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Learning system suspension using e-module in vocational education with model 4D

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Abstract: *The results of this study (1) determine how much influence the use of the E-Module suspension system has to improve student achievement. (2) Knowing the eligibility level of the E-module used in the learning process of the suspension system. (3) Knowing students' responses to E-Module-based learning media about the suspension system. The e-module development uses a 4-D model (Define, Design, Develop, Dissemination). The electronic learning module was validated by two material experts and one media expert and then tested on 5 students for small-scale trials and 26 students for large-scale students of class XI majoring in Automotive Light Vehicle Engineering, SMK Muhammadiyah Semin. Data collection used a four-scale Likert scale questionnaire. choice. The feasibility of electronic learning modules can be seen from the results of material validation, media validation and testing of students to get proper results. The results of e-module development from material validation and expert validation as well as dissemination to students state that the e-module is in the very feasible category. So it can be concluded that the use of suspension e-modules is feasible for vocational learning.*
Keywords*: E-Module Development, Suspension System, Learning Module, 4-D*

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INTRODUCTION

According to Ki Hajar Dewantara (Sugiarta et al., 2019) explained about the meaning of education, namely: Education is a demand in the life of the growth of children, as for the purpose, education is to guide all the natural strengths that exist in these children, so that they as human beings and as members of society can achieve the highest safety and happiness Education is a conscious effort to prepare students through guidance, teaching and/or training activities for their future roles. Education is a long-term human resource investment that has strategic value for the continuity of human civilization in the world. With education, humans are able to develop themselves so that they are able to deal with any changes that occur due to advances in science and technology (Hamid & Alberida, 2021). Technology in the field of education is focused on efforts to produce learning problem-solving procedures. The solution to this problem includes educational innovation based on information technology. The development of information technology that is capable of processing, packaging, and displaying and disseminating learning information both audio, visual, audiovisual, and even multimedia, has been able to realize virtual learning. The concept of virtual learning is then developed so that it is able to package learning to be more attractive to students wherever they are (Hamid & Alberida, 2021).

According to Government Regulation Number 19 of 2005 concerning National Education Standards it is said that learning must take place interactively, inspiring, fun, challenging, motivating students to participate actively, and providing sufficient space for initiative, creativity and

independence in accordance with their talents, interests and development. physical and psychological students. To achieve the criteria for the learning process, the means that can help are appropriate learning media. The use of media in the learning process will be able to generate new desires and interests, generate motivation and stimulate learning activities, and have a psychological influence on students. (Imansari & Sunaryantiningsih, 2017)

Education is an important part of life which at the same time distinguishes humans from other living things. In education there is a process of knowledge transfer between educators and students or better known as learning. Efforts to improve the progress of a nation, can be done by improving the quality of education that starts from educational goals. Quality education can aim to develop self-potential, including intellectual intelligence and positive personality (Pratama & Hartanto, 2022). Basically, in achieving curriculum demands, a lesson should lead to three main things, namely learning objectives, learning methods, and evaluation tools. (Mustari, 2015). In the teaching and learning process, it is hoped that educators can convey the material being taught and provide learning facilities, while students can understand the material being taught. So that the learning process can run as expected. Because learning is an important activity that everyone does maximally to be able to master or obtain something (Herawati & Muhtadi, 2018). The learning process plays an important role in producing graduates who are competent and professional (Nopriyanti, 2018). One of the things that can be done is to innovate the development of learning media that can help teachers convey learning material (Ramadhan et al., 2021).

This development in the ICT field is an opportunity for the world of education, namely by providing online teaching materials that can be accessed anywhere. anywhere and anytime. Online teaching materials can be designed in the form of web-based electronic modules. Electronic modules can take the form of presenting independent learning materials which are arranged systematically into the smallest learning units, then presented in an electronic format that allows students to interact with the program to broaden their learning experiences (Febrina et al., 2020).

Recently, research on the development of e-books or e-modules has been based on several software or applications that utilize information and communication technology, namely e-book makers such as macro flash media, 3D flip books, kotobee author and Articulate storyline 3. In this study, we used Articulate storyline 3 so that e-modules can be accessed via HTML5 without needing to be downloaded and requiring large storage space (Umbara, 2022). Interactive E-modules are learning materials that contain material, methods, limitations, and ways of evaluating that are designed systematically and attractively to achieve the expected subject competencies/sub-competencies according to the level of complexity. (Imansari & Sunaryantiningsih, 2017). Electronic modules can display text, images, animations and videos through electronic devices such as computers. Electronic modules can reduce the use of paper in the learning process. (Imansari & Sunaryantiningsih, 2017)

Based on this definition, e-modules do not only display two-dimensional media as is the case with print-based modules. E-modules are also known as interactive multimedia because various learning media can be presented in them (Muhammad Hashemi Maulida et al., 2022). E-module is a learning tool or tool that contains material, methods, limitations and ways of evaluating that are designed in a systematic and interesting way to achieve the expected competence according to the level of complexity electronically (Diantari et al., 2018) . Vocational High School (SMK) as a school is expected to be able to produce competent graduates, the need to improve the quality of education in SMK is a problem that must be considered and planned on an ongoing basis (Lestiawan & Johan, 2018)

Workshops at SMK Muhammadiyah Semin have facilities in the form of laptops and LCD projectors , making it very easy for the learning process. In addition, there is also a suspension system display media for learning media. the existence of existing facilities, facilitates the use of learning media E-module suspension system for the learning process at Muhammadiyah Semin Vocational

School. Based on the results of observations in class with several students in the Automotive Engineering department at Muhammadiyah Semin Vocational High School, the learning process for the chassis system so far uses teaching materials for the suspension system which has not become a benchmark, in the learning process, so that students feel bored and less motivated during the process. learning, Muhammadiyah Semin Vocational School students usually often experience drowsiness if learning feels monotonous in class. Considering that the activities of SMK Muhammadiyah Semin students are very busy. So during the learning process, a teacher must be creative in presenting learning material in the classroom. Either with teaching methods or creative materials during the learning process. At SMK Muhammadiyah Semin, they still use conventional teaching materials. Teaching materials are limited to the appearance of material and pictures only.

Teaching materials cannot yet display audio, animation and video in learning. This affects the comprehension and motivation of students in understanding the material presented by a teacher. Based on the problems in the field, this research develops e-module-based learning media in suspension system subjects, with the hope of boosting enthusiasm for learning and students' curiosity about these subjects so that students who graduate from SMK Muhammadiyah Semin become skilled and have good character. The problem with education in Indonesia is the lack of availability of teaching materials, teaching materials are seen as something that is crucial or important in learning processes or activities with the aim of enhancing learning (Widiana & Rosy, 2021). Vocational education has different characteristics from general education or high school . The most significant difference is from the purpose of implementing education. The aim of education in vocational education is to prepare graduates to enter the world of work (Purnomo & Triyono, 2018). In this modern era, the existence of computers and the internet has controlled almost all human activities. The development of computers and the internet has made human work easier, including in the field of education. Web-based learning (e-learning) is also growing and provides ample space for anyone to get information, students do not have to sit in class, but can carry out distance learning, can communicate and exchange knowledge with anyone without having to spend large costs in a relatively short time (Deta et al., 2020)

One of the electronic devices that can be used as a container for e-modules is an Android smartphone. Android smartphones can be used as media for delivering interactive learning or what is often called mobile learning (Lumbantobing et al., 2019). The Android-based e-module was chosen because it saw the facts in the field that many students use Android-based devices and the use of Android-based learning media is one of the applications of 21st century learning styles, so it is expected to make it easier for students to learn (Ramadhani & Yudiono, 2020). So to be able to increase students' understanding and activeness in the suspension system competency is to use the e-module. E-module has the advantage of being able to be accessed anywhere and anytime, thus facilitating the learning process. The E module encourages students to actively learn and explore further material about suspension systems.

METHOD

This research was conducted at the Muhammadiyah Semin Vocational School, especially in class XI students. This research is included in the type of research and development (*Research and Development*). Research and Development (Research and Development) is a research method to develop and test products that will later be developed in the world of education. There are various kinds of research models that can be used as a reference in this Research and Development research, here are the various models used in research and development (Albet Maydiantoro, 2019)

This research uses a development procedure which consists of four stages of development. The first stage is Define or often referred to as the needs analysis stage, the second stage is Design, namely preparing a conceptual framework for learning models and tools, then the third stage is Develop, namely the development stage involves validation tests or assessing the feasibility of media, and the last is the Disseminate stage, namely implementation on the target actually is the subject of research. in the product trial design after validation by material experts and media experts. Questionnaire data was collected and analyzed as a basis for revision. Next, conduct field trials on students in Class 1 XI at Muhammadiyah Semin Vocational School.

The Subjects of the Trial

Students who were the subjects of the trial were Class XI students of SMK Muhammadiyah Semin.

Time of Trial

Time of the research trial for the Development of the Suspension System E-Module in Class XI at the Muhammadiyah Semin Vocational School was held on August 25 – October 26 2021.

The data collection techniques in this study consisted of questionnaires, documentation and interviews: (a) Questionnaire is a data collection method that is carried out by using statements that must be done or answered by people who include the objectives of the questionnaire, in this technique the researcher gives questionnaires using a Likert scale to media experts, material experts, educators and provides response questionnaires to Class XI students SMK Muhammadiyah Semin. (b) Documentation starts from collecting photos of research activities and storing data about the state of students and other data during the learning process. (c) Interviews were conducted by interviewers to obtain information from sources. Interviews are used at the preliminary study stage to explore or complete data and information from educators.

The data analysis technique used to analyze the feasibility assessment results is by calculating the average results of the questionnaire and the results of student evaluations.

RESEARCH AND RESULTS

Feasibility of E-Module Learning

a. Discussion of Material Expert Evaluation from Lecturers

of the Suspension System Learning Module is included in the "Easy" category in the material aspect. Material experts taken from lecturers considered it feasible because the contents of the learning module were in accordance with the suspension system learning syllabus. However, there is still a correction, namely the material is too broad but lacks depth.

a) Discussion of Media Expert Evaluation from Lecturers Media

experts who assessed the suspension system learning module concluded that the module had media content that was appropriate enough to be presented to students. However, there are suggestions for improvement from media experts, namely the contents in which there are many words that are not written correctly.

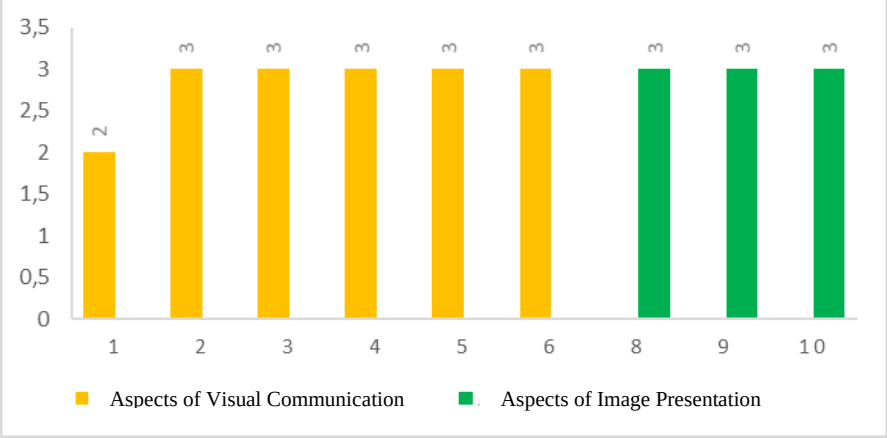


Figure 1. Media Expert

Total : 29

Category : Suitable for use with revision according to suggestions

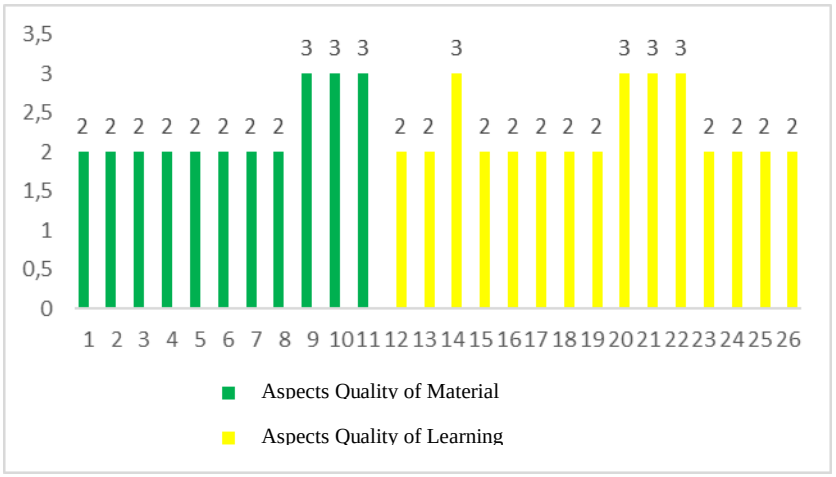
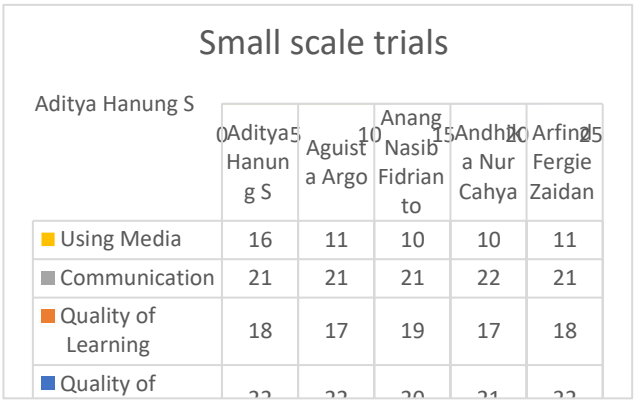


Figure 2. Material Expert

Total : 59
Category : suitable for use with revisions according to suggestions

b) Discussion of small-scale trials

Trials conducted on students are on a small or limited scale. This trial aims to determine the feasibility of this initial electronic module product. This trial was carried out by 5 students of class XI TKR SMK Muhammadiyah Semin. The assessment indicators are obtained from the data in the table as follows



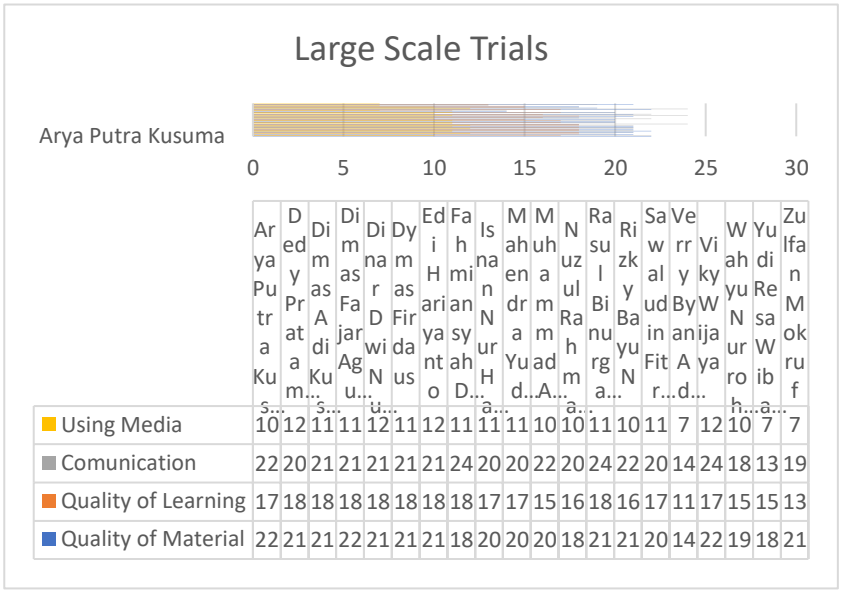
Aspects of Visual Communication

Figure 3. Small Scale Trials

Total : 356
Result : 71.20% (Good)
Conclusion : Decent

c) Discussion of large-scale

trials Large-scale trials are field trials of 20 students of class XI TKR SMK Muhammadiyah Semin. The performance of electronic modules can be seen when used in learning activities. Learning steps are carried out in accordance with the stages of material, language, media and learning contained in the electronic module. The assessment indicators obtained data in table form as follows:

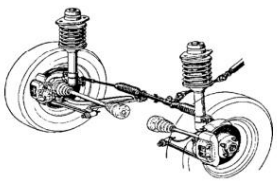


	Arya Putra Kus...	Dedy Pratam...	Dimas Adi Kus...	Dimas Fajar Agu...	Dinar Dwi Nu...	Dymas Firdaus	Edi Hariyanto	Fahmi Ansyah D...	Isna Nur Ha...	Mahendra Yud...	Muhammad A...	Nuzul Rahma...	Rasul Binurga...	Rizky Bayu N	Sawal udin Fitr...	Verry Byan Ad...	Viky Wijaya	Wahyu Nurroh...	Yudi Resa Wib...	Zulfan Mokruf
Using Media	10	12	11	11	12	11	12	11	11	11	10	10	11	10	11	7	12	10	7	7
Comunication	22	20	21	21	21	21	21	24	20	20	22	20	24	22	20	14	24	18	13	19
Quality of Learning	17	18	18	18	18	18	18	18	17	17	15	16	18	16	17	11	17	15	15	13
Quality of Material	22	21	21	22	21	21	21	18	20	20	20	18	21	21	20	14	22	19	18	21

Figure 4. Large Scale Trials

Total: 1341
Results: 67.09%
Conclusion: Feasible

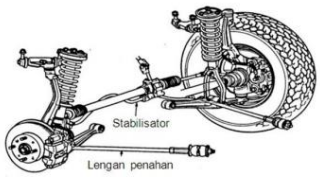
Suspensi Mac. Pherson, Dengan Lengan " L "



Lengan " L " mengantar gerakan roda (menahan gaya memanjang / melintang Penggunaan :

Aksel depan, dengan / tanpa penggerak roda

Mac Pherson Sistem " Honda " (Suspensi Lengan Melintang)



Suspensi ini tergolong " Suspensi *Wish Bone* " atau lengan menlintang yang dikembangkan dari suspensi *Mac Pherson* oleh Honda Penggunaan Aksel depan dengan penggerak roda

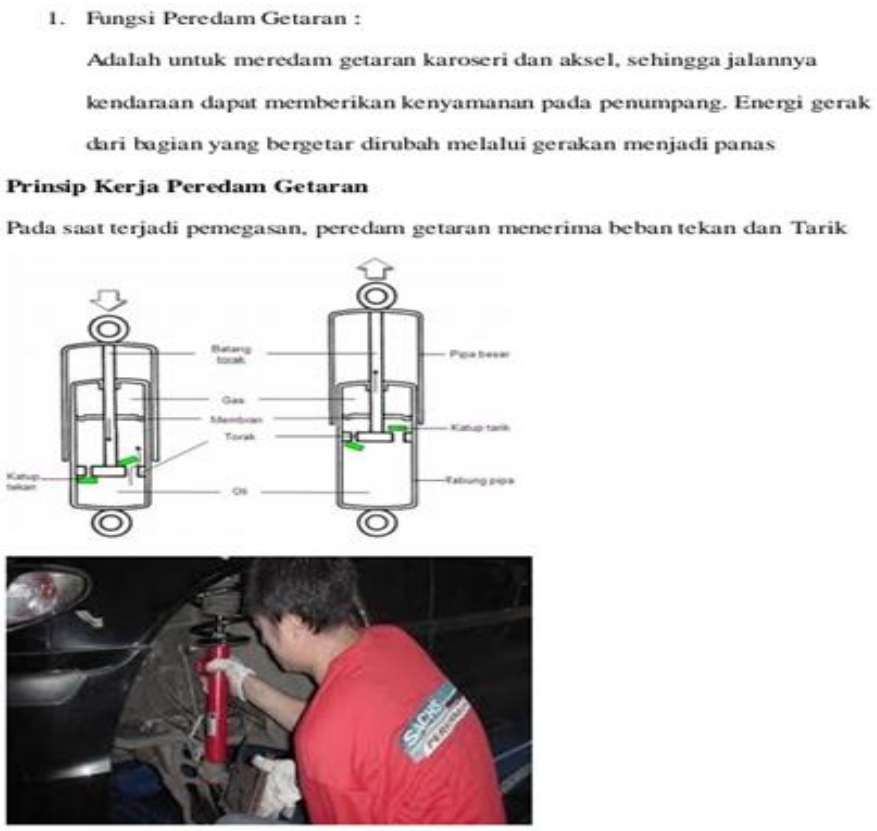


Figure 5. E-Modul Suspension

The E suspension module was rated very feasible from material validation and media validation. The results of student dissemination also showed that the module was able to increase students' understanding of the material and activeness in class. e suspension modules have easy access wherever and whenever according to student needs (purnomo et al, 2022) (pratama et al, 2022). So from this discussion it shows that the e-suspension module is very suitable for use in suspension learning in vocational high schools.

CONCLUSION

The feasibility of the module electronic product developed for suspension system learning can be seen from the acquisition of validation data by experts and trials on students for learning activities are as follows:

1. Assessment from Lecturer Material Experts
   Based on assessments from lecturer material experts, the electronic module gets the "Easy" category. Assessment using a questionnaire with four scale answers got 59 with the percentage "Decent".
2. Assessment from Lecturer Media Experts
   Based on the assessment of media experts from lecturers, the electronic module gets the "Decent" category. Assessment using a questionnaire with four scale answers got 29 with the percentage "Decent". However, with a record of making improvements from the lecturer.
3. Trials on Students Student
   Trials were carried out twice, namely small-scale trials and field or large-scale trials. Small-scale trials received ratings from students achieved in the "Good" category by 5 students with the following data. The category "Good" with a percentage of 71.20%, and the category "Good" with a percentage of 67.05%. Assessment uses four answer scales.

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