Development of Smartphone-Based Learning Media on Computer and Basic Network Subjects at SMK Negeri 1 Gunung Sindur, Bogor Regency

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Abstract: An obstacle in the process of practical learning is the unavailability of sufficient means. One side of the use of *smartphone* devices owned by students has not been utilized to the fullest. The purpose of this study is to develop smartphone-based learning media for class X basic computer and network subjects at SMKN 1 Gunung Sindur, Bogor Regency, and test the feasibility and effectiveness of the application of this smartphone-based learning media. The research method is research and *development* with a combined model of Borg & Gall and Dick and Carey. The material test results obtained a percentage of 92%, by assessing 4 aspects, namely material, language, presentation, and appearance. The test results by media experts and learning design experts obtained a percentage value of 80% which assessed aspects of media development and learning design. 3.Test the effectiveness of model development based on the results of N-Gain calculation obtained a value of 0.71 or 71%.

Keywords: Learning media; *smartphone-based*; computer and netn basic.

Introduction

The development of technology in the 4.0 era is even close to 5.0, which is becoming more rapid. Technological advances are impossible to avoid. This happens because technological advances always go hand in hand with the development of science. Such rapid progress also presents new problems that must also be addressed with the latest resources and also actual methods.

One of the impacts of the development of information technology is the emergence of various media that can guide the process in various aspects of life, including one of them in the learning process. Media is a means or tool that helps to convey information from the communicator to the communicant. This can be interpreted to mean that the existence of this learning media can change the learning paradigm from teacher-centered to student-centered learning.

After making observations in January 2022 at SMK Negeri 1 Gunung Sindur, Bogor Regency, it is known that for the learning process, the school has provided several learning support devices, such as projectors, and computers that are used for practice, especially in the competence of Computer and Network Engineering expertise. However, the use of computers directly in learning practical learning is still lacking. This is due to the lack of infrastructure and the very far comparison between the willingness of the device and the number of existing students, as well as limitations in the use of laboratories or special practice ruin for the competence of computer and network engineering expertise.

Theoretical learning that occurs is the teacher explaining the material with conventional methods. The use of computers as learning media is still lacking, because there is no learning media installed in the laboratory computer. The use of computers is still one-way, namely to help teachers display presentation *slides* through a projector.

The lack of facilities for practicum learning activities is an obstacle to increasing student competence, especially in basic subjects which are important things to be mastered by students. This is in line with the results of an interview conducted in January 2022 to teachers of Basic Computer and Network subjects, Bapak Rayuli, S.T., it can be identified that the implementation of practicum learning does tend to be monotonous, students only pay attention to the delivery of simulations from the devices that have been provided, there are many subject matter

but teachers feel that learning hours are still lacking. . The teacher added that this is not in accordance with the 2013 Curriculum, which requires more student-centered, and more interactive learning, one of which is with learning media. The teacher explained that some students asked to repeat the teacher's explanation but in the end the students still felt that they lacked mastery of computer maintenance and repair materials.

In addition, the subject teacher also said that due to the inadequate and ineffective learning process, the value of the results of the evaluation of Basic Computer and Network subjects was still below the minimum criteria. On the other hand, the results of a survey (January 2022) ownership of smartphone devices or gadgets from 3 class X Computer and Network Engineering (108 students) showed that 92% of students have an android-based smartphone, 5% have an iOS-based smartphone, and 3% do not have a *smartphone*. Only occasionally does the teacher give orders so that students are more active in looking for references or tutorials through their smartphones, but they have not been able to help to achieve the desired learning goals.

From the problems raised above, researchers are trying to develop learning media that can be used through smartphones for Basic Computer and Network subject matter kelas X competence of Computer and Network Engineering expertise at SMK Negeri 1 Gunung Sindur. With the hope that the existence of more interactive learning media can help increase student motivation in learning and can improve students' competence, especially in Computer and Basic Network subjects by utilizing the *smartphones* they have.

Based on the identification of the background of the problem, the focus of the problem from this research is the Development of Smartphone-Based Learning Media in Basic Computer and Network subjects Class X Competence of Computer and Network Engineering Expertise at SMK Negeri 1 Gunung Sindur, Bogor Regency by utilizing *smartphones* owned by students or parents as media for learning learning that can facilitate students in the learning process, especially the subject of Computer and Basic Network Class X and can improve competence and learning outcomes.

The formulations in this study are: 1) What is the procedure for developing Basic Computer and Network learning media using *Smartphones* in Class X of SMK Negeri 1 Gunung Sindur, Bogor Regency, 2) What is the feasibility level of Computer learning media and Basic Networks by using *smartphones* in Class X of SMK Negeri 1 Gunung Sindur, Bogor Regency, and 3) How is the effectiveness of using Computer learning media and Basic Networks using *smartphones* in Class X SMK Negeri 1 Gunung Sindur, Bogor Regency.

Reviewing Theory

One of the most commonly used operating systems in *Smartphones* today is *android*. The operating system can be illustrated as a bridge between the *device* and its use, so that the user can interact with his device and run the applications available on the *device*. Android is a new generation of Linux-based mobile platform that includes operating systems, *middleware*, and applications (Kuswanto & Radiansah, 2018).

According to (Fauzi et al., 2021), *android* is an operating system for *smartphones* and tablets. The operating system can be illustrated as a 'bridge' between the device and its user, so that the user can interact with the device and run the applications available on the *device*. While according to (Rahmat et al., 2019) android is an operating system for linux-based mobile devices that includes operating systems, *middleware*, and applications. Android is an oper system for mobile phones based on *Linux*. Android provides an open platform for developers to create their own apps. Furthermore, (Jannatan & Madjid, 2018) android is an operating system for linux-based mobile devices that includes operating systems, *middleware* and applications.

The development of science and technology leads to increasingly significant changes and towards a practical era. In sector education, the development of information technology penetrates the management system and also the learning system in the classroom. The increasingly varied use of media is a challenge for teachers in carrying out their duties as teachers in schools in order to achieve learning goals (Rahmat et al., 2019).

The use of *smartphones* that are fairly easy to carry, easily accessible and affordable as a medium in learning will greatly impact students (Amirullah & Susilo, 2018). In addition to relatively new facilities, students will be more interested in using facilities that are "contemporary" and ordinary to the student's situation in everyday life.

In addition, *Smartphones* are mobile phone devices developed by implementing a computer-based operating system. The operating system used in smartphones is generally the android operating system developed by

Google™ and iOS which was initiated by the computer company Apple™. The development of smartphones to date is not only limited to being a communication tool, but nowadays *smartphones* are widelyused as a learning medium. Given the high use of smartphones by students, teachers should facilitate students to use *smartphones*. As a medium to support learning. As stated by (Clark, 2019) that today's students have grown up using devices such as computers, mobile phones, and video consoles for almost every activity; from studying, working, or just limited entertainment.

Nurhidayat argues that the use of *smartphones* in educational programs makes this device a form of device that can be used as an alternative in media development. The use of *smartphones* in education is known as *mobile learning* technology (*m-Learning*) (Nurhidayat et al., 2020). The use of *m-Learning* stated by (Efgivia, 2019) can make a positive contribution to the peserta to access learning materials or as a learning medium. In addition, (Nurhidayat et al., 2020) argue that by using *smartphones* in education, making this technology has a central role to be used as a means of conveying information to students through *mobile* device technology.

The use of smartphones as learning media is supported by (Clark, 2019) which states that using smartphones as a learning medium provides in-depth learning opportunities for students because by using *smartphones* students can develop learning through searching for information from the internet, as well as training their skills in carrying out practicums because of the principles of Mobility owned by *SMARTPHONE*. It further said that by using *smartphones* students are able to build their competencies in a dynamic way.

Research Methodology

This study aims to develop Smartphone-based computer maintenance and repair Learning Media for computer and Network Engineering expertise competencies. Therefore, this research uses a research and development model with a *Research and Development* (R&D) approach. The R&D design model used by the research and development model in the world of education, because what was developed was an instructional design component of various existing approaches, the R&D model compiled by Walter R Borg and Meredith D. Gall was chosen in his book "*Educational Research: An Introduction*". This systems approach is known as the "Borg & Gall Development Model". As for the learning media development procedure, it uses a systems approach by Walter Dick, Lou Carey and James Carey in his book "T*he Systematic Design of Instruction*" known as the "Dick & Carey Instructional Design Development Model".

The selection of a Learning Media development model approach with Dick & Carey is also based on academic practical considerations in the development of interactive learning. The results of research conducted by Mujahideen Thohir detail these various considerations, including:
a. The Dick & Carey model has stages of development suitable for instructional design of learning
b. The Dick & Carey model specifically for learning design contains learning components that will be developed clearly step by step. This means that the Dick & Carey procedural stage is a componential procedural stage so that it is easy to do for teachers, and
c. The Dick & Carey model is used as a reference as an independent theoretical model in the realm of learning design disciplines and is one of the development models in R&D (Thohir, 2013).

The researcher determined `the research method to be used.` The Borg & Gall model with these various considerations. As for the procedural method for the development of learning media using the Dick & Carey model, so it can be said to be a combined development model with the research and development (R&D) design of the Borg & Gall model and the development of learning media with the Dick & Carey model system approach. Broadly speaking, researchers modified both models. Here are the stages of media development with a combined Borg & Gall and Dick & Carey model.

Research Results
A. Material Expert Test

Before conducting trials on students, researchers conducted Expert Judgment (expert test) of interactive media product design. Validation is carried out by two validators consisting of (1) material experts, 2) media experts, and (3) linguists. Data is obtained from the assessment questionnaire given to validators, and validators are welcome to provide comments and suggestions for product improvement. The expert in the development of interactive media is a person who has competence in the field of computer and network science, namely Mr. Syaiful Amri, S.T, M.M. as the Head of Multimedia Expertise Competencies of SMKN 1 Gunung Sindur.
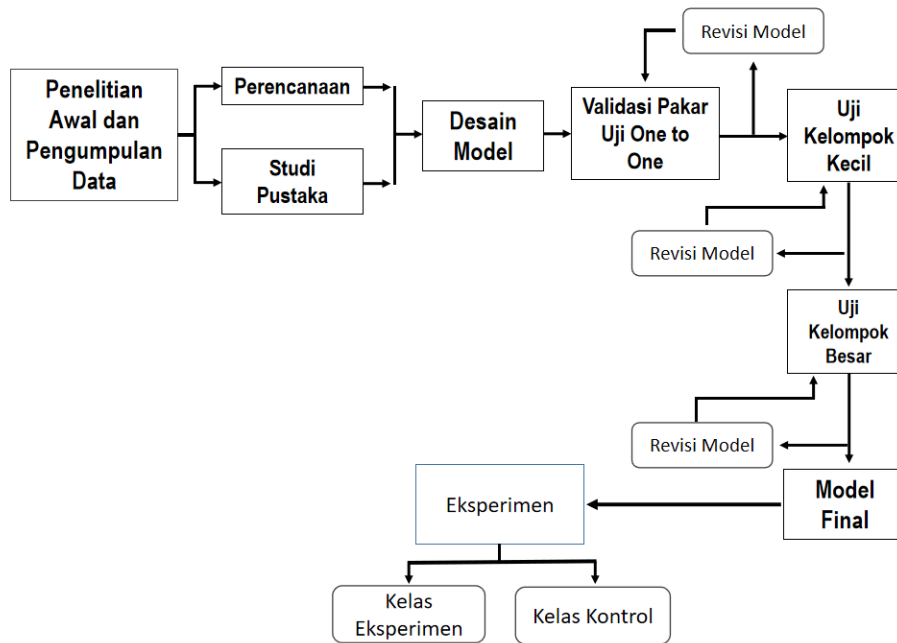
Figure 1. Development Model of Borg & Gall and Dick & Carey

Table 1. Mater Expert Validation Results Recap

No.	Aspects	Score	Maximum score	Percentage of fatigue
1	Material	23	25	92%
2	Language	38	40	95%
3	Serving	52	60	87%
4	Display	23	25	92%
Sum		136	150	

Based on the results of the assessment from material experts on the development of android-based interactive media, a percentage of results were obtained, namely:

$$presentase = \frac{Skor\ yang\ diperoleh}{Skor\ maksimum} x\ 100\%$$

$$presentase = \frac{138}{150} x\ 100\% = 91\%$$

The 91% result when interpreted using the interpretation of the validity of android-based interactive media is said to be feasible if the final value of the validation sheet is ≥61% and is included in the very feasible category when the final value reaches >81% (Arikunto, 2004). Interactive media products are based on "very decent" qualifications.

B. Media Expert Test and Instructional Design

To ensure the feasibility of the media being developed, further testing was carried out by media experts and instructional design, in this case it was tested by an expert in the learning media, Mr. Dr. Rudi Hartono, M.Pd, Lecturer and Secretary of the Postgraduate Education Technology Study Program at Ibn Khaldun University Bogor. The test results can be seen in the table below:

Table 2. Recapitulation of Scores from Media and Village Experts in Instructional

No	Aspects	Score	Maximum score	Percentage of fatigue
1.	Linguistic Structure	17	20	85%
2.	Media Display	21	25	84%
3	Software Engineering	20	25	80%
4	Deliverability	9	10	90%
5	Learning	53	70	76%

Based on the results of research from media experts and instructional design on the development of interactive learning media for the maintenance and repair of android-based computers, the following percentage values were obtained:

$$presentase = \frac{Skor\ yang\ diperoleh}{Skor\ maksimum} x\ 100\%$$
$$presentase = \frac{120}{150} x\ 100\% = 80\%$$

The 80% result when interpreted using the interpretation of the validity of android-based learning media is said to be feasible if the final score is ≥61% and if it is said to be very feasible if the final score reaches ≥81%. (Arikunto, 2004). Android-based learning media products are on the qualification of "feasible" this is in accordance with the conclusions given by media experts and instructional design that these learning media are worth testing.

The feasibility of the android-based Computer Maintenance and Repair (ADKK) interactive media model development product is obtained from the validation sheets given to validators namely one material expert, one instructional design and media expert and one learning practitioner.

Table 3. Interactive Media Development Product Validation Data

	Material Expert	Media and Instructional Design Expert	Average
Percentage Score	91%	80%	86%
Category	Very Decent	Proper	Very Decent

Based on Table 4.5 above, the average product validation by the three validators is 86% and falls into the category of highly decent. So the computer maintenance and repair learning media (ADKK) products that have been developed by researchers are of great value according to experts, so that they can be used in the learning process.

C. Effectiveness Test

After the validation of the android-based media development product is very feasible, the product will be tested on students to see the application, students consisting of 3 people for individual trials, 10 people for trials to small groups and large groups of class V for trials totaling 36 people.

In the development of this learning media product, it can be said to be very feasible with an average calculation result of 4.4 out of 5 maximum scales with good categories, while with a percent value scale, a score of 88% with a very decent category was obtained.

Testing the effectiveness of developing learning media for computer maintenance and repair in Basic Computer and Network subjects in class X Computer and Network Engineering by comparing the results of pretests, teachers before carrying out the learning process and conducting posttests after using and implementing the learning process. This test was conducted on 36 learners, with a comparison of the average values of pretest dan posttest in the table below:

Table 3. Pretest and Posttest Values

No.	Test	Experimental Class	Control Class
1	*Pretest*	64,7	63,4
2	*Posttest*	89,8	73,5

From the calculation above, $N - Gain$ the average student is 0.71. Based on these data, it can be concluded that the learning media for computer maintenance and repair in Computer and Basic Network subjects class X SMKN 1 Gunung Sindur using ADKK application media has a $N - Gain$ High interpretation. Based on the table of interpretation of $N - Gain$ computer maintenance and repair learning activities in the subject of Computer and Basic Network class X SMKN 1 Gunung Sindur using the ADKK application, this is included in the effective category.
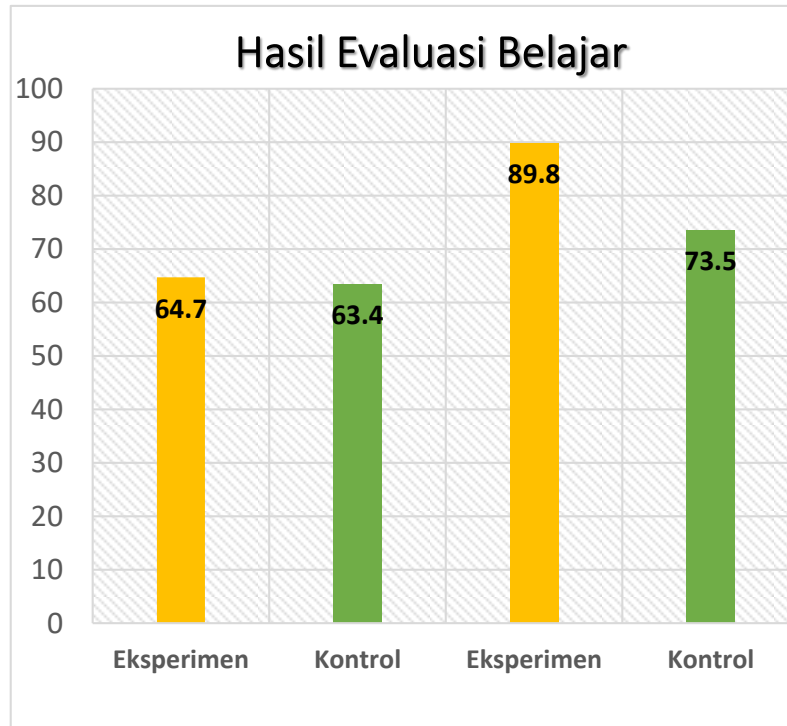
Figure 2. Pretest and Posttest Results Graph

Based on the data above, an analysis of the N-Gain *Score* was carried out (Arikunto, 2004):

$$N - Gain = \frac{Nilai\ Posttest - Nilai\ Pretest}{Nilai\ Maksimal - Nilai\ Pretest}$$

$$N - Gain = \frac{89,8 - 64,7}{100 - 64,7}$$

$$N - Gain = \frac{25,1}{28,9}$$

$$N - Gain = 0,71$$

Conclusions and Suggestions

A. Conclusion

The development model used is the Borg & Gall model integrated with the Dick & Carey model. The selection of this model is based on the product development procedure (learning media), which is detailed with the Dick & Carey model for the instructional design of learning development of computer maintenance and repair.

The results of the feasibility test analysis of teaching labeling media are determined based on the results of the assessment of material experts and media experts and learning design experts. The material test results obtained a percentage of 91%, by assessing 4 aspects, namely material, language, presentation, and appearance. The test results by media experts and learning design experts obtained a percentage value of 80% which assessed aspects of media development and learning design. Based on these tests, the development model of basic computer and network learning media on computer maintenance and repair materials through computer damage detection applications (ADKK) is categorized as good and feasible for use in the learning process of class X competence of Computer and Network Engineering expertise of SMK Negeri 1 Gunung Sindur, Bogor Regency.

The effectiveness test of thegan model based on the results of the N-Gain calculation obtained a value of 0.71 or 71%. Based on these calculations, the development of computer learning media and basic networks at SMKN 1 Gunung Sindur, Bogor Regency, is included in the effective category.

B. Suggestion

In this media development, researchers still have many shortcomings and limitations that must be corrected and further developed. For this reason, the researcher would like to convey the following suggestions:

1. For Teachers

Teachers can maximize and optimize the facilities owned by students to help the learning process as a solution to overcome the limitations of learning held in schools.

2. For Students

Students to increase motivation and independence in carrying out learning outside of face-to-face learning with teachers by utilizing technology owned by each student or facilities provided by parents at home.

3. For Schools

Schools can facilitate the development of web-based and *smartphone-based* learning media as designs in the learning process to improve school performance in providing learning services to students.

4. For General Users

General users outside of school can use this application as a source of reference or knowledge, while still paying attention to how to use this application in order to provide more benefits.

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