Development of Tutorial Video Learning Media on Engine Management System Diagnosis

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Abstract. Students readiness before participate in the practice activity need to be well prepared through a tutorial video for practicing. Therefore, this study aimed to (1) develop the Learning Media Video Tutorials for Engine Management System (EMS) practices in the Automotive engineering class, and (2) Identify the feasibility of the learning media developed. A research and development approach was implemented. There were two experts analized the product. The results showed that (1) the product is a tutorial video on a vehicle’s EMS diagnosis using a scanner, (2) the tutorial video is an .MP4 form with a file size of 2552 MB, which can be played through smartphones or computers, (3) the contents of the tutorial video is consisting introduction, DTC Function, Current Data Function, and Oscilloscope Function, (4) experts validity revealed that the tutorial video for diagnosing EMS on a vehicle is good and feasible to be implemented in the classroom activities. A further study to identify the effect of the tutorial video on the student’s achievement is suggested.

1. Introduction

The need for reliable mechanics in the industrial world today requires SMK graduates to be able to master vehicle engine maintenance with EMS technology. So like it or not, the prospective vocational school students must be able to master the material, in order to provide a good learning experience for their students. The results of the research from Hadromi et al. showed that to improve the quality of prospective teachers, they must have at least three skills, namely (1) basic skills: communication skills, information management skills, and problem solving skills; (2) self-management skills: skills to exemplify good attitudes and habits, responsive skills, adaptation skills, skills for continuous learning, work skills; (3) teamwork skills: collaboration skills, skills to actively participate in projects or tasks. One of the skills that is the concentration in this research is the skill to work. This skill must be possessed by every student who is a prospective teacher as a provision for later giving instructions and modeling the work that will be done by students during practicum.

Yogyakarta State University (UNY) has an Automotive Engineering Education study program, where one of the job prospects of the graduate is to become an instructor or teacher in the field of vehicle maintenance. In order to provide the best lesson to students, prospective teacher students must master the current trend of technology. Vehicles using the EMS system are no longer surprising, according to Sutiman (2011: 40-41), EMS technology itself is an integrated control. Referring to the opinion of Hans-Herman & Ulrich (2005: 139), this machine management system was developed, because of the need to reduce air pollution, besides that, sensor and actuator technology is already
capable and is increasingly developing which will provide precise measurements of the system. Since 2012, vehicles with a carburetor fuel system have stopped production and are replaced by motorbikes with injection technology (Hidayat, 2019). The euro 3 emission standard set by the government makes the fuel injection system a solution for motor vehicle manufacturers to reduce vehicle exhaust emission figures.

So that students who are prepared to become teachers have skills in diagnosing vehicles using EMS technology, a curriculum is compiled that presents this lesson, namely the Engine Management System (EMS) course. These course are divided into two, namely practice and practice which have a proportion of 2 theoretical credits and 1 practical credit. Experience from following practice EMS course, students prepareless to do practice. Students do not read jobsheets before the practice takes place, nor do students learn about what they learn during practicum. So the practice time becomes long, even students add hours outside of learning time. This is not good because it interferes with other learning hours and working hours of lecturers and workshop technicians or disturb other activity.

Therefore, a Video Tutorial Learning Media was created so that students were more interested in preparing for practice. This is in accordance with the research conducted by López et al (2016) in their journal which developed a teaching material and a video that displays detailed instructions. The result is by using interactive, effective learning to improve learning outcomes. Those research was an adoption researcher by utilizing an existing jobsheet, then making a video tutorial that gave clear instructions as preparation material for students to do practicum. The hope is that students can understand the practical steps more quickly, so that they can understand more quickly. In other words, they also save EMS practice time, eliminating the need to spend hours outside of practice.

This media development is carried out because it is to motivate students to be willing to prepare themselves to find out the object at hand, before carrying out the practice. In addition, students are getting used to learning videos, so that when they come, they can apply their experiences when needed for distance learning in school according to the students’ abilities, when they become teachers. Limits taken, only focus on making instructional media video tutorials for the diagnosis of EMS disorders, specifically for the K3-VE engine on the Toyota Avanza. Job video tutorials are not all jobs in one semester, only three jobs are taken using one object training tool and the Carman VG-64 scanner. The hope is that researchers will focus more on this development. Learning media are made of 4 video parts with one video as an introduction before entering competencies and three videos containing competencies.

2. Methodology
This study uses a development procedure from Thiagarajan, namely the ADDIE model because according to Mulyatiningsih (2011: 184) ADDIE is more about designing a learning system product which is in accordance with the topic of this research.

The data collection technique in this study was a questionnaire involving subjects, namely lecturers of material experts, lecturers of media experts, and students who had taken the Engineering Management System Practices (EMS Practice) course. The research instrument used, namely by using a questionnaire with a Likert scale, which has a score range of 1-4 where 1 is the lowest value and 4 is the highest value. The questionnaire assesses video tutorial properness level Angket tersebut menilai tingkat kelayakan video tutorial ini, as the purpose this research. The range of feasibility in this study can be seen in the table below:

| Interval Score | Category          |
|----------------|-------------------|
| X > Xi + 1.80 Sbi | X ≥ 3.4 | Very Proper |
| Xi + 1.80 Sbi < X ≤ Xi + 1.80 Sbi | 2.8 < X ≤ 3.4 | Proper |
| Xi - 0.60 Sbi < X ≤ Xi + 0.60 Sbi | 2.2 < X ≤ 2.8 | Enough Proper |
| Xi - 1.80 Sbi < X ≤ Xi - 0.60 Sbi | 1.6 < X ≤ 2.2 | Properless |
| X ≤ Xi - 1.80 Sbi | 1.6 ≥ X | Very Properless |
3. Result
The video development process was carried out in three stages, namely media development, material expert validation, and media expert validation. The development of video greatly affects the results of the media in terms of image and sound quality, therefore, researchers ask for help from videographers so that the resulting video has good results. The results of the development of media have the format .MP4, video resolution 1080x720 and 29 fps, file size 2552 MB. After the media development is complete, it is followed by validation of the material experts and media experts. Validation is done for each video tutorial, then averaged, and the results of the validation can be seen in the following table.

| Table 2. Score of Properness from Material Expert. |
| --- | --- | --- |
| No. | Aspect | Average Skor | Category |
| 1. | Kesesuaian Materi | 3.68 | Very Proper |
| 2. | Kejelasan Materi | 3.29 | Proper |
| 3. | Kebermanfaatan Materi | 3.37 | Proper |
| Cumulative Average | 3.47 | Very Proper |

| Table 3. Score of Properness from Media Expert. |
| --- | --- | --- |
| No. | Aspect | Average Skor | Category |
| 1. | Visual | 4.00 | Very Proper |
| 2. | Audio | 4.00 | Very Proper |
| 3. | Tata Laksana | 4.00 | Very Proper |
| Cumulative Average | 4.00 | Very Proper |

This research is a research that produces a learning media product, so that the product must be suitable for use. Then a feasibility test is carried out which results can be seen in the results above. After being tested for feasibility by material experts and media experts, the next step is the product testing. Product testing, carried out twice, namely large-scale trials, then small-scale trials. Small-scale testing, using 14 students as respondents and large-scale testing using 40 students as respondents. Both testing are loaded in the same graph so that trends can be seen. The result is a unique trend chart, this trend can be seen in the chart below.

![The Testing Video Tutorial Cummulative Trend Chart](image)

**Figure 1.** Testing Video Tutorial Cummulative Trend Chart.
4. Discussion
Cumulatively, this video tutorial learning media has an upward trend from part 1 to part 4 from all aspects, but in terms of material quality, there has been a decline in trend from 3.5 to 3.49 due to improvements in media quality, but this is comparable, because in other aspects the value gained increases. These results indicate that the results of suggestions given by users are very useful from the quality of the media, the increase is very much, although it has an effect on decreasing the quality of the material. However, the decline is not very significant if seen, and is still in a very feasible category.

The possibility that happens, from the rising trend, is that the music at the intro is less attractive. Even though the beginning is a very crucial moment for the viewer to get interest in the video tutorial. If the students are already interested and enthusiastic about listening at the beginning, the content of the video will be easier to distribute. If the information is easier to distribute, then the media is considered to be effectively used as a medium that can increase academic achievement. However, this is only a temporary hypothesis, in the future it is necessary to test its effectiveness in order to know whether it is true, this hypothesis is proven.

Other research on the effect of the effectiveness of using video tutorials in the implementation of skills training also strengthens this research. Research conducted by Muhariati et al (2017), regarding the impact that occurs in the use of video tutorials for bread production skills training explains that the use of video tutorials is effective with the effectiveness value being 76 out of a total value of 100. So the research from Muhariati et al strengthens the research. This means that this media can be continued to test its effectiveness on learning EMS practices.

This video tutorial encourages students to better understand the practicum material to be studied. As we know that the learning method is divided into three, namely visual, auditory, and kinesthetic. The three learning methods, this video has stimulated both visual and auditory aspects, so that the next step only needs direct practice to stimulate the kinesthetic part. If the three learning methods are used, the chances of all students succeeding in understanding the material presented will be higher. This is because each student has different learning methods for each dominant individual. So if everything is well accommodated, the more students will understand the material to be conveyed. In addition, the level of understanding that each individual has will also be better, because all aspects of learning stimuli are used from these three aspects. So it can be said from the help of this video tutorial, it can be predicted that student learning outcomes will be higher than before who did not use video tutorials as an aid in practical learning.

5. Conclusion
After doing research and development, it can be concluded that the results of this research and development are that this development produces a product in the form of a video tutorial for diagnosing EMS disorders on the Toyota Avanza using a scanner. Development using the ADDIE method. After production, the format of this video tutorial is .MP4 with a file size of 2552 MB. The material content in this video tutorial is an introduction, DTC Function, Current Data Function, and Oscilloscope Function.

The results of the feasibility of developing instructional media video tutorials for the Toyota Avanza EMS disorder diagnosis using a scanner based on validation by material experts get a cumulative score of 3.47 from a scale of 4 with a very feasible category, then the feasibility results based on validation by media experts get a cumulative score of 4.00 on a scale of 4 with a very decent category, then the response of students who have taken EMS courses in small-scale trials gets a cumulative score of 3.38 out of a scale of 4 with a good category, and in a large-scale test gets a cumulative score of 3.45 from a scale of 4 with a very good category.

Based on the development research carried out by the researcher, the researcher offers several suggestions for the continuity of further research, namely further development to examine the effectiveness of the use of this learning media on student academic achievement in the EMS course. In the future, if there is video-based research, researchers must practice using the camera first so that they are skilled at using the camera, so that the resulting video quality can be better than what is now. Video
tutorial media can be developed further for other materials, so that students can make practicum preparations for other practical courses. This media can also be developed with the same material, but using other brands of scanners, so that students have the skills to use tools from other brands.

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7. Ethical Statement
This research was carried out in accordance with the IOP’s ethical policy and was approved by the ethics committee of the Behavioural, Management and Social Sciences Graduate Program of Yogyakarta State University.

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