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Research Article

Development of Audio Video Media Based on Discovery Learning for Automotive Vocational School Students

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Abstract: This study aims to develop Audio video media based on the discovery learning model. The method used in this study is Research and Development (R&D) with the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The subjects of this study consisted of 3 media experts, 3 material experts, teachers and 24 students of SMK Otomtif. The data collection methods used consisted of observation, interviews, documentation, questionnaires, posttests, and performance with qualitative and quantitative data analysis techniques. Based on the results of the study, a review from media experts showed a percentage of 92% (very good), material experts 95% (very good), teacher questionnaires 97% (very good), student questionnaires 99% (very good), posttests using multiple choice questions. Based on the results of the analysis, video media based on the discovery model is effective for learning the theory of SMK Otomtif students.

Keywords: Audio Video, Automotive**,** Discovery learning, Media.

1. Introduction

The development of science and technology has had both positive and negative impacts on aspects of human life, the problems that arise can be solved by efforts to improve and master science and technology. The development of science and technology also makes there are no boundaries between humans to communicate. Therefore, the development of science and technology brings humans into global competition. One way that can be taken by a country to survive in global competition is by improving human resources.

The quality of education, which includes the use of supporting components in achieving learning objectives, is a problem that must be resolved immediately in the world of education. According to Rusman (Radyuli, Wijaya, & Sanita, 2020), one way to improve the quality of learning is to create a learning system that focuses on students (student center) and provides challenging and challenging facilities and infrastructure to meet the needs of students. In addition, IT-based learning systems and collaboration can help improve student creativity and innovation.

Learning media is an important part of the learning process. Learning media has evolved over the years, from conventional learning media gradually becoming more technology-based. The use of information and communication technology in learning media today makes the tasks of teachers and students easier. According to Nana (Azhar & Adri, 2008), learning media is the most important component in learning that has the ability to improve the learning process. Ultimately, learning activities are expected to improve student learning outcomes.

Understanding concepts, meanings, and relationships through intuitive processes is a discovery learning model (Budiningsih, 2012, p.43).

By using the discovery learning model, students are motivated to actively learn ideas and principles. Teachers encourage students to conduct experiments that allow them to discover new ideas. Discovery learning is a learning model that allows students to acquire new knowledge independently. Three categories of discovery methods are different: free discovery, guided discovery, and laboratory discovery (Priansa, 2017). Discovery occurs when

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someone is involved, especially when they use their mental processes to discover a number of concepts and principles.

One of the benefits of the discovery learning model is as follows: (1) knowledge is not lost and is easy to remember; (2) the results of discovery learning have a greater transfer impact than other results; and (3) overall, learning discovery learning can improve students' reasoning and free thinking skills. In particular, discovery learning can help students acquire the cognitive skills needed to solve problems and find their own solutions (Hamiyah, 2014).

In learning Basic Knowledge of Automotive Engineering (PDTO) is a basic material that presents knowledge about automotive. In this case, many students do not understand the material presented and find it difficult to imagine components or objects that they have not encountered so that it is still abstract. Therefore, in its delivery, visualization needs to be done to make it look more concrete by displaying related information on the Basic Knowledge of Automotive Engineering lesson material.

Based on the results of observations, interviews, and school needs analysis that have been conducted by researchers, learning materials have not been delivered effectively, so that students do not understand the material well. In addition, media is not often used as a learning support. The results of the analysis carried out on a number of videos that have been used, both those made by the teachers themselves and those shared with students through other YouTube channels. These videos contain explanations of the material given by the teacher consisting of only a few parts of the discovery learning model syntax. The results of this analysis are then used as a basis for developing video media that use the discovery learning model, including newly created media.

The researcher tries to provide a solution to solve this problem by developing video media based on discovery learning. The video is in the form of knowledge that will be given by the teacher to students. The researcher limits the development of video media products to only the subject of Basic Knowledge of Automotive Engineering PDTO. The products produced in this study are video media based on discovery learning. The learning videos developed are based on PDTO learning materials. The learning activities carried out are reading discourses related to the basics of automotive engineering and exploring information related to the material presented. The purpose of this study is to develop Audio video media based on the discovery learning model for Automotive Vocational School students.

2. Literature Review

According to Nana in (Azhar, & Adri, 2008), learning media is one of the most important elements in learning that can enhance the learning process, so that in the end the learning process is expected to improve student learning outcomes. According to Marfuah, Irsadi, and Pamelasari (2014) learning media is anything that can function as a learning aid for students, so that students can more easily learn the subject matter.

According to Fransisca, Yunus, Sutiasih, and Saputri (2019) explain that to design good media, several important points must be considered that can make a media said to be good to be implemented in the world of education. The points are: 1.) Learning media is easy to access anywhere and anytime; 2.) Learning media can facilitate work in understanding and studying learning materials in a learning media; 3.) The material used must be in accordance with the curriculum used in the learning subject in the media; 4.) Learning media must be easy to use for lay users, do not use media that should be easy but instead make it more difficult for users in terms of appearance and other effectiveness of use; and 5.) The media that is created must prioritize simplicity and its use.

Video media can provide real images to students, help teachers in teaching and learning activities, so that teachers can explain learning materials easily, students will also find it easier to understand the material given by the teacher. With the presence of media, students have the opportunity to learn independently without the presence of a teacher. In addition to learning media, learning models are one of the success factors in achieving learning goals. The use of media that can be seen (visual) in educational activities for children will be more beneficial, while the educational process where most of the teaching materials are delivered verbally by relying on the sense of hearing does not benefit much in achieving educational goals.

Learning media, according to Tartiwi and Wijayanti (2018), is defined as media that contains information messages with instructional purposes that include teaching intentions.

A study conducted by Rahmayani et al. (2019) found that the use of video media in the discovery learning model has an impact on student learning outcomes. Therefore, teachers can use this model to encourage students to participate actively and creatively in observing, finding, and solving problems themselves. After that, student results are not easily forgotten.

According to Daryanto (2016, p.175), several factors must be considered when choosing media. These include the objectives to be achieved, the nature of students and their targets, the type of learning stimuli desired (audio, visual, or motion), local environmental conditions, and the desired reach.

To achieve learning objectives, the right model must be selected. Discovery learning, also known as the discovery learning model, emphasizes how students actively participate in the process of finding new ideas. Discovery Learning is a learning process in which students are not given information directly, but are asked to organize their own understanding. Students are educated to become accustomed to being scientists. It is hoped that they will not only function as consumers but also actively participate in the creation of knowledge.

The discovery learning model has the following advantages: (1) Knowledge lasts a long time and is easy to remember; (2) Discovery learning outcomes have a better transfer effect than other outcomes; (3) Overall, discovery learning can improve students' reasoning and ability to think freely. In particular, discovery learning can train students' cognitive skills to find and solve problems without the help of others (Hamiyah, 2014).

According to Bell (1981) in Priansa (2017) stated several objectives of discovery learning, namely: (1) Participation and activeness of students, discovery learning encourages students to participate and be actively involved in learning. The fact shows that the participation of many students in learning increases when discovery is used; (2) Discovery of situations and predicting, through discovery learning, students learn to find in concrete or abstract situations, also predict (extrapolate) additional information provided; (3) Formulating question and answer strategies, students will learn how to formulate question and answer strategies that are not ambiguous and use questions and answers to obtain useful information in finding; (4) Training cooperation, discovery learning helps students to form effective cooperation, share information with each other, and hear and use other people's ideas; (5) Discovery is more meaningful, several facts show that skills, concepts and principles learned through discovery learning become more meaningful, (6) Facilitating transfer, skills learned in discovery learning situations in some cases, are easier to transfer to new activities and apply in new learning situations.

3. Proposed Method

This study uses a quantitative and qualitative approach with the type of Research and Development (R&D) development research referring to the ADDIE model. The ADDIE model has components consisting of Analysis, design, development, implementation, evaluation. This research was conducted from September 2024 until completion. This research was conducted at SMK N 1 Purworejo. The subjects or respondents involved in this study were 24 class X students. In this study, respondents conducted pre-tests and post-tests to test the effectiveness of video media based on the discovery learning model. Before starting product development, an analysis was carried out to determine the materials needed. This analysis focuses on a basic understanding of automotive engineering. Analysis, design, development, implementation, and evaluation are the phases of developing video media based on discovery learning. Field and literature studies are involved in the analysis stage. Learning theory, discovery learning syntax, video stimuli, data exploration, and video scripts began to be developed at the design stage. The KineMaster Premium application, along with the supporting application for background eraser (Background Eraser), is used to create video media based on the discovery learning model. Video media based on discovery learning models are designed to be easy for users to use.

The development stage includes setting development objectives, determining basic competencies and indicators, creating a storyboard for discovery learning-based video media, and creating teaching modules. The implementation stage includes the application of discovery learning-based video media that has been previously validated by media experts and material experts to ensure a valid and quality product. The product is revised if it has not reached a valid level. The revised media is then applied in the trial class. The evaluation stage includes process evaluation, post-test, and performance. Evaluation includes product

improvements, suggestions given by media experts, and material experts, then researchers improve them. The practicality of discovery learning-based video media is seen based on teacher response questionnaires. The effectiveness of discovery learning-based video media is seen from student response questionnaires, post-tests, and performance. The post-test used is in the form of a written test. The post-test is given to students who focus on PDTO material after using discovery learning-based video media to find out student learning outcomes. The post-test is in the form of descriptive questions given to students. To find out performance and measure learning outcomes in the form of process skills or product results. Data collection techniques consist of observation, interviews, documentation, questionnaires, post-tests, and performance. While the instruments used are questionnaires and student learning outcomes in PDTO subjects. The questionnaire instrument consists of four types, namely needs questionnaires, media experts, material experts, and for users (users) which are used to assess products from certain aspects.

The questionnaire was designed using a Likert scale in five assessment scales from the range "Very Good" (5), "Good (4), "Enough" (3), "Less" (2), "Very Less" (1) and the Guttman scale two assessment scales from the range "Yes" (1), "No" (0). The percentage results of each item are said to be successful or valid if they are in the range of 61%-80% of the "Good" criteria or the range of 81%-100% of the "Very Good" criteria. The score analysis used to calculate the percentage of data from the questionnaire data analysis is as follows:

$$\textbf{Percentage}=(\textbf{Total Score} / \textbf{Ideal Score})\times 100\%$$

Percentage (%) : Percentage
Total score : sum of respondents' scores
Ideal score : sum of maximum scores
100% : constant

From the percentage obtained, it is then transformed into a qualitative sentence. The average score in quantitative form then becomes a qualitative value according to the ideal assessment category, percentage range and interval criteria (%), "Very Good" (81%-100%), "Good" (61%-80%), "Enough" (41%-60%), "Less" (21%-40%), "Very Less" (0%-20%). The questionnaire for media experts consists of aspects of language and images, graphics, product excellence, media presentation, discovery learning model syntax. The questionnaire for material experts consists of aspects of suitability, language, feasibility, presentation, and competence. The teacher response questionnaire consists of aspects of suitability with learning time, suitability with indicators or learning objectives, student interest, media ability, suitability with students, discovery learning model syntax. The student response questionnaire consists of aspects of ease of understanding, learning independence, learning activity, interest in media, video presentation, discovery learning model syntax. The post-test and performance instruments are used to assess student learning outcomes after using discovery learning-based video media. The post-test contains PDTO material. The data analysis technique used is qualitative data from validator criticism or suggestions and quantitative data obtained from questionnaires and student learning outcomes. Student learning outcomes with a percentage level of 100% of student scores above the KKM score (score 75), then the media can be said to be effective.

4. Results and Discussion

The ADDIE model is used to develop video media based on discovery learning. The validity of video media based on discovery learning is obtained from the validation calculation of learning media and learning material experts, namely 3 media experts and 3 material experts. The practicality of the media is carried out by calculating the teacher's response questionnaire to the media that has been. The effectiveness of video media based on discovery learning can be seen from the student response questionnaire and student learning outcomes through the post-test and performance on discovery learning media by class X students of SMK N 1 Purworejo.

Media Expert Validation Results. The media expert validation stage aims to determine the validity of video media based on discovery learning before the trial is carried out. The media expert validation stage aims to determine the validity of video media based on discovery learning before the trial. Analysis of media expert assessment media I found the first validation with a total score of 82% with very good criteria and is suitable for use with many revisions, and the second validation with a total score of 99% with very good criteria and is suitable for use without revision.

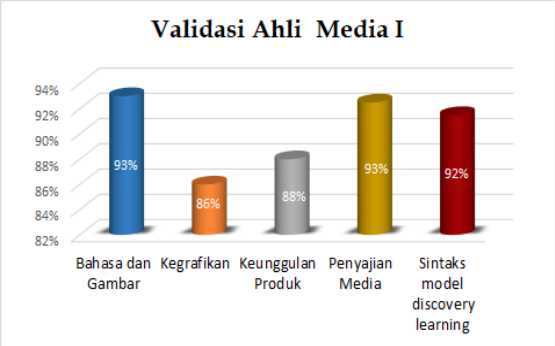

Figure 1. Media Expert Validation I

The results of the media expert II assessment are as follows: the first validation obtained a total score percentage of 86% with very good criteria and is suitable for use with minor revisions; the second validation obtained a total score percentage of 95% with very good criteria and is suitable for use with minor revisions. Both language and images are in the very good category. The graphics are very good. Product excellence is very good. The media is well distributed. The video has a very good discovery learning model syntax. The overall percentage of media expert II validation for stages 1 and 2 is shown in Figure 2.

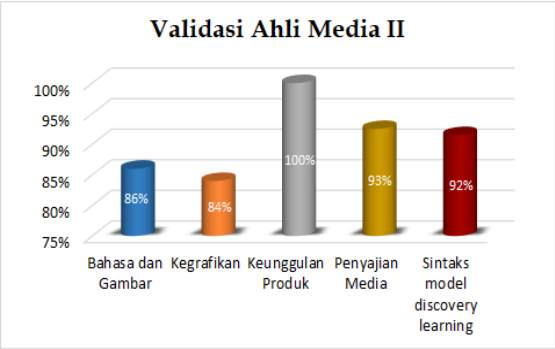

Figure 2. Media Expert Validation II

The results of the media analysis of the media expert assessment III, the first validation obtained a total score percentage of 92% with very good criteria and was suitable for use with minor revisions, and the second validation obtained a total score percentage of 99% with very good criteria and was suitable for use without revision. Language and images are categorized as very good. Graphics are very good. Product excellence is very good. Media presentation is very good. The syntax of the discovery learning model in the video is very good. Figure 3 shows the overall percentage of media expert validation III stages 1 and 2.

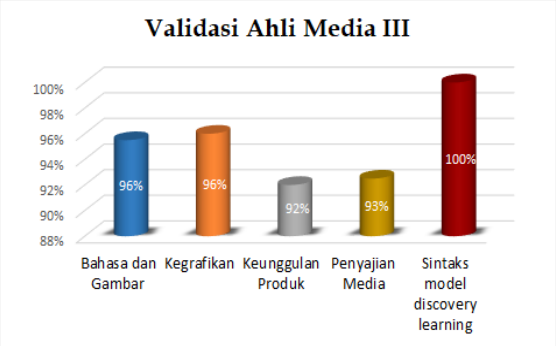

Figure 3. Media Expert Validation III

Based on the analysis of media validation I, II, and III, the average percentage of the total score was 92% with the criteria of very good and very suitable for use without revision so that it meets the valid criteria. Language and images are categorized as very good, graphics are very good, and product excellence is very good. This is in accordance with Riyana's opinion (2007, p.8) to produce learning videos that can increase user motivation, the development of learning videos must pay attention to their characteristics and criteria. The presentation of the media is very good which contains indicators of media presentation techniques, the attractiveness of the media to motivate students, the support of the media for learning, the suitability of the media applied to students according to the function of the video media. The syntax of the discovery learning model in the video is very good, the media is able to stimulate the material to be studied, the media is able to illustrate existing problems, the media facilitates students in exploring data, the media is able to process data by linking it to theory, the media is able to be used to validate conclusions, and the media concludes the results of the discussion. This is in accordance with the stages or procedures carried out in the discovery learning model according to Syah (2010) in Priansa (2017, pp. 261-262). Figure 4 shows the overall percentage of media expert validation.

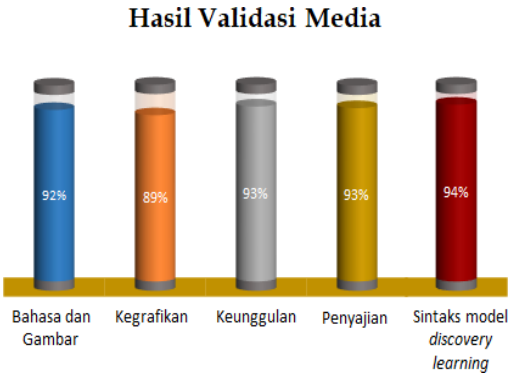

Figure 4. Media Expert Validation

Table 1. Media Validation Percentage Results

Validation	Level 1	Level 2
I	82%	99%
II	86%	95%
III	92%	99%

From the results of media expert validation I in stage I, the percentage was 82%, and stage 2 obtained a percentage of 99%; media expert validation II in stage I obtained a percentage of 86%, and stage 2 obtained a percentage of 95%; media expert validation III in stage I obtained a percentage of 92%, and stage 2 obtained a percentage of 99%.

Results of Material Expert Validation. The material expert validation stage aims to determine the validity of discovery learning-based video media before the trial is carried out.

The results of the material analysis of the material expert assessment I, the first validation obtained a total score percentage of 94% with very good criteria and was suitable for use with a few revisions, and the second validation obtained a total score percentage of 98% with very good criteria and was suitable for use without revision.

Suitability is categorized as very good. Language is very good. Feasibility is very good. Media presentation is very good. Competence is very good. Figure 5 shows the overall percentage of material expert validation I stages 1 and 2.

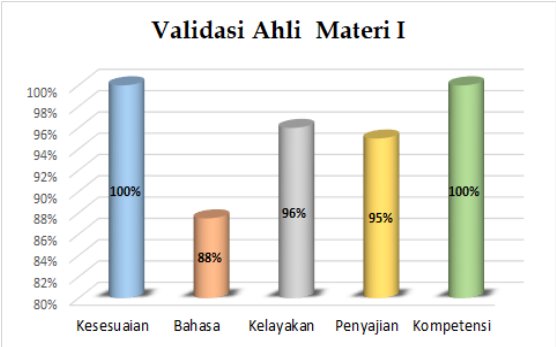

Figure 5. Validation of Material Expert I

The results of the analysis of the assessment material of the material expert II, the first validation obtained a total score percentage of 89% with very good criteria and was suitable for use with minor revisions, and the second validation obtained a total score percentage of 98% with very good criteria and was suitable for use without revision.

Suitability is categorized as very good. Language is very good. Feasibility is very good. Media presentation is very good. Competence is very good. Figure 6 shows the overall percentage of material expert validation II stages 1 and 2.

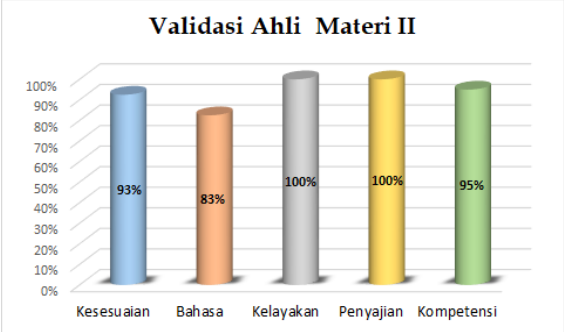

Figure 6. Validation of Material Expert II

The results of the analysis of the assessment material of the material expert III, the first validation obtained a total score percentage of 93% with very good criteria and was suitable for use with minor revisions, and the second validation obtained a total score percentage of 100% with very good criteria and was suitable for use without revision. Suitability is categorized as very good. Language is very good. Feasibility is very good. Media presentation is very good. Competence is very good. Figure 7 shows the overall percentage of material expert validation III stages 1 and 2.

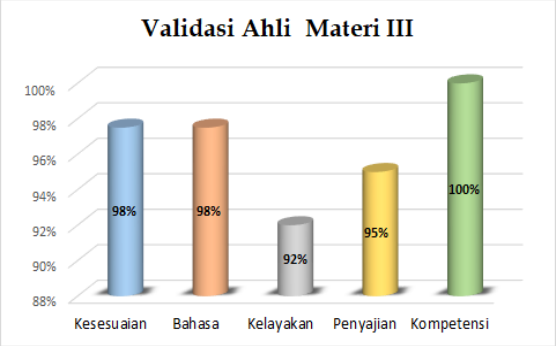

Figure 7. Validation of Material Expert III

Based on the analysis of media validation I, II, and III, the average percentage of the total score was 95% with very good criteria and very suitable for use without revision so that it meets the valid criteria. Suitability is categorized as very good, and competence is very good. This proves that video media based on discovery learning is in accordance with the implementation of thematic learning in the 2013 curriculum. The language is very good, and the media presentation is very good. This is in accordance with the characteristics of students/targets in media selection (Daryanto, 2016, p.175). Feasibility is very good. This proves that the media makes it easier for students to understand learning materials, in accordance with the opinion of Budiningsih (2012, p.43) that the discovery learning model can understand concepts, meanings, and relationships through an intuitive process to finally reach a conclusion. Figure 8 shows the overall percentage of material expert validation stages 1 and 2.

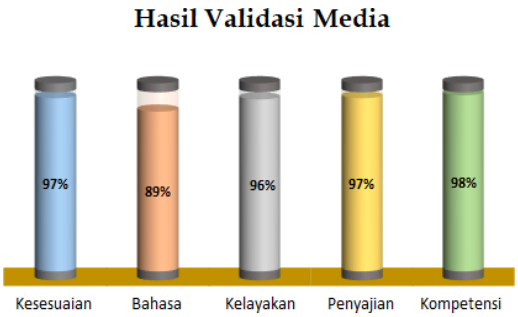

Figure 8. Media Validation Results

Table 2. Material Validation Percentage Results

Validation	Level 1	Level 2
I	94%	98%
II	89%	98%
III	93%	100%

From the results of the validation of material experts I in stage I, the percentage was 94%, and stage 2 obtained a percentage of 98%; validation of material experts II in stage I obtained a percentage of 89%, and stage 2 obtained a percentage of 98%; validation of material experts III in stage I obtained a percentage of 93%, and stage 2 obtained a percentage of 100%. The stimulation stage, contains the teacher's activities providing an overview related to the material to be studied, then the problem identification stage (problem statement), contains the teacher's activities providing problems through answers made by students as an initial hypothesis, The data collection stage, contains the teacher's activities supervising and facilitating and guiding the learning process carried out by students, The data processing stage contains the students' activities processing data that has been tested by linking it to theory, The verification stage, contains the students' activities checking the truth that they have obtained

The conclusion/generalization stage contains student activities in drawing conclusions and conducting a final evaluation of the implementation of activities individually as a final evaluation. Students present reports in the form of images, videos, written reports related to the process. Discovery learning-based media that has been developed by researchers has gone through the validation stage of media experts, material experts, then product trials are carried out on students. Advantages of the product: (1) Clarity of message (clarity of message) with video media, students can understand learning messages more meaningfully and information can be received in its entirety so that the information will automatically be stored in long-term memory and is retentive; (2) Stand alone (stand alone) namely the video that is developed does not depend on other teaching materials or does not have to be used together with other teaching materials. The media displayed using PDTO learning material videos that combine text, sound, and songs; (3) User friendly (friendly/familiar to the user) video media uses simple language, easy to understand, and uses common language. The information displayed is helpful and friendly to the user, including the user's ease in responding, accessing according to their wishes; (4) Representation of content in accordance with the subject matter to be studied so as to improve students' ability to solve problems (problem solving), increase motivation, encourage student involvement so that students can transfer their knowledge with various contexts; (5) Visualization with media, material is packaged multimedia containing text, animation, sound, and video according to material demands; (6) Using high resolution quality, the display in the form of video media graphics is made with the KineMaster Premium application with a 16:9 aspect ratio, discovery learning-based video; (7) Can be used classically or individually, learning videos can be used by students individually, not only in school settings, but also at home, besides that it can be used classically; (8) Media is able to stimulate the material to be studied, media is able to illustrate existing problems, media facilitates students in exploring data, media processes data by linking it to theory, media is able to be used to validate conclusions, media summarizes the results of the discussion.

Teacher Response Questionnaire Results. The results of the teacher response questionnaire aim to determine the practicality of video media based on discovery learning. The results of the teacher response questionnaire analysis obtained a total score percentage of 97% with very good criteria. Discovery learning-based video media is categorized as very good, the suitability with learning time is good, the suitability with indicators and learning objectives is very good. Student interest is very good according to the benefits of learning media. The ability of the media is very good. This is in accordance with the opinion of Sadiman (2011, p.6-7) that media can stimulate thoughts, feelings, attention, and interests and attention in such a way that the learning process occurs. Suitability with students is very good according to the characteristics of students/targets. The syntax of the discovery learning model is categorized as very good according to the stages or procedures of the discovery learning model.

Based on the analysis, the percentage score was 97% with very good criteria so that it met the practical criteria. Results of Student Response Questionnaires, Post Tests, and Performance. The results of the student response questionnaires, post tests, and performance aim to determine the effectiveness of video media based on discovery learning. In the trial by 24 students of SMK N 1 Purworejo, the student responses contained ease of understanding categorized as very good, independence in learning was very good, and activeness in learning was very good. This is in accordance with the opinion of Priansa (2017, p.271) discovery learning is a learning model that regulates in such a way that students obtain knowledge that they do not yet know in a way that is full of independence. Interest in learning media is very good in accordance with the function of video media. The presentation of the video is very good in accordance with the things that must be considered in selecting media. The syntax of discovery learning is very good in accordance with the stages of the discovery learning model procedure. The results of the analysis of the student response questionnaire obtained a total score percentage of 99%, the post-test assessment in the form of descriptive questions with the material Basic knowledge of automotive engineering, an average value of 95 percent 100% of student scores above the KKM score (score 75), and performance assessment based on the rubric of playing rhythmic musical instruments following the rhythm of the song with the criteria of very good beats, very good tempo accuracy, and very good attitude in playing musical instruments. The results of the performance assessment obtained an average value of 88 percent 100% of student scores above the KKM score (score 75) with very good criteria so that they meet the effective criteria.

Discovery learning-based video media is in accordance with relevant research, this media can be used in the teaching and learning process because it can make students understand the

material better, students are able to build their own knowledge, and increase students' interest in learning. The results obtained provide direct experience to students and are not forgotten by students.

5. Comparison

Based on the discussion above, it can be concluded that video media based on discovery learning is produced in the form of videos that are easy to operate by users with basic automotive engineering knowledge material that can be used individually or classically or in groups. The media consists of several content components, including: (a) preliminary activities, (b) learning objectives, (c) linking material to previous learning, (d) exploring information related to the basics of automotive engineering, (e) closing, (f) developer profile. Video media based on discovery learning is suitable for use in learning in the subject of basic automotive engineering knowledge (PDTO) by meeting the criteria of valid, practical, and effective. Thus, video media based on discovery learning can be used in learning at Automotive Vocational Schools.

6. Conclusions

Based on the results of the researcher's conclusions, suggestions can be made, namely teachers can use video media based on discovery learning in PDTO learning, teachers have more variation in using media based on science and technology, the availability of internet quota, media can be downloaded via the YouTube application. With the existence of video media based on discovery learning, it will certainly be able to help teachers in teaching according to syntax and provide better understanding for students..

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