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DEVELOPMENT OF ANDROID-BASED EDUTAINMENT MATHEMATICS LEARNING MEDIA ON ELLIPSE MATERIAL

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Abstrak

Media pembelajaran merupakan alat bantu belajar dalam menyampaikan informasi instruksional yang menjadi instrumen dalam menentukan keberhasilan dalam proses pembelajaran. Tujuan dari penelitian ini yaitu untuk mengembangkan media pembelajaran matematika *edutainment* android pada materi elips yang dapat digunakan dalam proses pembelajaran. Alasan dikembangkannya media ini adalah untuk menarik minat siswa pada materi elips yang dinilai sulit oleh sebagian siswa. Kriteria kelayakan media mencakup tiga aspek yaitu valid, praktis, dan efektif. Penelitian ini merupakan penelitian pengembangan dengan menggunakan model ADDIE yang mencakup tahap analisis, desain, pengembangan, implementasi, dan evaluasi. Media yang telah dikembangkan dilakukan uji coba terbatas dengan subjek siswa kelas XI SMAN 1 Kedungwaru. Instrumen yang digunakan terdiri dari lembar validasi, angket uji kepraktisan, dan hasil tes siswa. Berdasarkan data validasi yang diperoleh dari ahli media dan materi menyatakan media masuk dalam kriteria valid, dari hasil angket uji kepraktisan media oleh siswa menyatakan bahwa media masuk dalam kriteria praktis, dan hasil dari tes menunjukkan bahwa sebanyak 80% siswa memenuhi batas ketuntasan sehingga media masuk dalam kriteria efektif. Dari hasil tersebut disimpulkan bahwa media yang dikembangkan pada penelitian ini layak dan dapat digunakan dalam pembelajaran.
Kata Kunci: ADDIE, android, edutainment, elips, media pembelajaran, pengembangan

Abstract

Learning media is a learning aid that act as an intermediary in conveying instructional information which are one of the instruments that determine the success of learning process. The research aim is to produce an edutainment mathematics learning media-based android on ellipse materials that is good and decent that can be used in the learning process. The media was developed to attract students' interest in ellipse which is considered difficult by some students The qualification of the media cover three aspects of validity, practical, and effective. This research is developed using ADDIE model which consists of analysis, design, development, implementation, and evaluation. The developed media was conducted with limited trials with the research subjects are grade XI students of SMAN 1 Kedungwaru. The instrument used on this research are validation sheets, questionnaires test of practicality, and students' test. Based on the data obtained the result of validity test from the experts stated that the media was categorized as valid, from the questionnaires test of practicality from students the media was categorized as practical, and from the student test result showed that 80% of the students met the completeness limit so the media categorized as effective. The result concluded that the developed media categorized as decent and can be used in learning process.
Keywords: ADDIE, android, edutainment, ellips, development, learning media

INTRODUCTION

The industrial revolution era encourages science and technology to continue developing. Almost everyone in the world uses technology to communicate and obtain information. Smartphones become one of the chosen tools to meet these needs. As known, smartphones use an operating system called android.

Android is a Linux-based operating system designed for touchscreen mobile devices. Android is free and its operating system is open source, so it allows software inside to be freely modified by developers. With this development, we can use it in the education system, using android to create interesting and fun learning media, especially in learning mathematics.

Etymologically, the media comes from the middle word. While in KBBI, media means intermediary or liaison. Arsyad (2011) states the notion of media as humans, materials or events that can help students build their knowledge, skills, and attitudes. If it's concluded from that understanding then books, teachers, and the school environment are examples of the media. Meanwhile according to (Sadirman, 2018), the media cover all things with interest, attention, and skills that help in the learning process and improve learning outcomes. From some of these understandings, it can be concluded that the media is a useful intermediary for channeling messages with the aim of helping users acquire knowledge, skills, and attitudes by attracting student interest, attention, and skills so that the process and learning outcomes are encouraged.

The learning media is a tool for learning, both inside and outside the classroom. The learning media links the instructional information between the source and the recipient (Heinich, et al, 2002). Looking from the perspective of education learning media becomes one of the most strategic instruments in determining success in the learning process (Yulianti, 2013). Nasution (2015) also argues that the learning media is a bridge between the learning process and the purpose of learning. From some such understanding the learning media can be interpreted as a learning aid that is an intermediary in the transmission of instructional information that is an instrument in determining the learning process' success.

Learning media has various forms. Heinich, et al (2002) categorize learning media into six types, namely audio, visual, text, moving images, miniatures or manipulative objects, and humans. These media can be combined with each other depending on the needs in the learning process. In this study, the researcher will use "edutainment" as a medium in helping mathematics learning activities.

Edutainment is a combination of the words "education" and "entertainment" which means as it is. There are 4 things that are characteristic of edutainment, namely; (1) become a bridge between the learning and teaching processes, (2) encourage a conducive and fun learning atmosphere, (3) place students as the center of the learning process as well as educational subjects, (4) bring humanist learning concepts so that they can produce effective learning activities (Rosyid, 2018). In other words edutainment is an educational media designed into an entertaining, engaging, and fun form. Edutainment is created by incorporating various learning resources into the form of entertainment that familiar with life, in order to facilitate student social interaction such as television programs, computers, games, and so on (Sholeh, 2011). In this study, edutainment media will be applied using a mobile learning model.

Mobile learning (m-learning) leads to the use of mobile devices such as PDAs, mobile phones, laptops, and tablet PCs in the learning process (Wood, 2003). Quinn (2010) defines mobile learning as a combination of mobile computing and e-learning that is rich in resources and interactions, it also has strong support in learning regardless of space and time. From this definition, it can be concluded that mobile learning is a learning model that utilizes information and communication technology in the learning process. Mobile learning has the advantage of providing interesting teaching materials that can be accessed at any time.

In mathematics, edutainment and mobile learning are still very rarely used in learning. Whereas the use of edutainment can help improve students' understanding in learning, this is evidenced with the research conducted by Zin & Zain (2010). In addition, research conducted by Zin & Zain (2010) shows that edutainment can increase students' interest in following the learning process. The role of edutainment and mobile learning is very important because it has practical value and a large function in instructional implementation which is a new innovation that increase students' interest in learning mathematics (Rohani, 1997). Based on research that has been conducted by Qoriyah (2017) the use of edutainment in education could increase student interest and learning outcomes. It can be concluded that edutainment and mobile learning in education are media used to foster studdents' interest, it also improve students' understanding and learning outcomes in the learning process.

In mathematics, the cone slice is one of the materials that must be mastered by eleventh grade students in the specialization mathematics subject group. The ellipse is one of the plane figure that can be constructed from the wedges of a cone (Hanafiah, 1992). An ellipse is defined as the set of all points on a flat plane whose sum of distances against two specific points remains. These two points are called the focus points of the ellipse.

Sari (2016) mentioned that student learning achievement in cone slice material is very low, especially in the ellipse subsection. This is because students' lack of motivation to learn about the ellipse material, the perception that students have is that the material is less important to learn because it is only included in the group of specialization material and not included in the material tested on school exams. In addition, students find it difficult because the material is not visualized in geometry and only limited to formulas, causing weak mastery of concepts. The number of formulas that need to be memorized is also one of the obstacles for students in mastering the material.

Based on the problems above, the researcher wants to develop android-based mathematical edutainment learning media on ellipse material and determine its quality in terms of increasing students' understanding and interest.

METHOD

This research is using a type of development research method. Development research aims to produce a prototype product and provide empirical evidence of its effectiveness and build a methodological guide as the basis for the design and evaluation of the product (Van den Akker, et al., 1999). Development research in the world of education has many methodological variations and mentions, so it is necessary to know the boundaries of paradigms and their types (Siswono, 2019).

This study uses the ADDIE model because this model has clear stages to produce products specifically designed for learning (Lee & Owen, 2004). The ADDIE model is divided into five stages including analysis, design, development, implementation, and evaluation (Morrison, dkk, 2010). The first phase of the ADDIE model is called 'Analyze'. In this phase, the problem is identified, the training needs analyzed, the target audience identified, and the high-level learning goals are listed. The design phase deals with learning objectives, assessment instruments, exercises, content, subject matter analysis, lesson planning and media selection. The development phase is where the developers create and assemble the content assets that were created in the design phase. The implementation stage reflects the continuous modification of the program to make sure maximum efficiency and positive results are obtained. The evaluation phase consists of two parts: formative and summative. Formative evaluation is present in each stage of the ADDIE process. Summative evaluation consists of tests designed for domain specific criterion-related referenced items and providing opportunities for feedback from the users.

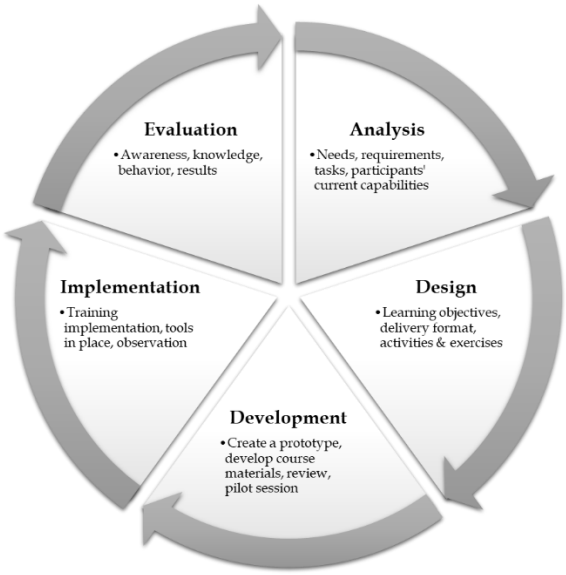

Figure 1. ADDIE model used in this study

The subjects selected in this study are grade XI students of SMAN 1 Kedungwaru. The research instruments used are validated questionnaires by material and media experts, media practicality questionnaires by students, and tests to determine student learning outcomes.

Nieveen (1999) states that the media is said to be eligible if it meets the criteria of being valid, practical, and effective. The media is said to be valid if the results of the validation table given to validator stated that the developed media falls into category of valid. According to Sugiyono (2013) the interval of media validity criteria is calculated using a likert scale so that the media validity criteria are obtained as follows:

Table 1. Media validity criteria

Percentage (%)	Category
4,21 – 5,00	Most valid
3,41 – 4,20	Valid
2,61 – 3,40	Quite valid
1,81 – 2,60	Less valid
1,00 – 1,80	Invalid

The media is said to be practical if the assessment result of the students stated that the media falls into the category of practical or good. The practicality of the media is calculated using likert scale with criteria as follows:

Table 2. Media practicality criteria

Percentage (%)	Category
81 – 100	Very practical
61 – 79	Practical
41 – 60	Quite practical
21 – 40	Impractical
0 – 20	Very impractical

The effectivity of the developed media is determine using data analysis techniques in the form of completeness of student learning outcomes. The media is said to be effective if the students' test results stated that 75% of students who take the test meet the predetermined minimum completion criteria (KKM), which is 75.

Table 3. Media effectivity criteria

Percentage (%)	Category
≥ 75	Effective

RESULT AND DISCUSSION

The implementation of this application is to increase student learning motivation and help students understand mathematics material. By using ADDIE, it can be described as follows:

1. A*nalyze*

The development of this application requires three stages of analysis, namely needs analysis, technological analysis, and curriculum analysis.

a. Needs Analysis

Based on several interviews of eleventh grade high school students, it was found that they had difficulty in the ellipse material. Thus, a unique and interesting learning support media that can increase student understanding is needed.

b. Technological Analysis

From various studies, it is said that technology can be used to help the learning process. Smartphones are one of the choices because of their high mobility and are used by many people in everyday life. Android is choosen because android is one of the most popular operating system in the world. Beside that, android is free and its operating system is open source, so it allows software inside to be freely modified by developers. Therefore, android technology-based learning media that can help the learning process are created.

c. Curriculum Analysis

In the 2013-curriculum specialization mathematics book, there is a sub-chapter that discusses ellipse material. This is used as the basis for the creation of this learning media.

2. Design

Before developing this application, the thing to consider is the mathematical design that will be made in the application. The design of such applications includes the following stages:

a. References

The references that's used were come from books, journals, articles, and various other sources related to ellipse material.

b. Material content design

The material on the learning media is designed in accordance with the indicators and learning objectives of the ellipse material in the 2013 curriculum.

c. Storyboard

The storyboard design is made based on the design of predetermined material content. The material used in the storyboard is in accordance with the learning indicators and objectives to be achieved.

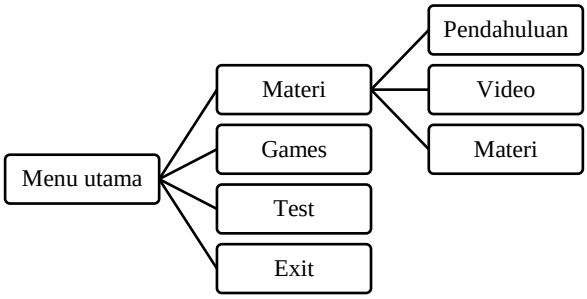

Figure 2. Storyboard Design

3. Development

At this stage, the process of creating learning media is using the Adobe Flash application. The name of the learning media that has been created by the researcher is "Geotik". This media is equipped with buttons that are useful for adjusting navigation in each scene. In the initial display, there are 4 menu options, namely: materi, games, test, and exit. The initial view menu can be seen in the figure 2.

Figure 3. Geotik initial display

The "materi" menu contains videos and explanations of materials that will be used as teaching materials. In the "materi" menu, there is an explanation of objects and events in everyday life that contains ellipse elements, definitions of ellipses, parts of ellipses, ellipse formulas, direktriks, tangent equations, and animated videos about ellipses and their explanations.

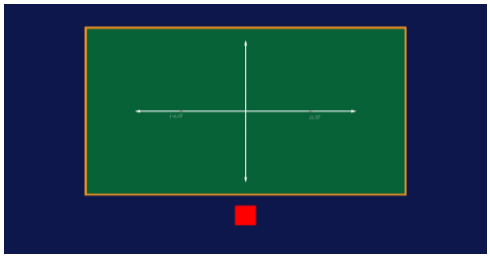

Figure 4. Video display on the “materi” menu

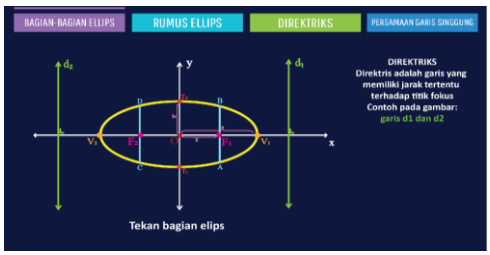

Figure 5. Ellipse material explanation display

Figure 6. Navigation buttons on the “materi” menu

The "games" menu contains 5 questions that are packaged as attractive as possible so that students do not get bored in doing it.

Figure 7. Initial display on the “games” menu

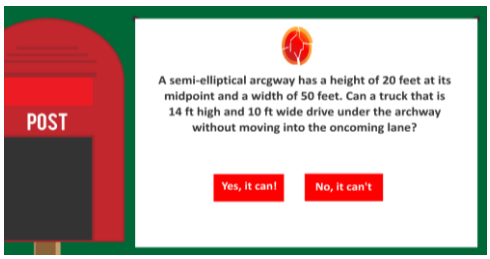

Figure 8. Question display on the “games” menu

Figure 9. “Main lagi” scene display

The "test" menu contains 10 multiple-choice questions at the end of the scene, values will appear that can be used as a reference to find out how far students understand this material.

Figure 10. Initial display on the “test” menu

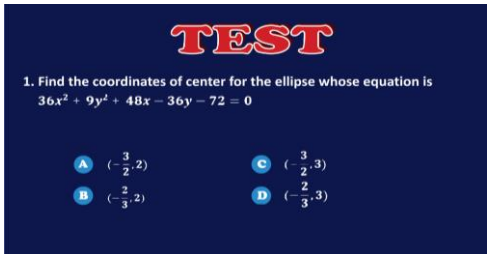

Figure 11. Question display on the “test” menu

Figure 12. Final display of scoring results

The "exit" menu serves to close the window of the media that has been created.

4. Implementation

The media that has been developed is tested on grade XI students of SMAN 1 Kedungwaru. The trial conducted was a limited trial with a subject of 10 randomly selected students. This stage aims to obtain data on the practicality and effectiveness of the media that has been created.

5. Evaluation

Based on the validation table by the material expert (Table 4), the media is included in the valid criteria with an average of 3.7. In the validation table by media experts (Table 5), an average value of 3.5 with valid criteria was obtained. From this data, the media developed is included in the valid criteria so that it can be use.

Table 4. Material expert validation results

No	Observed aspects	Observation score				
		1	2	3	4	5
1.	Relevance					
	The material in Geotik media is in accordance with the competencies that must be mastered				✓	
	Completeness of the material according to the level of student development				✓	
	The material adequately meets the demands of the curriculum				✓	
	Media illustrations is in accordance with the level of development of the student				✓	
2.	Accuracy					
	The material presented is in accordance with scientific truth			✓		
	The material presented is in accordance with the latest developments			✓		
	The material presented corresponds to everyday life			✓		
3.	The presenting completeness					
	Presenting competencies that students must master				✓	
4.	The material basic concepts					
	Geotik media used is in accordance with the concept of ellipse				✓	
	Geotik media used in accordance with learning objectives				✓	

Table 5. Media expert validation results

No	Observed aspects	Observation score				
		1	2	3	4	5
1.	General Display					
	Media design is in according with the Ellipse material				✓	
	Media design is in accordance with the concept of environmental preservation			✓		
	Media packaging is in accordin with the integration of Ellipse material with			✓		
	the concept of environmental preservation					
	The media design is interesting to look at			✓		
	The media design presents a real example of an Ellipse			✓		
2.	Custom Display					
	Color selection in the media				✓	
	Font selection in the media				✓	
3.	Media Presenting					
	Media display is attractive			✓		
	Media is titled/ captioned				✓	
	Media presentation is able to develop students' interest in learning				✓	

Table 6. The results of the practicality test questionnaire by students

Questions	The number of students who choose					Score
	1	2	3	4	5	
This media may cultivate student curiosity	-	-	5	5	-	35
The used media may develop students' thinking potential	-	-	6	4	-	34
The used media may help students from the initial learning process to the evaluation	-	-	3	5	2	39
Learning media helps students in the learning process	-	-	3	7	-	37
This learning media has never existed before	-	-	4	5	1	37
The given media can be	-	-	3	6	1	38

Questions	The number of students who choose					Score
	1	2	3	4	5	
used independently						
The material in the learning media is related to the previous material that has been studied	-	-	3	7	-	37
In learning media, there are tasks or evaluations that students can do as exercises	-	-	-	9	1	41
Evaluation questions presented in the learning media is in accordance with the taught material	-	-	4	6	-	36
Learning media helps students in mastering materials quickly	-	-	3	7	-	37
Learning media provide examples and illustrations that support the explanation of the material	-	-	2	8	-	38
Learning media uses simple and communicativ e language	-	-	7	3	-	33
The appearance of the main menu on the media makes it easier	-	-	2	5	3	41
for students to use the media						
The number of main menu options on the media is in accordance with the needs	-	-	3	7	-	37
The display of the main menu on this media is complete	-	-	3	7	-	37
The layout of the selection menu on the media is well organized	-	-	3	7	-	37
The contents of the display on the media are in accordance with the selection menu	-	-	-	7	3	43
Displayed images on the media make it easier for students to understand the material	-	-	5	5	-	35
The use of fonts in media is easy to read	-	-	6	4	-	34
The writing of mathematical terms in the medis is easy to understand	-	-	7	3	-	33
Total Score						739

After obtaining validation test results from media and material experts, a limited trial was carried out by taking the subject of grade XI students of SMAN 1 Kedungwaru. From the practicality test table by students (Table 6), an average score of 73.9% was obtained. From the results of the trial, it was concluded that the media was included in the practical criteria.

Table 7. Students' learning outcomes analysis

No	Name	Score	Description
1.	AP	80	Passed
2.	AR	90	Passed
3.	BW	80	Passed
4.	BY	80	Passed
5.	DN	90	Passed
6.	DV	70	Not Passed
7.	DA	80	Passed
8.	EF	80	Passed
9.	FS	80	Passed
10.	FL	70	Not Passed

Students reach the complete criteria if the score obtained meets the predetermined minimum completion (KKM) criteria limit of 75. From the table of analysis of student learning outcomes (Table 7), 8 of 10 students who takes the test passed the KKM. It means, 80% of the students met the predetermined minimum completion (KKM) criteria. Based on these data, it can be said that the media meets the criteria for effectiveness.

Based on the test results and questionnaires provided, the media that has been developed meets the criteria of being valid, practical, and effective. Thus the Geotik media developed in this study is said to be proper and can be used in learning.

The advantage of this media is that it has been equipped with videos and formulas that can help students understand the material. In addition, the media installed on the smartphone makes it easier for media to be carried anywhere so that students can study the material anytime and anywhere. As for the weakness of this media, the appearance of the media is less attractive and the material presented is less related to daily life.

CLOSURE

Conclusion

Geotik learning media is developed using the ADDIE method which includes the stages of: (a) the analysis stage, which includes three stages of analysis, namely needs, technology, and curriculum analysis; (b) the design stage, namely determining the references and materials to be used for the creation of the storyboard based on the results of the analysis stage; (c) the development stage, at this stage the storyboard design is then developed using the Adobe Flash application, and a media validation test is carried out by material and media experts for the revision stage to be carried out based on the suggestions that have been given; (d) the implementation stage where the results of the development stage are tested on grade XI students of SMAN 1 Kedungwaru to find out the media's practicality and effectiveness that has been developed; (e) the evaluation stage, namely the results of the media's validity, practicality, and effectiveness are analyzed to determine the media's feasibility.

The results of the media validity, practicality, and effectiveness tests state that the developed media is suitable for use in learning with the following analysis: (1) from the developed media validity tests, it meets valid criteria with an average value of 3.7 (material experts) and 3.5 (media experts); (2) based on the practicality test, the media is included in the practical criteria with an average of 73.9%; (3) the effectiveness test states that the media is included in the effective criteria with a total of 80% of students meeting the predetermined KKM score.

The advantage of this media is that it has been equipped with videos and formulas that can help students understand the material. In addition, the media installed on the smartphone makes it easier for media to be carried anywhere, so that students can study the material anytime and anywhere. As for the weakness of this media, the appearance of the media is less attractive and the material presented is less related to daily life.

Suggestion

Based on the research that has been carried out, it is suggested that teachers should be more proficient with the procedures of the media implementation, so it could reduce problems in the use of media that arise in the learning process. In addition, it is still necessary for teacher to deepen the material so that students can improve their understanding of the taught material. In developing the next learning media, it would be better if the content that contained in the media includes material from many sources so that the content of the media can be varied.

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