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Smart Learning Media Based on Android Technology

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Education play an important role in developing human resources to be capable of making changes and generating ideas in learning. This article aims to explain the process of designing android-based digital simulation learning media. The main reasons underlying this research are a) the low optimisation of smart phones in learning, b) the display of learning media used today is less attractive, and c) the low feasibility of learning media today. This research involves research development through the ADDIE Model approach. Five steps must be carried out: Analysis, Design, Development, Implementation, and Evaluation. The results of media development using the ADDIE development method consists of five stages, namely analysis (including: curriculum analysis, material analysis, and student character analysis), design (including: data design, navigation design, display design, user interface, and algorithm design), development, which involves making media in the form of user interfaces, and developing program code results of the feasibility assessment conducted by the medium expert. A mean score of 0.887 was received, as well as a score of 0.867 for the material expert validation test.

Key words: *Education, Multimedia, Smart Learning, Android, ADDIE, Technology.*

Introduction

The Internet has touched and changed human life (Kurniawan et al, 2017). There are 3 million Internet users in the world in 2016 (Malaysian Communications and Multimedia Commission, 2016). Predictions from Google Executive Chairman Eric Schmidt mention forecast that by 2020 the world's population will be connected to the Internet. The International Telecommunication Union (ITU) reports that 80% of teenagers (15-24) in 104 countries are online using Mobile Smartphones (International Telecommunication Union, 2017). The number of Smartphone usage in Q3 2016 worldwide has touched 7.5 billion.

Market shares by operating system (OS) is dominated by Android 65%. IOS, Windows Phone, and Blackberry fills out the remainder. Smartphones in Indonesia are used by 25% of the total population or about 90 million people. This number increases by 6 million per year (Scientia Mobile, 2017).

Indonesia is going digital (Das et al, 2016) through its population of 261 million people, around 13,700 islands (Tobias & Wales, 2014), (Sundiman & Idrus, 2016), 33 provinces, and over 500 districts. It has roughly 58 million learners, 3 million teachers, and 302,097 schools (Culture, 2017), (Bastari, 2016). In general, the challenges of education in Indonesia are increasing learners' interest in learning (Tobias & Wales, 2014), improving teacher quality, increasing efficiency, and the effectiveness of media based learning (OECD & ABD, 2015) (Culture, 2017). In language, media is a medium, that is, an intermediary. According to Dictionary of Education, media is a form of intermediaries in various types of communication activities. Learning media in teaching and learning (Hermawan & Arifin, 2015) is the key for success in education (Smaldino et al, 2014).

Teaching and learning are very influential in satisfaction and overall student achievement. The provision of science is important for students, but the approach given by educators to students can be much more influential in the satisfaction of students in schools and higher education (Meng & Idris, 2015). Engagement between educators and students and discussion on students' perceptions of their learning context may provide important insight into overall student behaviour (Abdullah et al, 2019), as will understanding the relative importance of students' perceptions in determining what they want as a different generation. Schools teach their students to think critically. Schools, however, really only encourage students to give the correct answer rather than encourage them to come up with new ideas (Wijayanti & Suparman, 2019).

The obstacles in process of teaching and learning were encountered by teachers and learners through the medium of learning. These obstacles include: a), the low optimisation of smart phones in learning, b) the display of learning media used today is less attractive, and c) the low feasibility of learning media today. Similar research related to learning media has been reviewed by several countries, such as Kumar et al, (2008). The Technology Acceptance Model (TAM) is a parsimonious, theoretically and empirically justified model aimed at explaining the usage of information systems. It states that behaviour is driven by the intention to use a system, which in turn is driven by the users' attitude and perceptions of normative influences. According to the model, a teachers' decision to use technology is linked with usefulness, ease of use, computer self-efficacy, job relevance, compatibility and subjective norm.

Successful teachers need to be knowledgeable and skilled in the application of new technologies in order to increase teaching effectiveness as well as create positive attitudes. Romiszowski (1992) states that Educational Technology Media can be categorised from the most common equipment used in schools, which is the textbook and the blackboard, to modern media such as high-tech computer equipment, LCD, Internet and digital cameras.

The Role of Multimedia:

Multimedia is the integration of various media such as text, numerals, graphics, images, video, animation, and sound in a digital environment. It has the ability to enable users to achieve interactivity requirements without the sequence. Multimedia is a combination of two or more types of media to create a sequence of programs that are effective in conveying an idea, with the assistance of both sound and visuals. Hesson (2006) finds computer simulators are used in education to help students understand and comprehend specific topics. Typically, multimedia production is developed and controlled by a computer. Multimedia is the use of computers to present and integrate text, audio, and video with links and tools that allow users to navigate, interact, create, and communicate. It is well known that teaching can be vastly amplified when it is not done purely theoretically, but visually and interactively instead (Felicia et al, 2017).

Table 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	33.88 %
2	Samsung	218	36.03 %
3	Advand	34	5.6 %
4	Evercross	17	2.80 %
5	Asus	102	16.8 %
6	Axio	4	0.66 %
7	Nexian	1	0.165 %
8	Noxia	9	1.4 %
9	Mito	4	3,23 %
Total		594	98.19%
Data of students who have a mobile/smartphone with limited facilities			
10	Mobile with limited facilities	0	0 %
11	Don't have a cell phone	11	1,81%
Total		11	1.81%
Number of students X (Network Computer		605	100%

Techniques) 2018		

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

Based on the data from Table 1, 594 people or 98.19% have smartphones / mobile of 605 students (Computer Network Engineering) TKJ. 11 (1.18%) students have smartphones with limited facilities and 0 people (0%) do not have smartphones. This proves that the main conditions for Android-based learning media have been met. As in the data of students who have mobile phones, all data can be processed using various methods (Novaliendry et al, 2015) such as the ADDIE method used in this paper.

Theoretical Basis

Vocational Education

Vocational education orientation should produce success in the form of graduates who can answer the needs of the labour market in the business world and in industry.

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 conveyed to students in obtaining knowledge, skills, or attitudes. Thus, learning goals can be achieved properly and perfectly (Arsyad, 2006) (Kustandi et al, 2011).

Mobile Learning

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 / cell phones, laptops and tablet PCs. Their development is part of learning electronically, so that it is also part of distance learning. The other important capabilities 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.

Explained that learning models are carried out between places or environments by utilising existing technology when learning to use a mobile phone by utilising a variety of existing features and applications. Mobile-based teaching that uses information technology and communication in the world of education continues to develop various strategies and teaching

patterns. These can be grouped under electronic learning, which is a form of learning media that utilises electronic devices and digital media.

From this definition, it can be said that mobile learning is a facility that provides general electronic information to learners and educational content that can help in the attainment of knowledge irrespective of distance and time (Novianti& Suparman, 2019). Mobile learning utilises the mobility of mobile devices, such as mobile phones or PDAs, to provide learning that can be done wherever and whenever..

Mobile Learning Function

According to Yulianto and Aan (2011), mobile learning can facilitate the relationship between students and the material being taught. Information or opinions relating to lessons or students' self-development needs can be shared between students, as well as educators. An educator is also able to place teaching materials and tasks that must be done by students in a certain 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.

Mobile learning has the potential to improve efficiency in the world of education even when in a very large 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 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 to be a reinforcer or remedy for students who are still following conventional learning.

3) Substitution
   Developed countries provide several alternative models of learning activities for their students. The goal is that students can flexibly manage their learning agenda in accordance with the time and daily activities of the students themselves.

Mobile Learning Supporting Devices

According to Keegan (2005), the supporting devices of mobile learning are the basis of the teaching and learning process by utilising technology from mobile learning. Some tools that are often used are:

1) Cell Phones (Cell phones)
   Mobile phones are no longer an alien thing for most Indonesian people. The cell phone itself has the standard ability to be able to communicate in voice and also via message or SMS (short message service). It can 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
   Smartphones are a combination of capabilities possessed by cell phones and PDAs. In other words, smartphones are PDAs that can function as a cell phone for voice and data communication.

   4) Mobile Learning Development
   The development of mobile learning is expected to have good prospects as a variation in teaching and learning. Darmawan (2012) said the main reasons for developing mobile based learning were that it

   1) Can be used anytime and anywhere
   2) Can use existing commercial cellular networks because the network is available everywhere
   3) Can be Integrated with existing systems such as e-learning, the education delivery system, and 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 a mobile learning.

Analysis and System Design

Types of Research

This research uses research and development methods, also called Research and Development (R&D). This research involves a process or sequence of steps to develop a new product or improve existing products. This research intentionally and systematically aims to formulate, improve, develop, produce, as well as test the effectiveness of a product, model, method/strategy/way. It will investigate certain procedures that are superior, effective, efficient, productive, and also meaningful.

Research Procedure

According to Manning and Johnson (Manning, 2011) the most easily identified learning design model is the ADDIE model. The approach consists of: analysing, 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.

Phase I: The initial stage of this research is to a**nalyse** the needs of Android-based learning media. An analysis is then made of the needs of the device or the availability of the main device from this android-based learning media. Conduct analysis of problems that have arisen has not found a solution until now.

Phase II: The second stage is **Design**. At this stage an attractive display design starts on the Android-based learning media, where the most important thing to consider is the background display, font, size, font colour display menu and navigator, as well as the video display supporting learning. This is what later makes students feel interested and comfortable when using learning media.

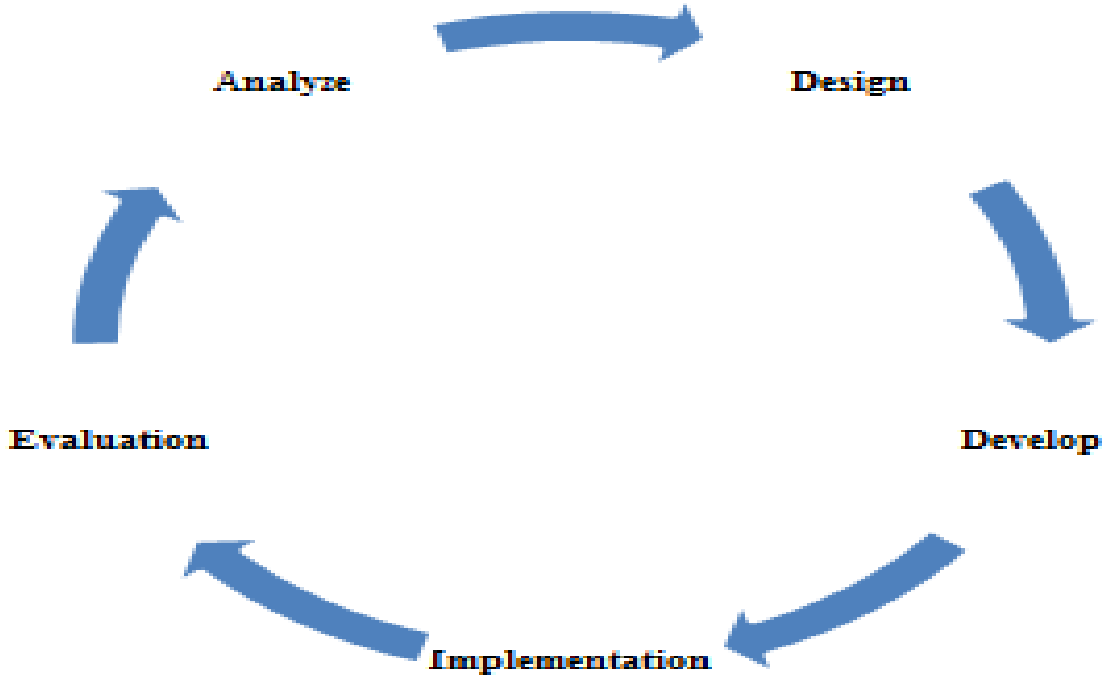
Phase III: The third stage is **Development**. At this stage the program code is developed and modifies some pre-existing algorithms.

Phase IV: The fourth stage is **Implementation**. At this stage the code and algorithm that have been developed are implemented into the smart phone.

Phase V: The fifth stage is **Evaluation**. At this stage applications that have been made are evaluated both functionally and procedurally, In this study, both the lead researcher, research

members and labour technicians will be involved in the development of the material until the teaching material is installed into the student's android. The students will assist in the implementation of activities, so that this stage can be easily understood. It can be seen using the following diagram:

Figure 1. ADDIE Model of Smart Learning Media Based on Android Technology



Implementation and Discussion

Trial Data Description

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

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 result of media development was in the form of an .apk file that can be installed on all types of Android devices with minimum specifications of API 14 or Android 4.0 Ice Cream Sandwich.

1. Learning media results

a) Display of android-based learning media icons

The use of icons aims to attract students to use Android-based learning media. The icon gives an interesting impression of 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.

Figure 2. Android Based Digital Simulation Learning Media Icons.

b) 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, while the exit button is used to exit the Android-based learning media. The intro menu page can be seen in Figure 3.

Figure 3. Intro Menu Display

c) Display main page

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

Figure 4. Main Page Display

d) Display Syllabus Menu

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

Figure 5. Syllabus Menu Display

III. KOMUNIKASI DALAM JARINGAN

DESKRIPSI

Manusia merupakan makhluk sosial. Secara naluriah, makhluk sosial membutuhkan berkomunikasi dengan sesama. Tidak ada manusia yang dapat hidup tanpa terjadinya komunikasi. Seiring dengan perkembangan teknologi, bentuk komunikasi juga ikut berubah. Jika pada awalnya komunikasi terbatas di lingkungan sendiri, kini jangkauan komunikasi setiap orang makin meluas. Hal ini membuka kemungkinan memperoleh sumber informasi baru dan memperluas lingkup interaksi dan diskusi.

Kegiatan Belajar 1: Menerapkan Pengetahuan Komunikasi Dalam Jaringan (Daring-Online) - Pengertian Komunikasi Daring

A. Tujuan Pembelajaran

Setelah mengikuti pembelajaran, siswa mampu

- menjelaskan pengertian komunikasi,
- mengidentifikasi jenis komunikasi,
- menjelaskan pengertian komunikasi daring,
- mengidentifikasi fungsi dan jenis komunikasi daring,
- mengidentifikasi komponen pendukung komunikasi dalam jaringan.

e) Material menu display

In the development of the material menu there are four subject materials. The four materials are Communication, Types of Communication, Online and Types of Online. Presentation of material in the form of text and images allows users to quickly understand the contents of the material listed on the material menu. In addition to the material sub menu, there are three buttons that 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. Development of the material menu can be seen in Figure 6.

Figure 6. Material Menu

f) 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. There are 4 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.

Figure 7. Video Menu Display

g) Evaluation 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. In order to answer the next question the user needs to press the ">>" button. If you want to go back to the previous question to change the 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. The correct answer key in each question 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.

Figure 8. Development of evaluation menu

2. Validation results

A 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 with 2 people acting as media experts and 2 people acting 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.

a) Media expert validation results

The media expert validation test was conducted to assess a product design that was being developed as well as to assess the feasibility of the research product design, in this case an Android-based learning media. Media validation test was conducted by 2 media experts. 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

Item No.	V Aiken Score	Status.	Assessment Aspect Results
Item 1	0.833	Valid	Design Aspect 0.903 Valid
Item 2	0.917	Valid	
Item 3	0.917	Valid	
Item 4	0.917	Valid	
Item 5	1.000	Valid	
Item 6	0.833	Valid	
Item 1	0.833	Valid	Operational Aspect 0.869 Valid
Item 2	1.000	Valid	
Item 3	0.833	Valid	
Item 4	0.833	Valid	
Item 5	0.833	Valid	
Item 6	1.000	Valid	
Item 7	0.750	Valid	
Item 1	0.750	Valid	Usability Aspect 0.875 Valid
Item 2	0.917	Valid	
Item 3	0.917	Valid	
Item 4	0.917	Valid	
Item 1	0.833	Valid	Language Aspect 0.900 Valid
Item 2	0.917	Valid	
Item 3	0.833	Valid	
Item 4	1.000	Valid	
Item 5	0.917	Valid	

b) Material expert validation results

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. The results of the validation of the material are then used as guidelines for the material to be developed on learning media. Material validation test was conducted by 2 experts. The material validation test also produced 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.

Table 3. Material Expert Validation Test Data.

Item No.	V Aiken Score	Status	Assessment Aspect Results
Item 1	1.000	Valid	Organisational Aspects 0.847 Valid
Item 2	0.833	Valid	
Item 3	0.917	Valid	
Item 4	0.833	Valid	
Item 5	0.750	Valid	
Item 6	0.750	Valid	
Item 1	0.833	Valid	Format Aspect 0.869 Valid
Item 2	0.917	Valid	
Item 3	0.750	Valid	
Item 4	1.000	Valid	
Item 5	0.833	Valid	
Item 6	0.917	Valid	
Item 7	0.833	Valid	
Item 1	0.833	Valid	Material Aspect 0.883 Valid
Item 2	0.917	Valid	
Item 3	0.833	Valid	
Item 4	1.000	Valid	
Item 5	0.833	Valid	

Table 4. Tabulation of Validation Test Recap by Media and Material Expert

No	Product	Number of Validator	Average	Status
1	Material	2	0.867	Valid
2	Media	2	0.887	Valid

Figure 9. Media Expert Validation Test Data

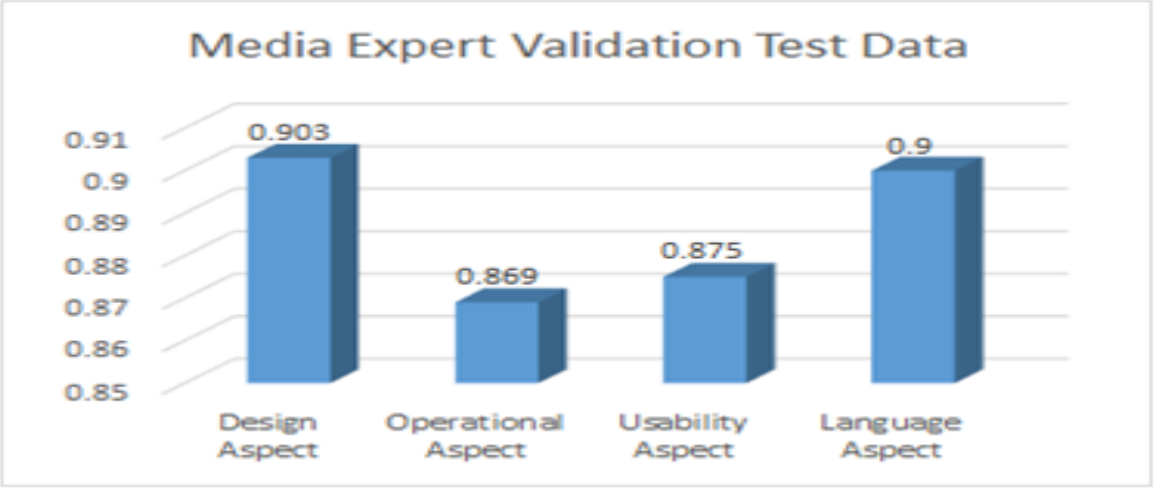
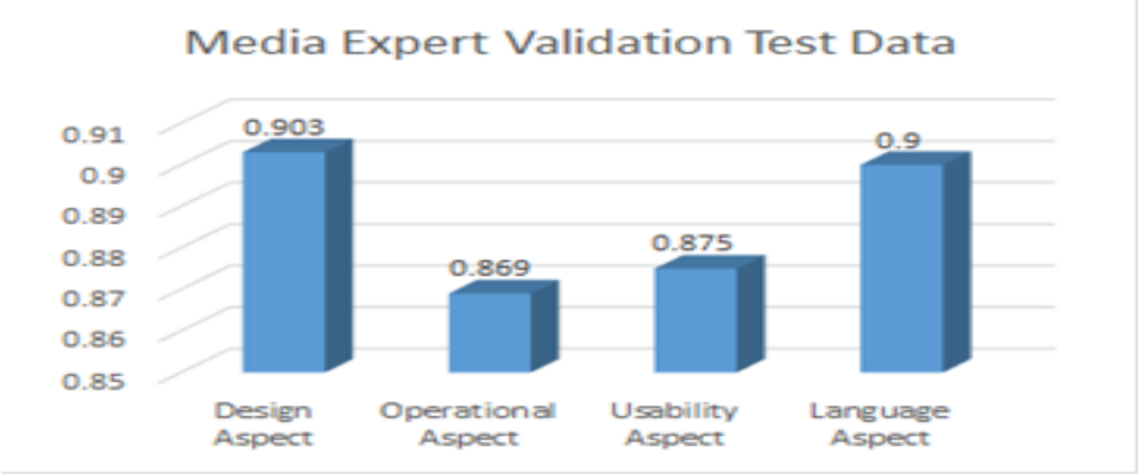


Figure 10. Media Expert Validation Test Data



Conclusions

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

1. The development of Android-based learning media on digital simulation subjects in vocational school using ADDIE development method consists of five stages: a) the analysis phase shows that the curriculum used in Vocational School 4 Payakumbuh is the 2013 curriculum, and is 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 basic competencies. The design of navigation is used to facilitate users in operating learning media. The design of the display (user interface) is in the form of story board creation, and the algorithm design is in the form of a flowchart. c) The development stage includes making media in the form of user interface development and program code development. Product validation is carried out by media experts and material experts to find out the feasibility level of learning media. d) The implementation phase involves conducting product trials on students of class X Network Computer Engineering at SMK Negeri 4 Payakumbuh. in order to get a good response to the learning media, and ensure that it is used as a learning media. e) The evaluation phase includes the stage of asking for feedback from end users, the stage of data collection, the stage of data analysis, and the product evaluation stage. Based on the results of development research, learning media with seven main components was produced. These components were the intro menu, syllabus menu, material menu, simulation video menu, evaluation menu, guide menu, and menu about application.

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

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