who is a teaching staff who has good abilities in the multimedia field, namely Wiwin Apriani, M.Sc.

Assessment by media experts to obtain math adventure computer based game media on geometry material that is feasible to do using a questionnaire so that media experts can provide input and suggestions. The results of the assessment by media experts can be seen in Table 5.2. the following.

Table 1. Media Feasibility Results of Media Expert Assessment

No	Aspects Assessment	Frequency					Xt	Yt	%	Criteria
		5	4	3	2	1				
1	Dispaly quality	4	4	1			39	45	86,7	very worthy
2 3	Manipulation Software	2					10	10	100	very worthy
Total							49	55	89,1	very worthy

Based on the table above, overall the results of the media expert's assessment include two aspects of the assessment, getting a percentage of 89.1, then the math adventure computer based game media media on the resulting geometry material is included in the very valid category and is very suitable for use as a learning medium.

3.3 Media Design Improvement

The improvement of the media design for the Math Adventure Education Game Media was carried out by taking into account the results of the assessment of the quality of the media and materials as well as input on the improvement of the media design by media experts and material experts.

3.4 Media Trial

The data on the results of the multimedia-based animation media trial can be seen in Table 5.5. the following.

Table 5.5. Media Feasibility Assessment Results

No.	Aspect Assessment	Frequency					Xt	Yt	%	Criteria
		5	4	3	2	1				
1	Interest in Learning	2	2				18	20	90	very worthy
2	Mastery Theory	2	1				14	15	93	very worthy
3	Display	2	2				18	20	90	very worthy
Total							77	90	91,1	very worthy

Based on the table above, overall the results of the student assessment include 3 aspects of the assessment, obtaining a percentage of 91.1%, the resulting math adventure game animation media is included in the very valid category and is very suitable for use as a learning medium on geometry material.

Figure 3. Game Home Screen and Game *Education* Instructions

Figure 4 Game *education* screen and exercise

Figure 5: Challenge screen and Game *educas* score

4. Conclusion

The conclusion that the research team can convey is based on the results of the research report, namely that the Android math education game media design has been obtained based on geometry material that is very valid and suitable for use as a learning medium, and based on the results of the trial of teaching materials using the math education game media that students' creative thinking skills can be built / improved by providing problems in mathematics in the form of animation and interesting games in accordance with math problems that exist in everyday life.

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