Development of Smart Learning Media Model Based on Android

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Abstract

Education plays an essential role in producing people who can make changes by creating ideas in learning. However, at present, there are still many limitations to the existing learning media for educational media, such as printed books, LCDs, and others. Meanwhile, the benefits of Android cellphones are still not maximized as a support for learning media. It can be said that almost all students currently own cellphones. With the development of the Analysis Design Development Implementation and Evaluations (ADDIE) model, Android-based learning media can become additional learning for students by utilizing existing information technology.

Keywords: education, students, multimedia, android, education, subjects, ADDIE, technology

I. INTRODUCTION

Information Technology Communication that is proliferating today is a smartphone. The base of smartphone usage in Indonesia has grown 33% from year to year since 2013. During the second quarter of 2016, there were around 3.5 million smartphones sold every day [1]. Besides having a function as a means of communication media, both in the form of sound and text, smartphone or better known as mobile (cellular technology) today has a multimedia function that can present audio, images, text, video with the ability to access the internet. [24] [25] [26].

Novaliendry et al. [2] said that when there were several benefits of using android, that is often used by many people. Smartphones are now a smart tool for two-way communication, multimedia, and education. The atmosphere of learning in the world of education today is very sophisticated, with an atmosphere that is conducive, interesting, and creative. The progress of technology can facilitate everything, including learning. [11][13][16][19][20][22]

The author has observed observers of Payakumbuh City Vocational School students especially the Expertise Program

(Computer Network Engineering) TKJ class X which has cellular technology as many as 605 people who already have mobile technology, obtained the following data:

Tabel 1. Data of students who have cellular/mobile/smartphone technology in Payakumbuh City

No	Cellular Technology Brands	Total	Percentage
Data of students who have a mobile/smartphone			
1	Oppo	205 person	33.88 %
2	Samsung	218 person	36.03 %
3	Advand	34 person	5.6 %
4	Evercross	17 person	2.80 %
5	Asus	102 person	16.8 %
6	Axio	4 person	0.66 %
7	Nexian	1 person	0.165 %
8	Nokia	9 person	1.4 %
9	Mito	4 person	3,23 %
	Total	594 person	98.19%
Data of students who have a mobile/smartphone with limited facilities			
10	Mobile with limited facilities	0 person	0 %
11	Don't have a cellphone	11 person	1,81%
	Total	11 person	1.81%
Number of students X (Network Computer Techniques) 2018	605 person	100%	

Source: Based on data collection on students of the Payakumbuh City Education Office Expertise Program (Computer Network Engineering) TKJ 2018

Based on data from Table 1 it can be seen that from 605 the number of students who have smartphones/mobile as many as 594 people or 98.19% of X students (Computer Network Engineering) TKJ. Whereas 11 people (1.18%) students have smartphones with limited facilities, and 0 people (0%) do not have smartphones.

II. THEORETICAL BASIS

II.I Vocational Education

Vocational education orientation should produce success in the form of graduates who can answer the needs in the labor market in the business world and industry [3][23].

II.II Learning Media

Teaching media is a tool that can be used in conveying messages and stimulating the learning process so that it can clarify the meaning sent to students in obtaining knowledge, skills, or attitudes, to achieve learning goals ideally and adequately [4][5][17][18][21].

II.III Mobile Learning

II.III.I Basic Concepts of Mobile Learning

Mobile learning leads to the use of handheld and mobile information technology devices such as PDAs (Personal Digital Assistants), cellular phones/cellphones, laptops, and tablet PCs. In its development is part of learning electronically, so that by itself, is also part of distance learning. The other important capability that must be available is the ability to be able to connect to other equipment, especially computers, the ability to present learning information, and also the ability to produce two-way communication between teachers and learners.

They have explained [6] that learning models are carried out between places or environments by utilizing existing technology when learning to use a mobile phone by using a variety of existing features and applications. This mobile-based teaching that is using information technology and also communication in the world of education continues to develop in various strategies and teaching patterns that can be grouped into electronic learning as a form of learning media that utilizes electronic devices and digital media.

From this definition, it can be said that mobile learning can be reported as a facility that provides general electronic information to learners and educational content that can help the attainment of knowledge without question between distance and time. Mobile learning itself utilizes the mobility of mobile devices, such as mobile phones or PDAs, to provide education that can be done wherever and whenever we are.

II.III.II Mobile Learning Function

According to Yulianto [7], mobile learning itself can facilitate the relationship between students and the material being taught. Likewise, the relationship between students and educators and between fellow students themselves can share information or opinions about sharing matters relating to lessons or students' self-development needs. An educator is also able to place teaching materials and tasks that must be done by students in a particular place and time. According to their needs, educators can also provide opportunities for students to be able to access certain study materials or practice exam questions that can be obtained.

Mobile learning has the potential to change efficiency in the world of education, even with a considerable area. With the rapid development of the mobile platform, we are required to deal with everything in a mobile application. The advantages of mobile learning itself are:

1) Supplements

Its function is only as an addition; namely, students have the freedom to choose whether to use mobile learning material or not.

2) Complement (supplement)

The point here is to supplement teaching materials that students receive in class. Mobile learning is here to be a reinforcer or remedial for students who are still following conventional learning

3) Substitution

In developed countries, some of them provide several alternative models of learning activities for their students. The goal is that students can flexibly manage their learning schedules by the time and daily activities of the students themselves.

II.III.III Mobile Learning Supporting Devices

According to Keegan [8], the supporting devices of mobile learning are the basis of the prerequisites for the ongoing teaching and learning process by utilizing technology from mobile learning. Some tools that are often used are:

1) Cell Phones (Cellphones)

Mobile phones are no longer a strange thing for most Indonesian people. The cellphone itself has the standard ability to be able to communicate and also via message or SMS (short message service). With more capabilities can be used to be able to use the internet through the Wireless Application Protocol (WAP) or can even be used to conduct video conferencing.

2) Personal Digital Assistant (PDA)

PDA is a tool that is small but has a higher ability than a cell phone. PDAs are also known as handheld computers, palmtop computers, or as pocket computers. PDAs also have capabilities that can be used to detect locations using the Global Positioning System or GPS, calculate internet access data, send and receive e-mails, and can also record videos.

3) Smartphone

It is a combination of capabilities possessed by cellphones and PDAs, or in other words, smartphones are PDAs that can function as a cellphone for voice and data communication.

d. Mobile Learning Development

The development of mobile learning is expected to have good prospects as a variation in teaching and learning. Darmawan [9] said the main reasons for developing mobile knowledge-based knowledge were:

1) Can be used anytime and anywhere

2) Quite extensive, can use existing commercial cellular networks because the network is available everywhere

3) Integration with existing systems in particular, able to:

a) Integrates with e-learning

b) Integrates with the education delivery system

c) Integrates with other systems such as instant messages.

Mobile learning is also able to use the infrastructure that has been provided by cellular operators, which, in principle, is a 3-tier application where there is a front-end layer, application server, and database. Here is a picture of the development of mobile learning [12][14][15].

III. ANALYSIS AND SYSTEM DESIGN

III.I Types of Research

This research uses research and development methods, also called Research and Development (R&D). This research is a process or steps to develop a new product or improve existing products, which can be accounted for. Furthermore, research that intentionally, systematically, aims/is directed/directed to find, formulate, improve, develop, produce, test the effectiveness of a product, model, method/strategy/way, services, specific procedures that are superior, the latest, effective, efficient, productive, and also meaningful.

III.II Research Procedure

According to Manning and Kevin E. Johnson [10], the most easily identified learning design model is the ADDIE model. The approach consists of analyzing, designing, developing, implementing, and evaluating.

Based on the reference above, the development of this learning media will be developed with the ADDIE model (Analysis, design, development, implementation, and evaluation).

The Development Procedure in Research for the past two years is as follows.

1. Stage I: Preliminary Study Phase is carried out using a descriptive qualitative approach that begins with a literature study, then a field study of the Learning Model based on Mobile Learning Subjects in Digital Simulation X Computer Engineering in Payakumbuh City Network.

2. Phase II: Model Development Stage, in the development of this model the preparation of the Model Learning Model based on Mobile Learning Digital Simulation Subject X Computer Engineering Payakumbuh City Network Engineering (Product Design) is ready to be validated and revised based on validator input, then carried out limited trials of products developed.

3. Stage III: Model Evaluation / Testing Stage, at this stage the learning model based on Mobile Learning Subjects in Digital Simulation X Computer Engineering in Payakumbuh City Network developed was validated, revised and tested limited; The subject of the trial was the students of SMKN 4 Payakumbuh and the subject teacher, the experiment was conducted with FGD and changed on the results of the test into a learning model based on Mobile Learning Subjects of Digital Simulation X Computer Engineering in Payakumbuh City Network Engineering which was final.

In this study, both the lead researcher, research members, and labor technicians will be involved together in the development

of the material until the teaching material is installed into the student's android. In contrast, students will assist in the implementation of activities.
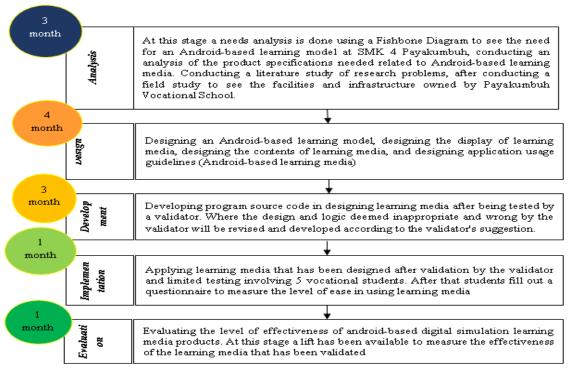

Fig. 1. ADDIE Model Development of Android-Based Digital Simulation Learning Media at SMKN 4 Payakumbuh

IV. IMPLEMENTATION

IV.I Trial Data Description

The development path used in this study adopted the ADDIE model development procedure. The steps that must be taken are Analysis, Design, Development, Implementation, and Evaluation. The results of research development in the form of Android-based learning media on Digital Simulation Learning.

IV.I.I Research result

The development of Android-based learning media is carried out using the assistance of Android Studio development applications and the assistance of other software such as Macromedia Flash. The results of media development in the form of an .apk file that can be installed or installed on all types of Android devices with minimum specifications of API 14 or Android 4.0 Ice Cream Sandwich.

1.   Learning media results

1) Display of android-based learning media icons

The use of symbols aims to attract students to use Android-based learning media. The image gives a striking impression of an android-based learning media, so students are interested in using it for learning. At this stage, the display icon is made from a collection of symbols of digital simulation components contained in the Android-based learning media. Display icons can be seen in Figure 2. Development of Android-Based Learning Media Icons.

Fig. 2. Android Based Digital Simulation Learning Media Icons.

2) Intro menu display

On the intro page, there are two access buttons, namely the start and exit buttons. The start button is used to enter the main page of the Android-based learning media. At the same time, the exit button is used to exit the Android-based learning media. The intro menu page can be seen in Figure 3.

Fig. 3. Intro Menu Display

3) Display the main page

In this main page, the display does not change during the development phase. Main page views still have 6 main menus, namely syllabus, material, simulation videos, evaluations, guides, and applications. The results of the development of the learning media main page can be seen in Figure 4

Fig. 4. Main Page Display

4) Display Syllabus Menu

The development of this syllabus menu was developed following the 2013 curriculum. This syllabus menu contains essential competencies, indicators, learning objectives, and subject matter that must be mastered by users of Android-based learning media. The development of this syllabus menu can be seen in Figure 5.
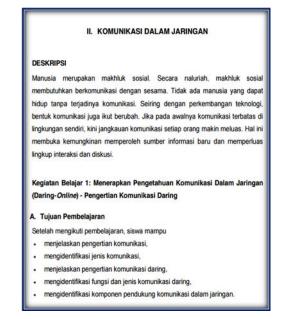

Fig. 5. Syllabus Menu Display

5) Material menu display

In the development of the material menu, there are four subject matters. The four materials are Communication, Types of Communication, Online, and Types of Online. Presentation of equipment in the form of text and images that allow users to more quickly understand the contents of the material listed on the material menu. In addition to the material sub-menu, three buttons are used to open teaching material, so it does not seem like a pdf format document when opening a sub-menu of teaching material to be opened. The development of the material menu can be seen in Figure 6.

Fig. 6. Material Menu

6) Video Menu Display

Unlike the previous video menu development stage, in the video menu development, there is a change in the content of the video content. There are 4 menu video menus, namely Communication, Communication Types, Online, and Online Types. The existence of this video menu is expected to help improve user understanding of the material listed on Android-based learning media. The development of the video menu can be seen in Figure 7.

Fig. 7. Video Menu Display

7) Evaluation of Menu Display

In the evaluation menu, there are two menu buttons, namely, start and history. In the evaluation menu, there are 40 multiple choice questions, to answer the next issue the user needs to press the ">>" button, if you want to go back to the previous question to change the question-answer you need to press the "<<" button, and if you want to end the question you need to press the finish button. After submitting, an evaluation result will appear that raises the value obtained, and the correct answer key in each question that has been answered is marked in green for the correct answer and red for the wrong answer. The development of the evaluation menu can be seen in Figure 8.

Fig. 8. Development of evaluation menu

2. Validation results

The validation test serves to determine the feasibility of a product that is being developed; the validation test itself consists of tests conducted by media experts and material experts. The validation test in this study involved 4 experts, namely 2 people acting as media experts and 2 people working as material experts. The results of the validation produce suggestions, assessments, and improvements for products that are being developed before being tested on users or students.

1) Media expert validation results

The media expert validation test was conducted to assess a product design that was being developed as well as to determine the feasibility of the research product design, in this case, an Android-based learning media. 2 media experts conducted a media validation test. The media expert is a lecturer from the Department of Informatics Engineering, FT UNP. The material validation test also produces descriptive data in the form of suggestions and improvements to the Android-based learning media application. Data from the validation of material experts can be seen in Table 2.

Table 2. Media Expert Validation Test Data

No	Name	Rated aspect			Total score
		Rule	Governance	Media	
1	Expert 1	13	21	23	57
2	Expert 2	12	21	25	58

2) Material expert validation results

A material expert validation test is conducted to determine the feasibility of the material listed on a learning media, in this case, an Android-based learning media. Then the results of the validation of the content are used as guidelines as correction material for the material to be developed on learning media. 2 people conducted a material validation test. The material validation test also produces descriptive data in the form of suggestions and improvements to the Android-based learning media application. Data from the validation of material experts can be seen in Table 3.

Tabel 3. Material Expert Validation Test Data

No	Name	Rated aspect			Total score
		Rule	Governance	Media	
1	Expert 3	6	14	27	47
2	Expert 4	7	16	33	56

3) Student response results

Beta test or end-user test conducted in class X Computer Engineering Network SMK N 4 Payakumbuh as many as 34 students. Data obtained from the product assessment of students in the form of questionnaires consisting of 34 statement items that are complemented by 4 choices of answer answers. The assessment aspects contained in the questionnaire filled out by students in the form of material and media rules, governance aspects, media aspects, and aspects of material presentation. In this end-user test, students are asked to fill in the suggestion and comment columns contained in a questionnaire that aims to develop the next product. Data on the results of these student responses can be seen in Table 4.

Tabel 4. Student Assessment Response Data

No.	Respondents	Assessment Aspects				Total Score
		Rules	Procedures	Media CAI	Presentation of Material	
1	Student 1	20	34	23	36	113
2	Student 2	16	32	20	29	97
3	Student 3	22	38	24	29	113
4	Student 4	20	30	25	31	106
5	Student 5	21	39	23	35	118
6	Student 6	22	36	25	36	119
7	Student 7	19	36	24	31	110
8	Student 8	18	32	22	32	104
9	Student 9	16	34	22	30	102
10	Student 10	19	34	22	30	105
11	Student 11	20	37	24	34	115
12	Student 12	22	34	25	36	117
13	Student 13	17	31	24	29	101
14	Student 14	17	31	24	29	101
15	Student 15	20	36	22	35	113
16	Student 16	19	34	23	29	105
17	Student 17	21	40	25	36	122
18	Student 18	22	40	26	40	128
19	Student 19	21	40	26	36	123
20	Student 20	17	36	22	30	105
21	Student 21	20	33	21	29	103

22	Student 22	21	40	25	35	121
23	Student 23	18	38	24	29	109
24	Student 24	18	32	24	29	103
25	Student 25	19	33	23	32	107
26	Student 26	19	34	24	34	111
27	Student 27	20	35	23	33	111
28	Student 28	16	32	20	28	96
29	Student 29	21	33	24	32	110
30	Student 30	20	34	23	30	107
31	Student 31	20	35	22	26	103
32	Student 32	17	36	25	36	114
33	Student 33	21	40	26	36	123
34	Student 34	19	32	22	31	104
Total Score		**658**	**1191**	**797**	**1093**	**3739**
Average Score		**19.35**	**35.03**	**23.44**	**32.15**	**109.97**

IV.II Data Analysis

The initial stage in testing instructional media using the black box testing method. The first step taken is to understand the learning media first, both understanding how it works and the features contained in the learning media. Then the next step is to test the learning media that can prove that there is a relationship between all the objects that exist in the learning media. Actions taken after carrying out black box testing is to do data analysis. Data analysis was performed to analyze the data obtained from the results of the trial of Android-based learning media through validation and response tests. Validation test analysis is carried out through two stages, namely analysis of media expert validation test and analysis of material expert validation test. Both validation analyzes are used to obtain a feasibility score from the experts on the learning media that is being developed. 1. Black Box Testing Analysis Black box testing is used to find out or measure an Android-based learning media application designed to run and function properly or not. Testing is done by installing the application 73 and then running the app on several types of Android smartphones with different versions ranging from the minimum version of Android 4.0 (ice cream sandwich) to a higher version, namely Android Marshmallow.

IV.II.I Validity test analysis

1. Analysis of Media Expert Validation Test

Validation tests conducted by media experts are used to determine the quality level of learning media before being tested on users. At this stage, the media validation test was carried out by two experts. The aspects assessed in the Android-based learning media validation test by media experts are the aspects of the rules, issues of governance, and elements of the media. Based on the results of validation conducted by media experts, it was found that the highest ideal score was 68, the lowest perfect score was 17, the average perfect rating was 42.5, and the first standard deviation was 8.5. Then the results of the conversion of scores in the form of a scale of four can be seen in Table 5. Ratings from media experts 1 get a total score of 57 in the category of "very 75 worthy" and assessment of media experts 2 get an overall score of 58 in the category of "very feasible." The mean score for the evaluation of media rules is 12.5 in the "proper" group, the average rating for the assessment of media governance is 21 in the "very feasible" category, and the average score for the evaluation of the media aspects of CAI is 24 in the "very decent" group. Assessment of the results of the validation of the media experts can be seen in Table 6. While the graph of the validation test assessment by the media experts, every aspect can be seen in Figure 9.

Tabel 5. Total Score Conversion Scale of Four Aspects of Media Substance

Score Interval			Category
55,25	<X≤	68	Very decent
42,5	<X≤	55,25	Decent
29,75	<X≤	42,5	Inadequate
17	<X≤	29,75	Not feasible

Tabel 6. Media Expert Validation Results

No.	Media Expert	Assessment Aspects			Total	Category	Percentage
		Rule	Governance	CAI media			
1	Media Expert 1	13	21	23	57	Very decent	83,82%
2	Media Expert 2	12	21	25	58	Very decent	85,29%
	Average	12,5	21	24	57,5		
	Category	Decent	Very decent	Very decent	Very decent		
	Percentage	78,13%	87,50%	85,71%	84,56%		

Media expert validators are lecturers who have expertise in the field of learning media assessment. In contrast, the material expert validator is a lecturer who knows the area of digital simulation materials as well as teachers in charge of digital simulation subjects in SMK. Based on the results of the assessment media expert instruments and an analysis of overall product quality which is divided into each aspect, the data obtained is the ideal expert evaluation criteria the media of learning media based on android is 57.5 with a score a maximum of 68, so it is included in the "very decent" category with the ideal score percentage is 84.56%. Based on the results of the assessment of expert instruments material and analysis of overall product quality divided in each aspect, it is obtained the data of the ideal assessment criteria of material experts on Android-based learning material at 51.5 with a score a maximum of 68, so it is included in the "feasible" category with the ideal score percentage of 75.74%. The last test of the Android-based learning media, i.e., testing to class X students of the Computer Engineering Network Vocational School 4 Payakumbuh expertise program to determine student responses to the media Android-based learning that is being developed. This testing phase attended by 34 students from a total of 34 students. Results obtained from the assessment of student responses, 16 students stated that learning media Android-based "very good" is used as a medium of learning, and 18 this student noted that Android-based learning media is "good" used as a learning medium. The average ideal score obtained of 110.21 with a maximum score of 136 with a perfect percentage of 78.72%, so it is included in the "good" category used as learning Media.
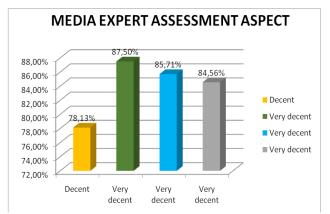

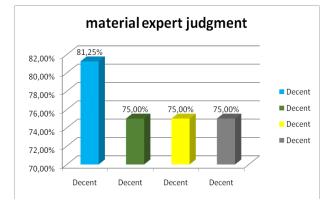**Fig. 10.** Material Expert Judgment
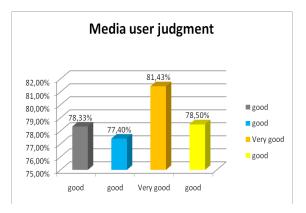

Fig. 11. Media user judgment

Fig. 9. Media Expert Assessment Aspect

V. RESULT AND DISCUSSION

The conclusions obtained are based on the results of research on development Android-based learning media on subjects digital simulation at Vocational High Schools 4 Payakumbuh, namely:

1.   The development of Android-based learning media on digital simulation subjects in vocational school using ADDIE development method which consists of five stages, namely: a) the analysis phase shows that the curriculum used in Vocational School 4 Payakumbuh is 2013 curriculum, based on the syllabus of digital simulation subjects, material that will be developed in learning media are communication, types of communication, online learning and types of online

learning with class X characteristics of Computer Network Engineering students who tend to be passive, b) the design stage includes the design of data in the form of collecting teaching materials that are in accordance with essential competencies, the design of navigation used to facilitate users in operating learning media, the design of the display (user interface) in the form of story board creation , and algorithm design in the way of making work flow in the form of flowchart, c) development stage includes making media in the form of user interface development and program code development, and product validation carried out by media experts and material experts to find out the feasibility level of learning media, d) implementation phase namely conducting product trials on students of class X Network Computer Engineering at SMK Negeri 4 Payakumbuh. in order to get an excellent response to the learning media, so that this learning media is well used as a learning media, and e) the evaluation phase includes the stage of asking for feedback from end users, the step of data collection, the step of data analysis, and product conclusion stage. Based on the results of development, research produced learning media with seven principal components, namely the intro menu, syllabus menu, material menu, simulation video menu, evaluation menu, guide menu, and menu about the application.

2.

3.   The feasibility level of Android-based learning media on digital simulation subjects by media experts on Android-based learning media is 57.5 (ideal percentage score of 84.56%) with a maximum score of 68, with details of the assessment of each aspect as follows: the ruling point gets a score amounting to 12.5, governance aspects got a score of 21, elements of CAI media got a score of 24 so that it was included in the "very feasible" category to be used as a learning medium. The assessment of the level of goodness of the material by the material experts get a score of 51.5 (the percentage of ideal scores of 75.74%) with a maximum score of 68, with details of the assessment of each aspect as follows: the ruling element gets a rating of 6.5, the governance aspect receives a score of 15, aspects of the presentation of the material got a score of 30 so that it belongs to the category of "feasible" to be used as a learning medium. Test responses from a total of 34 students, 16 students said the learning media "very good" was used as a learning medium, and 18 students stated the learning media "good" was used as a learning medium. Based on these data it can be concluded that the Android-based learning media on digital simulation subjects "good" is used as a learning medium

ACKNOWLEDGMENTS

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