Developing learning media of electronic fuel injections (efi) system android-based

J N Rohman¹, M R Ikhsan², M Solikin²

¹Wroclaw University of Science and Technology, Polandia, Poland
²Automotive Engineering Education Study Program, Yogyakarta State University, Yogyakarta, Indonesia

E-mail: 251708@student.pwr.edu.pl

Abstract. This research aims to: (1) producing android-based Electronic Fuel Injections (EFI) learning media; (2) knowing the feasibility of android-based EFI learning media; and (3) knowing students' responses to the learning media of the Android-based Electronic Fuel Injections (EFI) system. The research was conducted using the Borg and Gall model modified by Sugiyono. The technique of data collection is done by questionnaire, while the data analysis technique uses descriptive quantitative methods. The results of the research were obtained: (1) products in the form of Android-based Electronic Fuel Injections (EFI) system learning media; (2) learning media in terms of material included in the very feasible category and in terms of media included in the very feasible category; and (3) students' responses when testing the product, the aspects of use are included in the category very easily and the aspects of usefulness are included in the category of very useful. The response of students when testing the use, the aspects of use included in the category is very easy and the usefulness aspects including the category is very useful.

1. Introduction

Education is something that cannot be separated from human life. Education is held to make humans as individuals who can be useful for themselves also for the nation and state. With education, quality human resources will be created. In accordance with art. 3 of Act no. 20 of 2003 concerning the National Education System, which says that national education aims to develop capabilities and shape the character and civilization of a nation with dignity in order to educate the nation's life, aims to develop the potential of students to become human beings who believe and fear God Almighty, have a good character, healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. Therefore, in order to achieve the goals of education, education must be carried out as well as possible.

The development of science and technology from year to year become more sophisticated. Both, directly and indirectly, influenced human life in the political, economic, social, cultural, and educational fields. In the field of education, technological advances can be used as a tool to support the teaching and learning process, but not a few technologies are currently developing that have a negative impact due to misuse. Therefore, professional teachers are required to be able to make the best use of technology so that the learning process can be more optimal, resulting in superior and quality human beings.
SMK PIRI 1 Yogyakarta is one of the private Vocational High Schools in the city of Yogyakarta. SMK PIRI 1 Yogyakarta has 5 Program studies that including Electrical Power Installation Technic, Mechanical Technic, Light Vehicle Technic, Technic Audio Video, and Motorcycle Technic. The program of Light Vehicle Technic is one of the superior programs at SMK PIRI 1 Yogyakarta. This can be seen from the many interests of new students to choose that Program compared to other Programs at SMK PIRI 1 Yogyakarta. As a superior program, the light vehicle technic is expected to be able to have better graduates. However, in its implementation, in the Final Examination in the semester for the 2017/2018 school year, there are still many students who have not to pass the KKM score (75.00) on the productive subject. Based on the results of observations at the beginning of the study, it was known that only 15 from a total of 54 students had reached the KKM (27.8%). This shows that most students still have not mastered the material given.

The large number of students who have not reached the KKM is a problem that must be resolved immediately. Based on the results of the observation and interview, it was known that students had several problems in understanding the material caused by the lack of motivation to take part in the learning process, and lack of learning media that attracted students' interest. In addition, according to the Head of the program of the light vehicle technic also as a teacher of productive subjects, the material for the Electronic Fuel Injection (EFI) system is one of the most difficult materials for students to understand. The lack of media and reading sources is the cause of students having difficulty understanding the material, even at the time of the competency test which was conducted in March 2018, many students still had difficulties in determining the location of the sensors and the use of the EFI scanner. On the other hand, from the results of classroom observations, many students steal the time during the study to play smartphones. Meanwhile, the behavior of students outside of class hours cannot be separated from playing smartphones. From these conditions, the researchers had the idea to use smartphones as an attractive learning media as a solution to overcome the problems in learning.

2. Method
This research uses R&D (Research and Development) by Borg dan Gall that was develop by Sugiyono. The subjects in this research were students of class XI of the program of the Light Vehicle technic at SMK PIRI 1 Yogyakarta and the object of this research is Android-based learning media developed for the EFI system material.

3. Result
This study aims to produce a learning media for the Android-based Electronic Fuel Injections (EFI) system. The purpose of developing this learning media is based on observations in SMK 1 Piri Yogyakarta. The development of instructional media begins with gathering materials related to the EFI system. After the material is collected, then make a design from the media, the media design that will be made is adjusted to the needs or abilities of the students. The media design that has been made is then validated by material experts and media experts to determine its feasibility. The material expert assesses the feasibility of the media in terms of material, while the media expert assesses the feasibility of the media’s side. Media that has gone through the refinement stage based on input from expert respondents and gets a decent score are then tested on students. Testing on students was carried out on a small scale involving 10 students and a large scale involving 31 students. In small-scale product trials, there were no suggestions for improvement to the media so that improvements were not made. In large-scale usage trials, the media also did not receive improvement input so that improvements were not made. After the media was tested on students and received a positive response, the learning media was disseminated so that more users could use it. The distribution of learning media is done by uploading the media on Google Drive and spreading the Google Drive link for the learning media.
Material validation aims to assess the feasibility of the material on the media. The material expert who acts as a validator is M. Solikin, M.Kes. There are 21 statements answered on the provided instrument. The results of the assessment from material experts are as follows:

**Table 1. Material Expert Judgment.**

| No | Alternative Answers | Score | Total Data | Total Score |
|----|---------------------|-------|------------|-------------|
| 1  | Very good           | 4     | 13         | 52          |
| 2  | Good                | 3     | 8          | 24          |
| 3  | Not Good            | 2     | 0          | 0           |
| 4  | Very Not Good       | 1     | 0          | 0           |
|    | Total Score         |       |            | 76          |

The material feasibility category is used to determine the feasibility of the material on learning media. Based on the results of the calculation, it can be seen that the eligibility categories of material experts are as follows:

**Table 2. Eligibility Category From Material Experts.**

| Range Score | Categories       |
|-------------|------------------|
| 68,25 < X ≤ 84 | Very Feasible   |
| 52,5 < X ≤ 68,25 | Feasible       |
| 36,75 < X ≤ 52,5 | Not Feasible   |
| 21 < X ≤ 36,75 | Very Not Feasible |

The score obtained from the material expert is 76. If the score from the material expert is converted into a feasibility table, the learning media is included in the "Very Feasible" category. This category has a range of values from 68.25 to 84. Therefore, the material on the learning media developed is very feasible to use or apply.

The media expert who acted the assessment was Dr. Drs. Agus Budiman, M.Pd., M.T. He is a lecturer in the Automotive Engineering Department, Faculty of Engineering, UNY. There are 22 statements answered on the provided instrument. The results of the assessment from media experts are as follows:

**Table 3. Media Expert Judgment.**

| No | Alternative Answers | Score | Total Data | Total Score |
|----|---------------------|-------|------------|-------------|
| 1  | Very Good           | 4     | 13         | 52          |
| 2  | Good                | 3     | 9          | 27          |
| 3  | Not Good            | 2     | 0          | 0           |
| 4  | Very Not Good       | 1     | 0          | 0           |
|    | Total Score         |       |            | 79          |

Based on the results of the calculation, it can be seen that the eligibility categories of media experts are as follows:

**Table 4. Eligibility Category From Media Expert.**

| Range Score | Categories       |
|-------------|------------------|
| 71,5 < X ≤ 88 | Very Feasible   |
| 55 < X ≤ 71,5   | Feasible        |
| 38,5 < X ≤ 55   | Not Feasible    |
| 22 < X ≤ 38,5   | Very Not Feasible |
The score obtained from the media expert was 79. After being converted into the feasibility table by the media expert, the learning media developed was included in the "Very Appropriate" category. Therefore, the learning media developed from the media aspect is very feasible to use or apply.

The trial was conducted to determine the user’s (student) response to the media being developed. The trial was carried out twice, namely product testing and user trials. The instrument on the usage aspect consists of 11 statement points. Each point of the statement has the answer with the highest score, namely 4. While the lowest score in the answer to the statement is 1. Based on the calculations made, the categories of students' responses to the aspects of use are obtained as in the table below:

| Table 5. The Usage Aspect Category. |
|------------------------------------|
| Range Score                        |
| 35.75 < X ≤ 44                     | Very easy |
| 27.5 < X ≤ 35.75                   | Easy      |
| 19.25 < X ≤ 27.5                   | Difficult |
| 11 < X ≤ 19.25                     | Very difficult |

The instrument on the usefulness aspect consists of 10 statement points. Each statement point has the answer with the highest score, namely 4, and the lowest score 1. Based on the calculations made, the categories of students' responses to the aspects of use are obtained as in the table below:

| Table 6. The Usefulness Category |
|----------------------------------|
| Range score                     |
| 32.50 < X ≤ 40                   | Very useful |
| 25 < X ≤ 32.50                   | Useful      |
| 17.50 < X ≤ 25                   | Less useful |
| 10 < X ≤ 17.50                   | Not useful  |

The product trial involved 10 students as respondents. The recapitulation of the results at the product trial stage is as follows:

| Table 7. Recapitulation Of Product Trial Result. |
|-------------------------------------------------|
| No. Responden | Total | Aspects | Statement | Total Score |
|---------------|-------|---------|-----------|-------------|
| 1             | 10    | Use     | 11        | 365         |
| 2             |       | Usefulness | 10    | 327         |

The product trial stage obtained a total score of 365 on the use aspect and a total score of 327 on the usefulness aspect. Based on the calculations made on the total score, an average score of 36.50 was obtained in the use aspect and 32.70 in the usefulness aspect. After knowing the average score, then the score is converted into a table of user response categories in each aspect. Based on the user response category table on the aspects of use, the learning media is included in the "Very Easy" category. Media is included in the very easy category if it has a score range of more than 35.75 to 44. Meanwhile, the usefulness aspect of the media is included in the "Very Useful" category. Overall, based on the results of the product trial, the media that has been made is very easy and very useful to use.

The use trial involved 31 students as respondents. The recapitulation of the results at the usage trial stage is as follows:
Table 8. Recapitulation of the Results Usage.

| No. | Total Responden | Aspects     | statement | Total Score |
|-----|-----------------|-------------|-----------|-------------|
| 1   | 31              | use         | 11        | 1140        |
| 2   |                 | usefulness  | 10        | 1012        |

The trial usage stage involved 31 students as respondents. In this trial, the instructional media got a total score of 1140 in the aspect of use, while in the usefulness aspect received a total score of 1012. The average of the total score in the aspect of media use got an average score of 36.77 and the usefulness aspect got a score of 32.65. Based on the user response category table, the score is "Very Easy" category, while the usefulness aspect is "Very Useful" category.

4. Discussion
Based on the all assessment results, it is generally known that the media that was developed are suitable for use in learning activities. With the media that was developed, it is hoped that can facilitate student to study of Electronic Fuel Injection’s material easier. With this media, they can study by their phone at anytime and anywhere.

5. Conclusion
Based on the results of the research, the research produces a learning media as a software for an Android device that containing material on the Electronic Fuel Injection (EFI) system, with the feasibility of learning media in terms of material and media is a very feasible category, from the use aspect of the product is a very easy category, and from the usefulness aspect is a very useful category.

References
[1] Kemendikbud 2003 Undang-Undang Nomor 20, Tahun 2003, tentang Sistem Pendidikan Nasional
[2] Nana S 2016 Penilaian Hasil Proses Belajar Mengajar (Bandung: PT. Remaja Rosdakarya)
[3] Sugiyono 2015 Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D (Bandung: Alfabeta)
[4] Suryani N, Setiawan A, and Putria A 2018 Media Pembelajaran Inovatif dan Pengembangannya (Bandung: Rosda)