Developing the Android Application Based Learning Media of Light Vehicle Engine Maintenance Course

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Abstract. This research aimed at (1) Developing the Android Application based learning media of Light Vehicle Engine Maintenance (PMKR) course (2) evaluating the feasibility of the developed learning media, based on media experts and material expert's review, also questionnaire feedback from users. This is an R&D (Research and Development) research, adopting the four-D model (define, design, develop, disseminate). The study was conducted at the Teknologi Kendaraan Ringan (TKR) class of SMK Negeri 3 Yogyakarta, in the school academic year of 2019/2020. Data collected by observation, interview and questionnaires. Descriptive technique is used for the development stage data analysis, while the learning media feasibility is perceived by translating quantitative data into certain levels of qualitative data. The research results showed that the developed learning media is very feasible, as given score 3.59 by expert judgments and an average score of 3.45 from the users’ responses.

1. Introduction

Education is a learning process to develop the students potential, character and skills through conscious and planned efforts. Therefore, in the learning process, it is hoped that it can create broad-minded individuals as well as establish a dignified citizen. Law Number 20, the 3rd Article of 2003 concerning the National Education System, states in detail the aim of education is to make humans posses religious norm, noble character, healthy, knowledgeable, capable (creative, independent), become democratic citizens, and be responsible (President of the Republic of Indonesia, 2003).

Educational goals can be achieved if the learning process is also going well. To achieve this goal, as stated in the Ministerial Regulation No. 34 of 2018 concerning national education standards for Vocational Middle Schools / Madrasah Aliyah Vocational, learning is a process of guiding students through interactions among students, students and teacher interactions, and accessing other resources in a learning environment. To achieve mastery of the specified competencies. Therefore, the success of the learning process is largely determined by educators, students and learning resources. Educators can determine the success of learning through the learning methods used to increase students' understanding of the material received.

The information and communication technology has been rapidly develops, it provides better access for students to the technology, such as sending messages, pictures, sounds and videos. The
development of information and communication technology has brought enormous changes to the advancement of the world of education, where the learning process is required to use various kinds of technology and reduce conventional learning methods. This should be able to spur educational institutions to start developing technology-based learning media. Educators as facilitators have to be able to develop attractive learning media to improve the learning process. With the technology-based learning media, it is expected that students will be more interested and motivated to study.

SMK Negeri 3 Yogyakarta is a technology-based Vocational High School that has implemented the 2013 Curriculum in learning: By preparing students to become competent workforce with competences according to their majors. In accordance with its vision, namely to become an education and training institution that is able to prepare graduates with character, competence, and environmental insight. From this vision, it is hoped that SMK Negeri3 Yogyakarta will be able to produce graduates with character, competence, and environmental insight.

The results of the analysis of the level of subject difficulty carried out in early July using a questionnaire, shown that students still had difficulty understanding one of the Light Vehicle Engineering (TKR) learning materials with a focus on Light Vehicle Engine Maintenance (PMKR) studies. Of the 30 respondents in class XI TKR 3, 43.33% of them thought the material was difficult and 13.33% considered it very difficult.

Moreover, from the results of observations during the Introduction to School Field (PLP) which was held in mid-July 2019 to the end of August 2019, there were problems with the PMKR Mid-Semester Examination (UTS) for class XI TKR 3 out of 30 students, it can be stated that none reached 75.00 and only 7 people whose scores were above 70.00. The value of one person who gets close to the KKM is 74.00 and is the highest score. While the lowest score was 56.00 with an average grade of 64.60. From this, most of the students did not reach the minimum passing grade (KKM) in the Mid-Semester Examination (UTS). From the data on the distribution of scores of students XI TKR 3 on daily tests and also the Mid-Semester Examination in the Maintenance of Light Vehicle Machinery, it can show that students still have difficulties in answering the given exam material. After evaluating the questions given during the Mid-Semester Examination, a key factor that caused problem for students to reach KKM was some difficulties in the lesson of maintaining conventional gasoline/carburetor fuel systems. The difficulty of students in answering the given exam material is an indication of the lack of delivery of the material provided by educators to students. In the learning process, there are several factors that affect the lack of delivery of the teaching material delivered to students, namely from unsuitable learning methods, the approach used by educators, lack of learning media or learning models that are not properly fit with the students learning characteristics. To maintain the quality of the learning process, educators have tried to use various learning models and also use the scientific approach but it has no effect on the learning outcomes of students. Even though they have used a variety of learning models, often educators still teach material to students using the lecture method using PowerPoint, so there is less learning media that is more interactive.

This Android application-based learning media is an innovation that can bring changes to the learning process, where the learning process is no longer just listening to the material description from educators, but students also carry out other activities such as observing, searching, reading directly, understanding objects, images, and videos that they don’t understand by learning independently in Android application-based learning media through their respective cellphones. That way, learning becomes more lively and leads to student center learning in accordance with the educational curriculum applied.

Learning media based on Android applications is one type of multimedia learning media which can combine all types of media both visual, audio and audio-visual in an application found on an Android smartphone. Munir (2013: 113) states that in the world of education, multimedia learning media can indeed combine several media into one in the learning process, so the learning process will develop well, thus helping educators to present interactive media.

The advantages of using multimedia learning media according to Munir (2013: 113-114) include (1) Material that has been difficult to explain can be better explained, (2) Adding motivation...
to students during the teaching and learning process, (3) The learning system is more innovative and creative, (4) A complete package of learning media (it can contain text, images, audio, animated images, or videos). Information and communication technology contained in computer systems can deliver teaching directly to students by interacting with subjects that have been programmed into a system that has become an application (Darmawan, 2013: 93).

In order to solve the problem, in which increase the interest of students participation and learning activities, the development of the learning media has taken for the subject of Maintenance of Light Vehicle Machines using an Android-based smartphone, which contained teaching material as an explanation accompanied by videos and learning evaluations.

The purpose of this study is to develop a learning media product to be applied on android applications platform which include: (1) components of the conventional gasoline fuel system, (2) how the conventional gasoline fuel system works, (3) problems with the conventional gasoline fuel system, and (4) how to check the conventional gasoline fuel system.

2. Methodology
2.1 Types of Research
This type of R & D study aims at producing and assessing the feasibility of the product. The model was adapted from the four-D development model, proposed by Thiagarajan (1974: 5) which consists of 4 stages: Defining, Designing, Developing, and Disseminating.

According to Fellyson Titting et al (2016: 122) development research is a method for producing certain products or perfecting existing products and testing the effectiveness of these products. A similar statement was also expressed by Endang Mulyatiningih (2011: 54) who argued that in development research there are always products produced such as models, media, modules, evaluation tools, and so on.

2.2 Time and Place of Research
The study takes place at SMK Negeri 3 Yogyakarta. The time used for research is the 2nd semester of the 2019/2020 school year. Respondents of this study were educators and grade XI students of the Light Vehicle Engine (TKR) expertise program at SMK Negeri 3 Yogyakarta during the 2019/2020 school academic year. The research procedure refers to the 4D development model: a. Define the conditions needed in developing interactive multimedia learning, including: 1) initial analysis; 2) student analysis; 3) analysis of learning tasks / activities to be carried out; 4) analysis of the concept of the material to be presented; and 5) formulation of learning objectives. b. Designing the media based on the analysis of the definition stage, to prepare a prototype of a learning device: 1) preparation of multimedia assessment parameters; 2) multimedia format selection; 3) selecting the media (tools) used for multimedia production; and 4) making the initial multimedia design as a prototype. c. After the product is finished, the learning media product enters the development stage, which is to produce a revised product based on input from experts, includes: 1) expert validation, followed by revisions, and 2) development testing through product testing to determine user responses to the developed product. d. Disseminate is the final stage in the development of multimedia learning that aims to promote the final product so it can be accepted by users, as individual user as well as in group users. At this stage, the steps taken include: 1) packaging the product and 2) distributing the product.

2.3 Data Collection Methods and Tools
Data collection method carried out by observations and interviews to obtain in-depth information about issue or theme raised in the study. Users feedback were collected by questionnaires, while data collection tools were used by researchers to collect research data by measuring.

2.4 Data analysis technique
Analysis assessment data from material and media experts was carried out by calculating the average score per aspect and the average score of the overall answer without compromising the validity and reliability. Validity was determined by the V Aiken index and reliability was determined using the SPSS software. The Aiken Validity Index will appear in the range of 0 to 1 with the criteria for a
value of 0.8 - 1,000 including the very high category, 0.6 - 0.799 including the high category, 0.4 -
0.599 including the high enough category, 0.2 - 0.399 is in the low category and <0.200 is in the very
low category. Based on this, items are considered valid if they have a minimum V Aiken index in the
high enough category with a value of 0.4. The reliability is determined using by the Cronbach’s Alpha
index comparison table. The questionnaire is reliable when the Cronbach's Alpha index > 0.7 (Eko
Putro Widoyoko, 2012: 180). Data that were valid and reliable then analyzed by calculating the
average score and finally converted into a qualitative product feasibility level referring to the
classification table (Eko Putro Widoyoko, 2012: 123).

| Average Score | Classification         |
|---------------|------------------------|
| > 3,25 s/d 4,00 | Very Feasible          |
| > 2,5 s/d 3,25  | Feasible               |
| > 1,75 s/d 2,50 | Not Feasible           |
| 1,00 s/d 1,75  | Not Feasible At All    |

3. Result
3.1 The Definition Stage (Define)
At the defining stage, the requirements or needs needed in the development of learning media are
determined. Data at this stage were obtained through observation and interviews which were analyzed
descriptively based on relevant theoretical studies: a. Pre-problem analysis, it is known that the
purpose of developing learning media for the Maintenance of Light Vehicle Machine based on
android applications is to overcome several problems. The problem in question is that 43.33% of
students think it is difficult for the subject of PMKR, especially in the Basic Competencies of
Conventional Fuel Systems, especially on the subject of the carburetor system because it is quite
complex and abstract, the methods used by teachers in delivering material tend to be conventional
using the lectures so as to make students behave passively when learning takes place and the limited
learning media used in delivering material so that it is less attractive to students; b. Analysis of
educators and students (learner analysis), it is known that class XI students of TKR at SMK Negeri 3
Yogyakarta are less active in learning. In addition, teachers are also very limited in the use of
instructional media because they only use power points and the learning applied is still teacher-
centered; c. Concept analysis Concept analysis is carried out to determine the teaching materials to be
included in the media. This is done by identifying the competencies that students must master in
accordance with those contained in the curriculum and syllabus used by the school; d. Task analysis
Task analysis is carried out to identify what activities will be carried out during the learning process.
Based on the 2013 curriculum, learning activities are carried out through a scientific approach which
consists of observing, asking (questioning), collecting information (collecting), associating
(associating), and communicating (communicating); e. Formulation of learning objectives (specifying
instructional objectives) Based on the identification of the material concept analysis and the analysis
of the tasks that have been carried out, it can be determined the learning objectives that will be carried
out through the media. The learning objectives are through observing, asking (questioning), collecting
information (collecting), associating (associating) and communicating (communicating).

3.2 Design Stage (Design)
The design stage is the stage of preparing the initial design of the developed learning media. This
stage consists of several steps, namely: a. Compilation of Assessment Parameters (constructing
criterion-referenced test) In this study, a non-test instrument was used, therefore the parameters were
obtained based on the results of the questionnaire which was a non-test instrument; b. Format
selection (format selection) The drill and practice format is considered the most suitable to be applied
in class XI TKR 3 because in this format students are trained to have proficiency in a skill or
strengthen mastery of a concept. The evaluation menu in the media provides a series of questions or
questions that are displayed randomly, so that every time it is used, the questions or questions that appear are always different, or at least in different combinations; c. Media selection (media selection) The selection of media in developing interactive learning media for PMKR with the subject matter of conventional fuel system/carburetor is taken by the previous results of the media requirements analysis, namely Adobe Flash CS6 (creative suite 6) in making Android-based learning applications.

3.3 Development Stage (Develop)

Before conducting field trials and distributing to users, the resulting product needs to be tested on material experts, media experts, small-scale trials and product revisions. Where at the material expert trial stage conducted by Dr. Agus Budiman, M.Pd., M.T. who is a lecturer from the Department of Automotive Engineering Education, YSU and Kliwon Parwidi, S.Pd. who is a Light Vehicle Engineering teacher who teaches PMKR at SMK Negeri 3 Yogyakarta.

### Table 2. Material Expert Validation

| No | Aspect         | Avg Score | Category       |
|----|----------------|-----------|----------------|
| 1  | Contents       | 3.66      | Very Feasible  |
| 2  | Learning       | 3.52      | Very Feasible  |
|    | **Cumulative Average** | **3.59** | **Very Feasible** |

From the results of the table above in terms of learning material media, it is very feasible to use with several revisions, namely improving the editorial in the description of the carburetor material, changing the word problem to the word trouble, and adding electric pump material. The next stage is the validation stage of the media expert, validate by Ponco Wali Pranoto, M.Pd. who is a lecturer from the Department of Electronics Engineering, UNY and Drs. Bekti Sutrisna, who is one of the educators at SMK Negeri 3 Yogyakarta with the results as described in table 3.

### Table 3. Validation Results of Media Experts

| No | Aspect           | Avg Score | Category       |
|----|------------------|-----------|----------------|
| 1  | Visual Communication | 3.56      | Very Feasible  |
| 2  | Programming      | 3.55      | Very Feasible  |
|    | **Cumulative Average** | **3.55** | **Very Feasible** |

From the results obtained, this PMKR learning media falls into the very suitable category for use with revisions from media experts, namely Making page numbering on media material, Making a back button on the application and Providing dubbing and subtitles on the video. After receiving input and making improvements in accordance with the revisions from the experts, the next stage was a small-scale trial for 10 TKR students with the response results in table 4.

### Table 4. Small Scale User Responses

| No | Aspect            | Avg Score | Category       |
|----|-------------------|-----------|----------------|
| 1  | Contents          | 3.43      | Very Good      |
| 2  | Learning          | 3.44      | Very Good      |
| 3  | Visual Communication | 3.49      | Very Good      |
| 4  | Programming       | 3.43      | Very Good      |
|    | **Cumulative Average** | **3.45** | **Very Good** |

Some revisions were made, and the last step is Disseminate. At this stage, learning media product was introduced to 30 TKR students and received a response with the results in the table below.

### Table 5. Large-scale User Responses
From the results of large-scale trials and got a cumulative score of 3.49 and learning media is very well used in learning. This media can be accessed directly via a smartphone device with the minimum specifications required to run this learning media: Android OS v6.0.1 (Marshmallow) operating system; Qualcomm MSM8917 Snapdragon 425 chipset; 2 GB RAM and 16 GB internal memory. The capacity of the smartphone is considered sufficient because when this learning media is run it only takes up 85.14 MB of RAM memory and 0 MB when it is not running. This learning media for conventional fuel system / carburetor material can be used as a learning medium in delivering material in class or learning independently.

4. Conclusion

Learning media products for the Maintenance of TKR are made through four stages of research and development, including: (a) Observation and interviews, the define stage data shows that 43.33% of Grade XI Students of TKR consider that PMKR on the material of Conventional Fuel Systems/Carburetor is a difficult subject, learning methods in class are still dominated by lectures and there is no multimedia learning that is interesting and can also help students to better understand the learning material; (b) conducting the media design, selecting the media format, constructing the initial design to produce a media prototype; (c) developing by validating and making revisions based on expert's advice, followed by field trials to determine the responses of educators and also students as users followed by revisions so that the final product of learning media is suitable for learning at SMK Negeri 3 Yogyakarta; (d) media packaging, Android-based application with a capacity of 56MB as the .apk format into a compact disk, and finalize by product distribution. The quality of the developed media achieved a validation score of 3.59 which is very feasible, and based on field trials of users response achieved 3.45 which is defined as very feasible. These results show that the final product of learning media is considered as very feasible and recommended to be used in the field.

Several suggestions for the future project: (1) providing this media as an alternative choice in explaining learning material in schools, (2) even though the presence of media can make learning more interesting, educators has to be aware to the teaching scheme in order to ensure students comprehensions to the material being taught, (3) the continuation of the media development has to be made to make the learning contents in accordance with what is needed in schools.

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