Development of Learning Media Based on Android in Basic Algorithm and Programming Course for Students Grade X of Nasional Berbah Vocational High School

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Abstract. The purpose of research are develop Basic Algorithm and Programming for student grade X of National Berbah Vocational High School Application on Android-based learning media and knowing the feasibility of the Android-based learning media. The research use ADDIE as development model. The result of the development is an Android Application that contains material, sample of program, video, and evaluation on learning and can use for self learning or in class. The product has been tested for feasibility based on the assessment of media experts is 95.34% with the category "Very Feasible", the assessment of material experts is 88.6% with categories "Very Feasible" and product testing by students with final result feasibility is 82.47% so that the learning media is very feasible to be used in the learning of Basic Algorithm and Programming in grade X of Nasional Berbah Vocational High School.

1. Introduction
Learning media which are packaged by utilizing information technology are considered to have provided convenience in the field of education. Various media that can help overcome difficulties in learning are now widely applied to certain learning in the form of applications, one of which is learning media based on Android applications.

Basics of Algorithms and Programming is one of the lessons learned in class X majoring in Computer Engineering and the Networking at Vocational School Berbah. Difficulties experienced by students are difficulties in learning the material because of the limitations of independent learning resources and the lack of learning media that supports the learning process. The teacher must strive to guide students in learning because students' interest and motivation to learn are still lacking because of the use of learning media factors that have not varied.

This is in line with the results of previous research by Rosiani [8] which states that the lack of interest and awareness of students majoring in Computer Engineering and Networking of the Berbah National Vocational School of Sleman in studying at school or at home has not yet achieved the KKM (Minimum Completeness Criteria). In that research there is a conclusion that the variation of media used in learning is very important to foster student interest in learning.

Based on these problems, it is necessary to apply learning media that are expected to be able to attract students' interest and motivation to learn and provide convenience in learning the material in the presence of learning media. As a learning resource that can be used in class or independently, almost all students have an Android smartphone that has not been used optimally as a tool for learning. Therefore, this study aims to develop Android-based learning media products on the Basics of Algorithms and
Programming for Class X students of the National Vocational School Berbah and find out the feasibility of the product being developed.

General characteristics in learning media need to be considered so that the resulting media products are good. This includes: (1) Introduction to the program in the form of learning media titles, (2) Student control of navigation buttons and menus, (3) Consistency of information provision, (4) Text, graphic and video presentation modes, (5) Providing assistance, and (6) Closing the program. [1]

Learning media developed need to be tested for eligibility before being applied in learning. Asyhar [5] describes one of the principles of learning media evaluation criteria which is very important, namely the aspect of presentation clarity. Presentation of content needs to be considered in order to facilitate students in learning the material and information presented.

As quoted by Arsyad [4] that the evaluation criteria for the quality of instructional media are divided into three, namely (1) Quality of content and objectives, (2) Instructional quality, and (3) Technical quality. In addition, Thorn [10] categorizes several fundamental aspects in evaluating the effectiveness of a media, namely: (1) Ease of Use and Navigation, (2) Cognitive load, (3) Knowledge space and information presentation, (4) Media Integration, (5) Aesthetics, and (6) Overall Functionality.

2. Research Method

The type of research is development research using ADDIE development models according to Branch [6] namely Analysis, Design, Development, Implementation, and Evaluation to develop learning media products. The study was conducted in the odd semester from August to October 2018 at Berbah National Vocational School which is located in Tanjungtirto, Kalitirto, Berbah, Sleman, Yogyakarta Special Province, Indonesia. The subjects in this study were two expert lecturers in the media of informatics engineering education in the assessment of instructional media in terms of media, one teacher in Basic National Vocational Program Berbah in material assessment, and 20 students in class X Computer and Network Engineering as respondents.

The research procedure adjusts the five stages of the ADDIE development model, namely Analysis, Design, Development, Implementation, and Evaluation. The purpose of the analysis phase is to determine the initial needs in developing this learning media. In developing this media analysis is needed, namely: (1) Analysis of User Needs, (2) Analysis of Content or Content, and (3) Analysis of Hardware and Software Requirements.

In the Design stage, the steps taken are to plan the elements that will be included in the learning media, namely making flowcharts that describe the sequence and structure of the learning media. Besides designing a storyboard that includes a template design plan and also material. After making the storyboard the interface is made or what is called the interface design. The development phase is carried out to produce learning media products. The product was developed using Adobe Flash CS6 software with Adobe Air for Android extension. After the product is developed, it needs to be assessed by expert judgment, namely media experts and material experts so that a product that is suitable for use is produced. After the product is finished and is declared feasible by the testing of media experts and material experts, the product is implemented to grade X students majoring in Computer Engineering and Networking at the National Vocational School Berbah. Every stage that is carried out needs to be evaluated to ensure that the product complies with the specifications. In addition, an evaluation is conducted to measure the feasibility of the learning media developed. The instrument used to collect data on the development of this product was a questionnaire/questionnaire distributed to media experts, material experts, and respondents to measure the level of media viability. The type of measurement scale used in this study is a Likert scale. According to Sugiyono [9], Likert scale is a scale that is widely used in questionnaires and is used to measure a person's perception, attitude or opinion of a product that has been developed.

Data collection techniques in this study are: (1) Observation to observe various problems in schools, (2) Interviews to find out the problems found in depth, and (3) Questionnaire to evaluate learning media products that have been developed. Before questionnaires are distributed to respondents, instruments that have been developed need to be tested for validity and reliability in order to meet the requirements.
of valid and reliable instruments. A valid instrument means that the instrument is able to measure what should be measured, while a reliable instrument is that the instrument can be trusted to be used in data collection. The validity test was carried out by the instrument experts followed by the analysis of each question by comparing the results of \( r \) arithmetic with \( r \) tables with a significance value of 5%. If the \( r \) table is less than \( r \), the item is valid. The technique used in the item validity test is Product Moment correlation according to Arikunto [2] which is described in the following formula:

\[
r_{xy} = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{(n(\sum X^2) - (\sum X)^2)(n(\sum Y^2) - (\sum Y)^2)}}
\]

(1)

Description:
\( R_{xy} \) = correlation coefficient between item scores and total scores
\( N \) = total respondents
\( \sum X \) = total of item scores
\( \sum Y \) = total scores
\( \sum XY \) = total of item scores multiplications with total scores

The reliability test using the Alpha formula as follows:

\[
r_{11} = \left( \frac{k}{(k-1)} \right) \left( 1 - \frac{\sum \sigma^2_x}{\sigma^2_{11}} \right)
\]

(2)

Description:
\( r_{11} \) = reliabilitas instrumen instrument reliability
\( k \) = total of question
\( \sum \sigma^2_x \) = total of item varian
\( \sigma^2_{11} \) = total varian

After the reliability coefficient is known, the calculation results are converted in the interpretation table \( r \) value according to Arikunto [2], as follows:

| \( r \) value | Interpretation |
|--------------|----------------|
| 0,800 – 1,00 | very high      |
| 0,600 – 0,800| high           |
| 0,400 – 0,600| fair           |
| 0,200 – 0,400| low            |
| 0,000 – 0,200| very low       |

Data analysis in this research used three steps. Based on Arikunto [2], three steps in conducting data analysis: (1) Preparation to check the completeness of data and the kinds of data fields, (2) Tabulating data, and (3) Application of data according to the research approach. At the tabulation stage, data analysis activities include obtaining quantitative data by scoring items that need to be scored. The score given for each answer is presented in Table 2.
Table 2. Scoring for each item

| answering            | Skor |
|----------------------|------|
| very agree           | 5    |
| agree / good         | 4    |
| fair                 | 3    |
| not agree            | 2    |
| very not agree       | 1    |

Based on the scores that have been given, the data is applied in calculations to assess the feasibility in the form of a percentage which can be briefly described by the following formula [7]:

\[
\text{Appropriate percentage} \, (\%) = \frac{\text{obtained score}}{\text{ideal maximum score}} \times 100\%\]

(3)

The percentage of eligibility obtained, then converted into descriptive sentences to assess the feasibility of the media. The following is a guideline table for the media eligibility criteria according to Arikunto [3]

| Appropriateness percentage | interpretation         |
|----------------------------|------------------------|
| 81-100%                    | very appropriateness   |
| 61-80%                     | appropriateness        |
| 41-60%                     | fair                   |
| 21-40%                     | not appropriateness    |
| <21%                       | very not appropriateness|

3. Result and Discussion

This research produces learning media products in the form of applications that can be used on Android-based smartphone devices. Figure 1. example of the display of the product developed
Successfully developed products have been tested for suitability based on assessments by media experts and material experts. The following are the results of the assessment of media experts and material experts:

The results of the assessment by media experts are shown in Figure 2.

![Figure 2. Bar graph of expert media evaluation](image)

Based on the assessment of media experts the percentage value obtained from the ease of use and navigation aspect is 96%, the percentage value from the aesthetic aspect is 92.85%, the percentage value from the media integration aspect is 95%, and the percentage value from the technical quality aspect is 97.5%. Thus, obtained an average final percentage of 95.34% which stated that the media aspect of the Android-based learning media is included in the very feasible category.

The results of the assessment by content experts are shown in Figure 3.

![Figure 3. Bar graph of expert material evaluation](image)

Based on Figure 3, the material eligibility from the suitability aspect is stated to be very feasible with a feasibility percentage of 90%, the aspect of content quality and objectives is declared to be very feasible with a eligibility percentage of 93.3%, and the instructional quality aspect is declared to be very feasible with a feasibility percentage of 82.5 %. The overall average percentage is 88.6% so that the material in instructional media is categorized as "Very Eligible".

Before the questionnaire is used for data retrieval to respondents, it needs to be tested for validity and reliability. The instrument validation was carried out by the instrument expert lecturer then trialed to the students. The results of testing the instrument on students showed that from a total of 23 question
items, there was item question number 15 which was invalid because r count < r table. So that the items that can be used for data retrieval are 22 items.

The instrument reliability test was performed by calculating the Alpha value assisted with SPSS 16.0 software. The following results from the reliability test:

**Table 4. Instrument Reliability Results**

| Cronbach’s Alpha | N of Items |
|------------------|------------|
| 0.887            | 22         |

From the resulting reliability value compared to the interpretation table r value, the instrument reliability is included in the very high category, so that the instrument can be trusted to be used in testing the feasibility of Android-based learning media on respondents.

The results of the feasibility test by student are shown in Figure 4.

![Figure 4. Results of the feasibility test by students](image)

Based on testing to students in Figure 4, obtained the percentage of eligibility results from the aspects of ease of use and navigation of 85.4% which was declared very feasible, the aspect of presentation clarity of 82.2% which was declared very feasible, aesthetic aspects or beauty of 84% which was stated very feasible, and the instructional quality aspect of 78.25% which was declared feasible. Thus, the final score of 82.47 is obtained so that the Android-based learning media that are developed are very feasible to use.

4. **Conclusion**

The development of instructional media is carried out with the ADDIE development model, namely Analysis, Design, Development, Implementation, and Evaluation. The results of product development are in the form of applications that support classroom learning and independent learning by utilizing Android-based smartphones. The features provided in this application have been adjusted according to need, which includes instructions, material, videos, practice questions, and minigames.

The result of the feasibility test by the media expert was 95.34% which was stated in the very feasible category, the results of the test by the material expert was 88.6% which was declared very feasible, and the results of the feasibility test by the students amounted to 82.47% which was stated in the very feasible category. So as a whole the Android-based learning media is very feasible to use in learning the Basics of Algorithms and Programming of Class X National Vocational School Berbah.
Researcher’s suggestion for further research related to the development of similar learning media is:
(1) Android-based learning media on the Basics of Algorithms and Programming can be developed by
loading broader basic competencies, (2) Learning media is more developed with database systems so
that the material and more dynamic exercises, and (3) Development of instructional media that provides
more means of interaction between users.

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