Development of Learning Media Practices the Ignition System in Automotive Electrical System Courses, Department Automotive Engineering

J N Rohman¹, A N Wahyudi², 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 aimed to: (1) producing ignition system practice learning products and (2) to know the feasibility of ignition system practice learning media in automotive electrical system courses in the Department of Automotive Engineering Education Yogyakarta State University. This study was a research and development using the 4D development model (define, design, develop, and dissemination). The subjects of this study were 38 students of the Department of Automotive Engineering Education. Data collection techniques were carried out by observation and closed questions to get preliminary data from automotive workshops as well as students of automotive engineering education and questionnaires to find out the results of practical learning media from experts and users. The feasibility data analysis is done by describing it into 5 categories as on the Likert Scale. The results of this development research are: (1) the resulting ignition system practice learning media products in the form of job sheets which have word format and video tutorial with MP4 format and (2) the feasibility of this practice learning media is determined by material experts (4.74) for job sheets that are categorized as very feasible and (4.95) for video tutorials that are categorized as very feasible, eligibility based on media experts (4.78) for job sheets that are included in the very feasible category and (5.00) for video tutorials that were in the very feasible category, the response of students as users received a rating (4.04) for the job sheet that was in the appropriate category and (4.13) for the video tutorial which was in the appropriate category. So that the development of ignition system practice learning media is feasible to use.

1. Introduction

By the declaration of the free market in Southeast Asia, Indonesian workers are required to be able to develop their competence and ability in order to compete with foreign workers. One aspect of improving the quality of human resources is through education. National education in Indonesia which is based on Art. 3 of the Act of the Republic of Indonesia Number 20 of 2003 concerning the National Education System has the aim of developing capabilities and shaping the dignified character and civilization of the nation in order to educate the nation's life. In education, teaching and learning activities are the main activity in the entire educational process in the classroom. The success of achieving educational goals depends a lot on the quality of the teaching and learning process. The teaching and learning process cannot be separated from the main role of the teacher insides it.
Teachers at the senior high school, especially teachers in vocational school, must have more specific competencies in the field of vocational expertise. However, in Indonesia currently, there is still a lack of 159,000 vocational teachers in various regions. Not only in terms of quantity, but vocational teacher professionalism is also considered lacking. The professionalism of teachers in Indonesia is hoped that will be able to answer the challenges of the development of science and technology which have an impact on changing learning patterns.

LPTK (Education Institute of Teachers' Education) is a higher education institution that prepares professional teachers. Provision of the teachers is the main task of the LPTK as an institution that is responsible for producing teaching staff, including vocational teachers, with demands for high teacher competence and professionalism to respond to the developments in science and technology.

UNY as one of the LPTKs in Indonesia that has a program study of automotive engineering education, learning in the program must be adjusted by vocational-based learning with the demand to provide balanced learning between theoretical knowledge and skills. To realize these demands, the Program Study of Automotive Engineering Education uses 3 (three) educational curriculum references, which are the Indonesian National Work Competency Standards (SKKNI), 2013 Curriculum, and UNY Curriculum.

Based on the latest curriculum for the Automotive Engineering Education program in 2016, one of the courses taught is the Automotive Electrical System Course which is taught in semester 3 with a total of 3 credits with details, namely 2 theoretical credits and 1 practical credit.

According to the syllabus of the Automotive Electrical System Course of FT UNY (Moch. Solikin, 2008: 1-4) One of the competencies that taught is the ignition system developed in the Automotive Electrical System course, namely installing, maintaining, testing, and repairing the ignition system.

The results of observations carried out in the automotive electrical workshop in the subject of practical of the automotive electrical system, the number of media that used for the practice of both conventional and electronic ignition systems is 3 (three) teaching aids with the number of students in one lab class totaling 20 students. From the number of students, it is divided into 4 groups so that one group of practical learning is carried out by 5 students and with an allocation of practical learning time of 100 minutes with the media used are 1 for 5 students, so there are some students who in practicum have not been able to try the ignition system practice because of that situation.

Based on the results of observations using a questionnai re that given to 30 students of the Automotive Engineering Education Department class of 2017, data that was obtained stated that 50% of the 30 students did not understand the ignition system practice material in the automotive electrical system course. Furthermore, 60% of 30 students stated that they often a failure in practical exams because they do not understand the material in the practicum, 50% of 30 students use job sheets as a reference in their practicum and 83% of 30 students stated that it is easier to understand the material by first looking at the tutorial video. To overcome the problem of the number of students who fail in the practical exam, it can be overcome by optimizing the function of the learning media, where the learning media is a component of one of the main components of practical learning tools.

Based on this problem and based on the situation analysis that has been carried out, the learning of the ignition system in the automotive electrical system course needs to be the development of learning media with updating of work steps in job sheet and provide video tutorials to clarify the work steps that have been written on it. Therefore it is necessary to research that problem with the topic "The Development of Learning Media of Ignition System Practices in Automotive Electrical System Courses in the Department of Automotive Engineering Education, Yogyakarta State University".

2. Methodology
The type of this research is R&D (Research and Development), that was conducted in January - May 2020 at the Department of Automotive Engineering Education, Yogyakarta State University with the Subjects were students of the Department of Automotive Engineering Education, Faculty of Engineering, Yogyakarta State University, who had taken courses in automotive electrical systems, totaling 38 students.
The data collection techniques in this research are (1) observation with the aim of knowing the existing practical lecture models. The data obtained from these observations are used to consider the learning media development process, (2) closed questions, to collect qualitative data about student characteristics that will be used as the subject of product implementation, and (3) questionnaires, to obtain data related to the feasibility of learning devices. Questionnaires are given to media experts, material experts, and students.

Data analysis in this research is the descriptive analysis where the results of the analysis are used as materials for developing learning media. In Arikunto’s explanation (2010: 286), quantitative data in the form of figures from the results of an assessment or measurement can be processed by adding up, then compared to the expected amount so that the average value is obtained. All data collected was then analyzed to find out how respondents rated the program that had just been tested. Each aspect must have a score of 3 (feasible). If it is less than feasible, it means that these aspects must be corrected later if the method is described in the formula:

$$\text{Average Value} = \frac{\text{The total score of the assessment results}}{\text{Number of assessments}}$$

From the results of the average calculation are then converted into a qualitative value with a scale of 5 with a Likert scale reference in the value conversion table, according to Eko Putro Widoyoko (2016: 238) as follows in Table 1.

| Average Value   | Category              |
|-----------------|-----------------------|
| $X > 4.2$       | Very feasible         |
| $3.4 < X \leq 4.2$ | Feasible             |
| $2.6 < X \leq 3.4$ | Decent, OK          |
| $1.8 < X \leq 2.6$ | Fair enough, good enough |
| $X \leq 1.8$    | Not Feasible, Not Good |

### 3. Results

The object of the research is a video tutorial media and a job sheet. (1) Video Tutorial Feasibility Assessment result. The assessment carried out by material experts for the ignition system practice learning media in the form of a video tutorial includes 2 aspects, they are aspects of the quality of the material content and the usefulness of the material in developing the abilities of students. The results of the material expert's assessment for the ignition system practice learning media in the form of a video tutorial are presented in Figure 1. below.

![Material Expert Assessment graph Video Tutorial](image)

**Figure 1.** Material Expert assessment graph Video Tutorial.

The assessment carried out by media experts for the ignition system practice learning media in the form of a video tutorial includes 3 aspects, namely the ability to time and place manipulation, visual communication skills, and video tutorial presentation format. The results of the media expert's
assessment for the ignition system practice learning media in the form of a video tutorial are presented in Figure 2. below.

**Figure 2. Media Expert’s grading graph for the Video Tutorial**

Small-scale experiments were carried out with 12 students of the Department of Automotive Engineering Education batch 2016 at this stage respondents were asked to provide responses to the ignition system practice learning media in the form of video tutorials and job sheets by filling out a questionnaire that had been prepared. The results of small-scale trials for the ignition system practice learning device in the form of a video tutorial showed in Figure 3. in below.

**Figure 3. Small Scale Experiment Graph for Video Tutorial.**

Large-scale experiments were carried out on students of the Automotive Engineering Education Department batch 2017 and batch 2016, totaling 38 students. This stage is intended to determine student responses to learning media for ignition system practices in the form of video tutorials and job sheets. The results of large-scale experiments for the ignition system practice learning media in the form of a video tutorial showed in Figure 4.

**Figure 4. Large Scale Experiment Graph for Video Tutorials.**
(2) Job Sheet Feasibility Assessment. The assessment for the ignition system practice learning media in the form of a job sheet from material experts includes 3 aspects, namely clarity and suitability of the content, language aspects, and delivery organization. The results of the material expert's assessment for the ignition system practice learning device in the form of a job sheet are as follows in Figure 5.

![Material Expert Assessment Graph for Job Sheet](image)

**Figure 5.** Material Expert Assessment Graph for Job Sheet.

The assessment for the ignition system practice learning media in the form of a job sheet from a media expert includes 3 aspects, namely consistency in writing, writing format, and attractiveness. The results of the media expert's assessment for the ignition system practice learning device in the form of a job sheet shown in Figure 6.

![Graphic Assessment of Media Experts for Job Sheets](image)

**Figure 6.** Graphic Assessment of Media Experts for Job Sheets.

The results of small-scale experiments for the ignition system practice learning media in the form of a job sheet shown in figure 7.

![Small Scale Experiment Graph for Job sheet](image)

**Figure 7.** Small Scale Experiment Graph for Job sheet.
Meanwhile, the results of large-scale experiments for the ignition system practice learning media in the form of a job sheet shown in Figure 8.

4. Discussion
Based on video tutorial assessment results, it is generally known that the video tutorials developed are suitable for use in learning activities. With the video tutorial, it is hoped that all types and topics of learning in the affective, cognitive, motoric, and interpersonal domains are almost all available in video form (Smaldio, Lowther, and Russel, 2011: 404-406). In addition, text, images, music, sound, moving images (animation and video) that are combined into one complete unit are the advantages of video tutorials that can support learning activities (Wasis Dwiyogo, 2013: 215-216). However, the development of video tutorials still has limitations related to video recording for some difficult components due to their difficult to reach location. In addition, the resulting file size is large enough to be stored on the device used for recording.

Based on the jobsheet assessment results, the job sheet that has been developed are in the proper category for use in learning practice. The job sheet that has been developed includes the title, MP (subject material), SK (competency standard), indicators, places, learning instructions (student/teacher instructions), and objectives to be achieved. The job sheet also contains supporting information, exercises, work instructions, and assessments (M. Bruri, 2009: 14). However, the job sheet that has been developed still has limitations related to not being able to combine with the video tutorial, because if it is combined into 1 unit file it has too long a duration.

With the ignition system practice learning media in the form of video tutorials and job sheets, students are expected to be able to learn about ignition system practice material anywhere and anytime. The practical learning media in the form of video tutorials and job sheets is very easy to use, which can be played or opened via a computer or smartphone, which in today's era almost all students have them, thus with this media students are expected to more easily to study about that material (the ignition system), so that during the practical exam they will be better prepared and can get good results (pass the exam).

By comparing with the previous results and based on the data that obtained from the research, the ignition system practice learning device in the form of video tutorials and job sheets is suitable to be used as a learning tool for students of the Automotive Engineering Education Department, FT UNY, on the ignition system material contained in the course Automotive Electrical System. This is in accordance with several studies that have previously been described. Because of that, with the ignition system practice learning media in the form of video tutorials and job sheets, this should be reproduced to help students to better understand the material and help students to achieve the learning objectives that have been set.

5. Conclusions
Based on the results of the analysis and previous discussion, it can be concluded as follows, (1) the results of the product development of the ignition system practice learning media in the course of Automotive Electrical System in the Department of Automotive Engineering Education, Faculty of Engineering, Yogyakarta State University are a job sheet with a file size of 277 MB with a format file as pdf and word. The video tutorial has the "MP4" format with a storage capacity of 1.18 GB which can
be played on a computer or smartphone with a total of 5 videos. (2) the results of the eligibility of the material expert for the ignition system practice learning media in the form of job sheets and video tutorials get a cumulative score of 4.74 and 4.95 from a scale of 5 which are in the very feasible category. The results of the feasibility of the media expert for the ignition system practice learning media in the form of job sheets and video tutorials get a cumulative score of 4.78 and 5.00 from a scale of 5 which are in the very feasible category. The 2016 student response in the small-scale field experiment for the ignition system practice learning media in the form of job sheets and video tutorials got a score of 4.14 which was in the good category for the job sheet and got a score of 4.25 which was in the very good category for video tutorials. Furthermore, for large-scale field experiments for the ignition system practice learning media in the form of job sheets and video tutorials, the scores were 4.04 and 4.13 which were in the good category. Based on this data, the ignition system practice learning media in the form of video tutorials and job sheets is feasible to use.

References

[1] Aria P 2013 Pengembangan Media Pembelajaran Video Tutorial Pada Mata Pelajaran Kompetensi Kejuruan Standart Kompetensi Melakukan Pekerjaan Dengan Mesin Bubut di SMK Muhammadiyah I Playen Student Thesis Universitas Negeri Yogyakarta
[2] Azhar A 2014 Media Pembelajaran (Jakarta: PT Raja Grafindo Persada)
[3] Daryanto 2010 Belajar Dan Mengajar (Bandung: CV Yrama Widya)
[4] Eko P W 2017 Teknik Penyusunan Instrumen Penelitian (Yogyakarta: Pustaka Pelajar)
[5] Endang M 2012 Metode Penelitian Terapan Bidang Pendidikan (Bandung: Alfabeta)
[6] Bruri T, Siswanto B T, Hariyanto, and Wagiran 2009 Materi Diktat Training of Trainer Calon Tenaga Pengajar/Dosen Lingkungan Badiklat Perhubungan Tahun 2009 (Magelang: Badan Diklat Departemen Perhubungan)
[7] Majid A 2009 Perencanaan Pembelajaran (Bandung : Remaja Rosdakarya)
[8] Noktaviyanda M F and Widya A 2011 Peningkatan Hasil Belajar Melalui Penerapan Media Pembelajaran Job sheet Pada Panel Peraga Sistem Kelistrikan Otomotif J. Pendidik. Teknik Mesin, 7 p 23-25
[9] Riyana C 2011 Pedoman Pengembangan Media Video (Jakarta:P3AI UPI)
[10] Sadiman A et al 2014 Media Pendidikan (Jakarta: PT Raja Grafindo Persada)
[11] Smaldino, Sharon E, Lowther, Deborah L, Russel, James D 2011 Teknologi Pembelajaran dan Media untuk Belajar. (Alih Bahasa: Arif Rahman) (Jakarta: Kencana)
[12] Solikin M 2008 Silabus Listrik dan Elektronika Otomotif (Yogyakarta: UNY)
[13] Poppy K D et al 2009 Pengembangan Perangkat Pembelajaran (Bandung: P4TK IPA)
[14] Thiagarajan S, Semmel D S and Semmel M I 1974 Instructional Development for Training Teacher of Exceptional Children (Bloomington Indiana: Indiana University)
[15] Trianto 2012 Mendesain Model Pembelajaran Inovatif Progresif (Jakarta: Kencana Prenada Media Group)
[16] Wasis D D 2013 Media Pembelajaran (Malang: Wineka Media)