The Development of Engine Management System’s Learning Media Video in Lightweight Vehicle Engineering Expertise
Nasional Berbah Vocational High School

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Abstract. This research aimed at (1) developing the engine management system’s learning media video, (2) knowing the feasibility of developing the engine management system’s learning media video with assessment from media and material, also (3) knowing the responses of the lightweight vehicle engineering students of National Berbah Vocational High School toward the engine management system’s learning media video. The research of the engine management system’s learning media video is a research and development (R&D) study that employed 4D development model (Define, Design, Develop and Disseminate). Data collection technique carried out front analysis and questionnaires then analysis of feasibility is carried out by describing it into five categories such as the Likert scale. The results of this development study are the engine management system’s learning media video contained the three materials which were characteristics, functions, and the working of sensors, actuators, and electronic control unit, the media feasibility of this learning media is determined by assessment of material expert (4.3), media feasibility based on media expert (4.1), then student responses as the user get a grade (3.5), so the engine management system’s learning media video was feasible to be used in the learning process.

1. Introduction
Vocational high school is a secondary level education which is expected to be able to prepare graduates who have certain competencies. One of expertise in vocational high school is technology and engineering which includes automotive engineering expertise. In automotive engineering expertise, there are several competency expertise, one of them is lightweight vehicle engineering expertise.

Nasional Berbah Vocational High School is one of the vocational high schools in Sleman who has lightweight vehicle engineering expertise. By using ISO 9001:2008 management quality standards, it shows that the Nasional Berbah Vocational High School has implemented quality management.

Learning can be interpreted as a process or method for someone to carry out learning activities [1]. The teachers as an educator have a role as a facilitator who provides facilities for students in the learning process. One convenience that can be used is learning media. The learning media play an important role in the learning process [2]. All forms and means of delivering information that is made and used according to learning theory are called learning media [3].
Lightweight vehicle engineering expertise has several productive subjects such as lightweight vehicle engine maintenance subjects. There are some basic competencies that students must achieve, such as applying the engine management system maintenance method. Mastery of competencies in vocational learning requires the right strategy [4].

Each formal and non-formal education unit provides facilities and infrastructure that meet educational needs in accordance with the growth and development of the physical, intellectual, social emotional, and mental potential of the students [5]. The learning process in Nasional Berbah Vocational High School has been equipped with supporting facilities such as laptops, LCD projectors, and whiteboards. However, these facilities are not used optimally because of the lack of supporting learning media.

Most students do not participate actively in the learning process because the media used is monotonous. Meanwhile, teachers have difficulty developing learning media that are more supportive and attractive to students. Students will be interested in the material presented when it is balanced with the use of media in the form of cutting, video, animation, or power point. The material in the lightweight vehicle engine maintenance subjects is abstract so learning media are needed to help students understand the competencies.

Based on this description above, the development of learning media is very necessary. This is intended so that students are more interested and actively participate in the learning process so that they can understand the material optimally. Therefore, it is necessary to develop a learning media video with a material engine management system. Learning media video are all electronic media formats that use moving images to deliver messages [6].

This research aimed at (1) developing the engine management system’s learning media video, (2) knowing the feasibility of developing the engine management system’s learning media video based on the assessment of the material and media experts, and (3) knowing the responses of the lightweight vehicle engineering students of National Berbah Vocational High School toward the engine management system’s learning media video.

2. Methods

2.1. Research Methods

The aim of this research is to develop the engine management system’s learning media video for supporting students learning activities. Therefore, research and development study was conducted as the approaches to this research. This study used the 4D (Define, Design, Develop, and Disseminate) model to develop learning media. 4D model consists of the Define phase, the Design phase, the Develop phase, and the Disseminate phase [7].

2.2. Feasibility Test

This study uses a questionnaire instrument to determine the feasibility of the learning media. The assessment has been carried out by potential users, media experts, and material experts. The material experts received a questionnaire containing 15 questions with 2 aspects called material quality and language. The media expert questionnaire consisted of 26 questions with 3 aspects, namely visual communication, video presenting, and video management.

While the potential users received a questionnaire containing 20 questions with 3 aspects called quality of material content, quality of learning, communication, and media usage. Expert judgment examined the instrument validation using construct validity. These instruments can be used for data collection after validation.

Analysis of data obtained from the study using a descriptive analysis technique. It is used to test the feasibility of the learning media. The learning media feasibility criteria shown in Table 1.
3. Result and Discussion
The 4D stages for the development of engine management system learning media video are described below.

3.1. Define
Definition is the first step taken to initiate the development of the learning media. Observation and interviews with teachers, documenting learning tools and materials, and analysing students descriptively qualitatively are ways to get data at this stage [8]. The researcher conducted a problem and needs analysis through several observations. From the observations, the researcher knows that teachers of Nasional Berbah Vocational High School in the Lightweight Vehicle Engineering study program uses monotonous learning media and it’s not far from the image media. Nasional Berbah Vocational High School used the revised 2013 Curriculum which means that the teacher must play role as a facilitator including providing various activities and learning media.

Electronic devices such as laptop, computer, and smartphone are very close to the daily lives of students. Therefore, the development of learning media that is suitable for them is video-based learning media. The video-based learning media of the engine management system will be used in the subject of Lightweight Vehicle Engine Maintenance course.

3.2. Design
The material for the video was taken from the learning materials on Automotive Engineering Education Department, Faculty of Engineering, Universitas Negeri Yogyakarta (UNY). The material is adjusted to the competencies that students must achieve and then converted into a script. The start, apperception, materials, closing, developer profiles, and finish are the content of the video script.

The presenter delivers the start and the apperception. At the start, the presenter introduces herself and the purpose of the video. Then in the apperception section, there is a basic explanation of the engine management system. Turn to the material, the engine management system-components explanation is divided into 3 sections, namely sensors, actuators, and electronic control unit.

The image displayed on the material section is component video clips with voice-over material for each component. Then, the closing section presents the conclusion from the previous material. The developer-profiles section, there are profiles of the developers along with their photos. Last in the finish section, the developers say thank you to viewers.

3.3. Develop
This development phase is to produce learning media video that is appropriate with the analysis of problems and needs at the beginning, and in accordance with the feasibility standards. There are 3 activities carried out at the development phase, namely video shooting, video editing, and media feasibility assessment. The video recording process uses a Fujifilm XA5 camera and a Rode Videomic microphone at locations around the UNY campus. The video was edited using Adobe Premiere Pro CC 2017 software.

The video was created in .mp4 format with a duration of 17 minutes 33 seconds. The sample images from the video is shown in Figure 1 to Figure 6. Figure 1 shows the cover of the video. Then figure 2 shows the appearance of the presenter when opening the video.

### Table 1. Product feasibility criteria.

| No | Score (5 scales) | Feasibility grades |
|----|------------------|--------------------|
| 1  | >4.2 – 5         | Very feasible, very good |
| 2  | >3.4 – 4.2       | feasible, good |
| 3  | >2.6 – 3.4       | Enough             |
| 4  | >1.8 – 2.6       | infeasible, bad    |
| 5  | >1 – 1.8         | Very infeasible, very bad |
The material section (Figure 3) showed the clip of the components and the explanation. The explanation of the material dubbed by the presenter with the material that has been prepared. This causes the duration of the video clip must match the duration of the voice over. To simplify understanding, subtitles are also added to the video.

After the material section, there are closing section, developer profiles section, and finish. All three sections are shown in figure 4 to 6.

Before large-scale trials and dissemination to users, the product needs to be tested by a material expert, a media expert, small-scale trials, and product revisions. The product’s material tested by Drs. Moch. Solikin, M.Kes from Department of Automotive Engineering Education Universitas Negeri Yogyakarta, by assessing two aspects, namely material quality and language that shown in table 2.

| No. | Aspect        | Score | Grade     |
|-----|---------------|-------|-----------|
| 1.  | Material quality | 4,4   | Very worthy |
| 2.  | Language      | 4,3   | Very worthy |
|     | Average       | 4,3   | Very worthy |

Besides that, the product also tested by media experts, Dr. Drs. Agus Budiman, M.Pd from the Department of Automotive Engineering Education Universitas Negeri Yogyakarta, by assessing three aspects, namely visual communication, video presenting, and video management that can be seen in table 3.
Table 3. The result of media expert judgment.

| No. | Aspect                | Score | Grade    |
|-----|-----------------------|-------|----------|
| 1.  | Visual communication  | 4.3   | Very worthy |
| 2.  | Video presenting      | 3.9   | Worthy   |
| 3.  | Video management      | 4.0   | Worthy   |
|     | **Average**           | **4.1** | **Worthy** |

According to the validation results that have been shown in the tables above, we can conclude that the developed learning media is worthy. Although almost all aspects of the assessment get a good score, there are some suggestions from the material and media experts so that this learning media video can be even better. The suggestions shown in table 4 below have been used to improve the learning media video.

Table 4. Expert suggestions and follows up.

| No. | Suggestions from The Experts                                                                 | Revision                        |
|-----|-----------------------------------------------------------------------------------------------|---------------------------------|
| 1.  | The explanation of the component locations coupled with the component-locations video.        | Add the component-locations video. |
| 2.  | Time lag in explanation of competencies.                                                       | Add more time to competency explanation. |
| 3.  | The substitution of explanation for each component is given component diagram with a longer time. | Add component diagrams every change of component explanations. |
| 4.  | Improvements to the volume on the video.                                                      | Fix the volume on the video.     |

After that, small-scale trials were carried out on 8 students with the results that is shown table 5.

Table 5. The result of small-scale trials.

| No. | Aspect                | Score | Grade |
|-----|-----------------------|-------|--------|
| 1.  | The quality of material content               | 3.9   | Good   |
| 2.  | The quality of learning                          | 3.6   | Good   |
| 2.  | Communication                                      | 3.5   | Good   |
| 3.  | Media usage                                       | 3.7   | Good   |
|     | **Average**                                       | **3.7** | **Good** |

3.4. Disseminate phase

At this phase, the dissemination of learning media was carried out with large-scale trials on 21 students. The result obtained shown in the table below.

Table 6. The result of large-scale trials.

| No. | Aspect                | Score | Grade |
|-----|-----------------------|-------|--------|
| 1.  | The quality of material content               | 3.5   | Good   |
| 2.  | The quality of learning                          | 3.5   | Good   |
| 2.  | Communication                                      | 3.4   | Good   |
| 3.  | Media usage                                       | 3.5   | Good   |
|     | **Average**                                       | **3.5** | **Good** |

From the judgment result of the material expert, the media expert, and the potential users, we know that the learning media video of the engine management system can be categorized as feasible learning media to be used in classical or individual learning process in the Lightweight Vehicle Engine Maintenance course for VHS in the Lightweight Vehicle Engineering program. This learning video was uploaded on YouTube with the URL https://youtu.be/ucVLP9WUb4k so it can be accessed anytime and anywhere.

This learning media is made to overcome some of the problems that exist during the learning process in engine management system maintenance competencies. Digital technology is familiar to vocational high school students nowadays. The students expect to have access to information and learning materials
quickly. When that is not fulfilled then it can cause the following problem, such as the low active participation of students during the learning process.

The production process with a long time, the ability to record and edit video, the availability to appear in front of camera, and a lot of money are things that prevent teachers to develop a learning media video. Recently some researchers have made learning media videos because the Z generation likes them. Videos related to the engine management system and lightweight vehicle engine maintenance have been developed for college students in the DLI system tutorial [9] and college students in the ESA system tutorial [10].

The good learning process must be accompanied by a proper learning media that can attract the student’s attention. Therefore, learning media like this should be reproduced, especially for some complex subjects in order to help students understand the material and can achieve the competencies goals. This leaning media video is very practical to use anytime and anywhere. The development of this learning media allows students to be able to learn independently, so that the value of independence in character education can be applied in everyday life [11].

4. Conclusion

The results of the development research were: (1) the engine management system’s learning media video contained the three materials which were characteristics, functions, and the working of sensors, actuators, and electronic control unit in the mp4 format, with 17 minutes 33 seconds duration and had a measurement of 1.24 GB; (2) the feasibility scores of this learning media which determined by the material expert judgment was 4.3 categorizes as very feasible and the media expert was 4.1 which is feasible; and (3) the result of the student responses as users was 3.5 categorized as good. The learning video was uploaded on YouTube with the URL https://youtu.be/ucVLP9WUb4k. So that the engine management system’s learning media video was feasible to be used in the learning process.

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