

Development of multimedia-based learning media interactive on a subject of cooling systems in Vocational School of Industry Yogyakarta

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Abstracts. This study aims to produce cooling system learning media in an easy way to operate and suitable to be used in teaching and learning activities. This type of research was Research and Development with the procedure of developing the media through 10 stages. The technique of collecting data used the validation sheet. The data analysis technique used quantitative analysis. The result of the media expert validation shows that the flash-based cooling system learning media is feasible with an average of 96.4% which included three aspects of assessment, namely: aspects of media display, use of images, sound and evaluation questions, and navigation systems. The result of the material expert validation showed that the learning media of flash-based engineering images was very feasible with the average of 85.4% which included three aspect of assessment, namely: aspects of material relevance, an aspect of learning materials content, and aspect of multimedia ease of operation. The results of user evaluations indicate that flash-based cooling system learning media was very feasible, with the percentage of 84.5% in small group trials and 82.6 in large group trials covering 5 aspects, namely: an aspect of material relevance, a content of learning materials, convenience operation, navigation menu, and system display design.

Keywords: flash, cooling system, learning media

Introduction

National education functions to develop capabilities and form a dignified character and national civilization in order to educate the nation's life, aiming to develop the potential of students to become human beings who believe and devote to God Almighty, noble, healthy, knowledgeable, capable, creative, independent, and become a democratic and responsible citizen.

According to Ki Hajar Dewantara (1994: 20) Education is guidance in the life of the growth of children. The purpose of education is to guide all the natural forces that exist in children, so that they as human beings and community members can achieve the highest safety and happiness.

One educational institution that can develop its students into human beings with integrity has a solid personality and provides them with the knowledge and skills of Vocational High Schools. Because vocational

education is a form of secondary education held to continue and expand basic education and prepare students to enter employment and develop professional attitudes. With the greater demand, the education system and learning media must be varied so that educational goals are achieved.

From the results of observations in the Yogyakarta Industrial Vocational Automotive Mechanical Engineering Expertise Program, students as human beings who have responsibilities, have lately paid little attention to the interests related to their obligations as a science claimant. Many of them think that participating in school learning is an unpleasant activity. Teacher attendance is only considered as a routine that must go according to the lesson hours. With such psychological conditions, learning activities are almost always felt as a burden rather than active efforts to deepen knowledge.

Based on the statement above, the use of learning media is felt to help students better

understand the material and can repeat the contents of the material when needed. Learning media can be accessed and owned by students through intermediaries of computers or other electronic devices. The demonstration and lecture methods used cannot always be repeated continuously when students have not understood the material that has been delivered. The teacher as a demonstrator will experience fatigue and boredom when he has to repeat continuously the material that has been conveyed to students so that the method of delivery can change and be inappropriate.

Overcoming such things requires learning media that can support the sustainability of the learning process so that it can facilitate the teacher when delivering the material and students do not feel monotonous and boring. Media is used as a tool for the learning process so that the teaching and learning process is more efficient. Use of media by utilizing learning facilities that contain material, methods, limitations of learning materials, instructions for learning activities, and exercises in this case using the Adobe Flash program.

By using this learning media based on the Adobe Flash program, the teacher can display some material to support the demonstration method. The teacher only needs to explain the material displayed with learning media using the Adobe Flash program. This is very helpful for teachers so learning is expected to be more efficient. Using this teaching material is expected to be able to improve the quality of learning and students' interest in participating in learning in the classroom.

Based on the formulation of the problem stated above, the objectives of this study are as follows: (1) produce learning media in the form of computer software, as learning media that can improve student learning achievement in Yogyakarta Industrial Vocational School; (2) knowing the procedures or steps for developing interactive media on cooling systems that are feasible to be applied as learning media in the Yogyakarta Industrial Vocational School.

Instructional Media

In general, media is a plural word of "medium", which means an intermediary or introduction. The word media applies to various activities or businesses, such as the media in

delivering messages, media are also used in the source of teaching or education so that the term becomes an educational media or learning media. (Wina Sanjaya, 2006: 161). Romiszowski in Oemar Hamalik (2008: 202) formulates media teaching "... as the carries of messages, from some transmitting sources (which may be a human being or an inimate object), which is our case is the learner) ". Carries of information interacts with students through their means.

Learning media are facilities or tools that can be used as intermediaries in the learning process to enhance effectiveness and efficiency in achieving learning objectives. AH Sanaky, (2013: 4). Rabiman (2017) states that learning media are all tools both in the form of hardware and software that can be used as a means of two-way communication or interaction between teachers, learning resources and students in learning, so as to stimulate students to study both in class and in outside class.

Interactive Multimedia

According to Rayandra Asyhar (2012: 45) multimedia is media that involves several types of media and equipment integrated in a learning process or activity. In the early 90's, multimedia concepts developed into an integration of more than one media consisting of text, graphics, sound, video, animation where students can control the delivery of diverse multimedia elements (Sunaryo Sunarto, 2005: 116).

Rob Phillips (1997:8) describes interactive meaning as a process of empowering students to control the learning environment. In this context the learning environment is meant by learning by using a computer. Interactive clarification in the scope of multimedia learning is not located in the hardware system, but rather refers to the learning characteristics of students in responding to the stimulation displayed by the layer. The quality of student interaction with computers is largely determined by the sophistication of computer programs. Interactive is a response to display stimulus, for example students provide answers to a question.

Adobe Flash

Adobe Flash (formerly called Macromedia Flash) is one of the computer software which is a superior product of Adobe Systems. Adobe Flash is used to create vector images and animated images. Files generated from this

software have a .swf extension file and can be played on a web browser that has been installed with Adobe Flash Player. Flash uses a programming language called Action Script that first appeared in Flash 5.

Flash uses a programming language called ActionScript that first appeared in Flash 5. According to Madcoms (2013: 3), ActionScript is a command placed on a keyframe or object so that the frame or object will become interactive. Before 2005, Flash released by Macromedia Flash 1.0 was launched in 1996 after Macromedia purchased a vector animation program called Future Splash. The latest version launched on the market using the name "Macromedia" is Macromedia Flash 8. On December 3, 2005 Adobe Systems acquired Macromedia and all its products, so the name Macromedia Flash changed to Adobe Flash. Adobe Flash is a popular animation maker application program for now, where all the work related to the latest 2D and 3D animation on the latest Flash version, can be done easily through this application program.

Zemmbry and Surinam (2007: 7) suggest that animation is a series of images arranged sequentially. When the series of images is shown at sufficient speed, the series of images will appear to be moving. Animation speed is usually measured by fps (frames per second), which is the number of images displayed in one second. Flash animations on the web, usually use 12 fps.

Cooling System

There are two ways of cooling the engine, namely the air cooling system and the water cooling system. But what is more commonly used in cars is a water cooling system. The water cooling system is equipped with a water pump that is useful for circulating water in the cooling system. The radiator functions as a tool to cool water that has absorbed heat from the engine by removing the heat from the water through cooling fins. (Rabiman 2017: 65).

Radiator hose that is useful for flowing cooling water from the radiator to the water pump and from the motor to the radiator. Close the radiator to keep the pressure inside the radiator always at work pressure. Thermostat to keep the temperature of the cooling system always at work temperature. A cooling fan that is useful for drawing air so that air flows

through the radiator and cools the water inside the radiator. (Wardan Suyanto MA 1989: 379)

Method

This type of research is Research and Development with the procedure of media development through 10 stages of adaptation from Sugiyono, (2015: 26), namely: preliminary studies and data collection, planning, initial product development, initial trials, revising the results of trials, field trials, improvement of product results from field tests, field implementation tests, improvement of final products, and dissemination and implementation of products resulting from the development of research subjects are students of Class XII Light Vehicle Engineering at Yogyakarta Industrial Vocational School consisting of 30 students. The object of the research is the development of cooling system learning media.

The data collection technique in this study is a validation sheet. Data analysis techniques using quantitative analysis to determine the percentage of the feasibility of learning media.

Results and Discussion

Data Analysis of Media Expert Validation

Media expert's assessment in the aspect of media display is 75%. The assessment indicator consists of 2 with each indicator gaining a 75% percentage. If averaged, 75% will be obtained, so that if seen in the percentage evaluation interval table the result is feasible. Media expert assessment in aspects of the use of images, sounds, and evaluation questions was 72.8%. The assessment indicator consists of 7 with each indicator gaining a percentage of 75%, 100%, 75%, 75%, 55%, 75%, and 55%. If averaged, there will be 72.8%, so if seen in the percentage evaluation interval table the result is worthy of use.

Media expert's assessment of aspects of the navigation system is 75%. Indicator indicators consisting of 1 get a percentage of 75%. If averaged, 75% will be obtained, so that if seen in the percentage evaluation interval table the result is feasible. Referring to the evaluation percentage interval table, the results of the assessment from material experts from the aspect of media display are feasible, from the aspect of using images, sounds, and evaluation questions is very feasible, and from

the aspect of the navigation system it is very feasible.

If averaged from these three aspects the result is 74.3%, so that if seen in the percentage interval evaluation table as a whole the results are feasible. The results of media expert analysis if presented in a bar chart can be seen in figure 1.

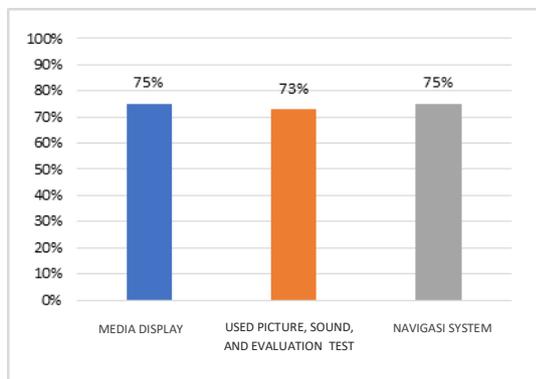


Figure 1. Bar diagram of media expert validation data analysis

Data Analysis of Material Validation

The assessment of material experts in the aspect of material suitability with the syllabus was 87.5%. The assessment indicator consists of 3 with each indicator gaining a percentage of 100%, 87.5%, and 75%. If averaged, there will be 87.5%, so if you look at the percentage interval evaluation table the result is very feasible. The material relevance aspect obtains a percentage of 84.3%. The assessment indicator consists of 4 with each indicator gaining 74%, 87.5%, 87.5%, and 87.5%. If averaged, there will be 84.3%, so if you look at the percentage evaluation interval table the result is very feasible.

The content aspect of the learning material gets a percentage of 89%. The assessment indicator consists of 8 with each indicator gaining 87.5%, 75%, 100%, 87.5%, 87.5%, 87.5%, 87.5%, and 100%. If the diratarata is 89%, then if you look at the percentage evaluation interval table, the result is very feasible. Referring to the evaluation percentage interval table, the results of the assessment from material experts from the material suitability aspects with the syllabus are very feasible, from the aspect of material relevance it is very feasible, and from the aspect of content the learning material is "very feasible".

If averaged from these three aspects the result is 86.9%, so that if seen in the percentage

interval evaluation table as a whole the results are very feasible. The results of material expert analysis if presented in a bar chart can be seen in Figure 2 below.

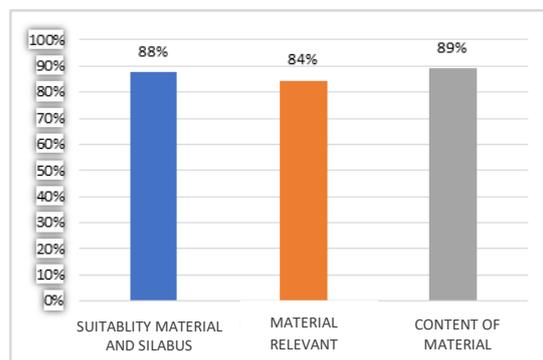


Figure 2. Bar diagram of material expert validation data analysis

Data Analysis of User Validation

Student responses to the cooling media learning media developed in small group trials showed good results. Student responses are given in the form of questionnaires with 10 assessment indicators. Of the 10 indicators divided into 5 aspects, the results of the material relevance aspect is 80%, from the content of the learning material is 83.1%, from the aspect of ease of operation is 82.2%, from the navigation menu aspect is 90%, and from aspects system display design is 87.5%. Referring to the evaluation percentage table, the results of the field assessment of aspects of material relevance, content of learning materials, aspects of ease of operation, aspects of the menu navigation, and from the design aspect of the system is "very feasible".

If averaged from these five aspects the result is 84.5%, so that when seen in the percentage evaluation table the overall percentage is "very feasible". The results of the user analysis of this small group trial if presented in the bar diagram can be seen in figure 3 below.

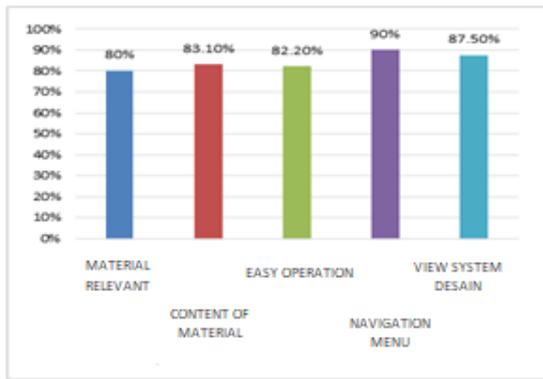


Figure 3. Bar diagram data analysis validation of small group trials

While students' responses to the cooling system learning media developed in large group trials still show good results too. Student responses are given in the form of questionnaires with 10 indicators of the same assessment. Of the 10 indicators divided into 5 aspects, the results of the material relevance aspect are 82.1%, from the content of the learning material is 81.4%, from the aspect of ease of operation is 78.3%, from the navigation menu aspect is 84.2% , and from the design aspect of the system is 87.1%. Referring to the evaluation percentage interval table, the results of the field assessment from the aspects of material relevance, content of learning material, ease of operation aspects, navigation menu aspects, and from the aspect of the display design of the system are "very feasible".

If averaged from these five aspects the result is 82.6%, so if seen in the percentage evaluation table the overall percentage is "very feasible". The results of the analysis of user trials of this large group if presented in a bar chart can be seen in figure 4 below.

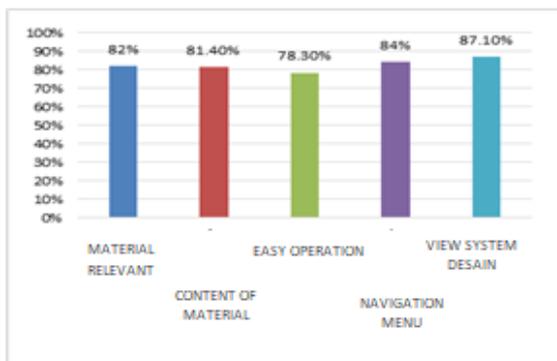


Figure 4. Bar diagram of data analysis validation of large group trials

Final Product Study

After going through various processes and constraints, finally the flash-based Cooling System learning media has been developed. The development of learning media is carried out in approximately 4 months. The development process begins with the learning problem analysis stage and learning component. After the analysis phase which takes about two months, then proceed with the design phase. At this stage there are several obstacles, especially in determining the concepts to be developed and also the difficulties the difficulty in using the software used in making flash-based learning media is because this is not the expertise given on the lecture bench.

Next is the stage of product development and user testing which takes approximately two months. This flash-based cooling system learning media was designed to present material about Class XII Cooling Systems for Ringin Vehicle Engineering. In this media, materials are presented in accordance with the syllabus of the Cooling System subjects at Yogyakarta Industrial Vocational School. This media presents text, image, and evaluation questions that can be worked on and can immediately see the scores achieved.

This learning media will later be disseminated among students and teachers who are capable of cooling system subjects. This will certainly make the teacher easy to provide material to students, and also students will easily learn about Cooling Systems because the multimedia can be learned on their own even when the teacher is not available.

The results of the validation of media experts indicate that the flash-based cooling system learning media is very good / feasible to use with an average percentage rating of 74.3%. This value includes three aspects of assessment, namely: aspects of media display, aspects of using images, sound and video, and aspects of navigation systems.

The results of the material expert validation showed that the flash-based cooling system learning media was also very good / feasible with an average percentage rating of 86.9%. This value includes three aspects of assessment, namely: aspects of material relevance, aspects of the content of learning materials, and aspects of multimedia ease of operation. The learning media of this flash-based Cooling System has been tested in the field by involving 10 students of class XII B at

the Yogyakarta Industrial Vocational School at the small group trial stage.

The results of the user assessment indicate that the flash-based cooling system learning media is very good / feasible, with a percentage of 84.5%. Then this learning media was tested again by involving 30 students of class XII B at the Yogyakarta Industrial Vocational School at the stage of the large group trial. The results of the user assessment on a large group trial showed that the flash-based cooling system learning media was very good / feasible, with a percentage of 82.6%. This value includes 5 aspects, namely: aspects of material relevance, aspects of the content of learning materials, ease of operation aspects, navigation menu aspects, and aspects of system display design.

In general, the learning media of the flash-based Cooling System developed has advantages in terms of display attractiveness, and the integration of the contents of the material with images and evaluation questions. Its use is very easy, and it doesn't take long to master it. These advantages certainly can improve student learning achievement and facilitate students in learning independently. This is in accordance with the results of research from Aris Kusnandi (2014) which states that teaching and learning activities using learning strategies are more effective because student-centered learning.

Setuju and Slamet Priyanto (2015) state that through proper use of media, all objects can be presented to students. The media can more allow the interaction of students with their environment, produce uniformity of observations can instill true, concrete, and rational basic concepts and the media will generate new desires and interests, motivate and stimulate children to learn, provide a comprehensive experience from the concrete to abstract.

Although there are several advantages, this media can not be separated from weaknesses. The weakness is related to the size of the total file, besides that researchers have not found an application to open this learning media on smartphones / android, this is because when making this learning media researchers use 2.0 action scripts that tend to be used for making software on laptops / PCs. The advantages possessed by the flash-based Cooling System learning media indicate that this media is considered feasible to be applied in learning activities in Vocational Schools, especially for

Class XII Cooling System subjects in the odd semester.

Thus, the learning media of the flash-based Cooling System is an alternative effort that can be done to improve the quality of learning in Vocational Schools. Therefore, this research needs to be followed up with other studies to find out the broader impact of improving the quality of learning in Vocational Schools.

Conclusion

This flash-based cooler is very feasible, with a percentage of 84.5% in small group trials and a percentage of 82.6% in large group trials covering 5 aspects, namely: aspects of material relevance, aspects of learning material content, aspects of ease of operation, navigation menu aspects, system display design aspects. So according to the scale table the percentage in this assessment is categorized as "very feasible".

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