THE DEVELOPMENT OF INTERACTIVE MULTIMEDIA LEARNING IN VOCATIONAL SCHOOL

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Abstract. This research aims to develop a learning medium in the form of interactive multimedia at vocational high schools in Indonesia. The development model used is the IDI (Instructional Development Institute) model. The population of this study was all students of SMK N 1 Hiliran Gumanti. The sample used was purposive sampling technique. The research instruments to collect data were validation sheets, questionnaires, and tests. (1) Validity test using a validation sheet to test the media being developed (2) questionnaires being used to test the practicality of the media distributed to students using a Likert scale (3) tests being used to see the effectiveness of the media being developed. The research results showed that 1) The development of interactive multimedia-based learning media was assessed as valid based on content by 5 experts at 91.80%; 2) Based on the responses of 28 students, interactive multimedia learning was proven to be more practical by 85.25%; 3) Effective use of learning multimedia improves student learning outcomes as shown by an increase in student scores from 42.1% to 84.21%. In short, the development of interactive learning multimedia has been proven to be valid, practical, and effective.
Keywords: *instructional media, interactive multimedia, learning outcome*

1. INTRODUCTION

Vocational education is education that prepares students, especially to work in specific fields. SMK is one of the educational institutions that are at the secondary education level. The orientation of SMK is to prepare human resources who can work and are ready to enter the world of business and industry through their areas of expertise during the educational process that has been carried out. Based on the Republic of Indonesia Government Regulation number 19 of 2005, article 26 paragraph 3, it is stated that the competency standards for graduation in vocational secondary education units increase intelligence, knowledge, personality, noble character, and skills to live independently and take further education by their vocational. [1] Graduate competency standards can be achieved one way through the learning process.

The learning process in PP. No. 19 of 2005 concerning National Education Standards article 19 concerning Process Standards explained: the learning process in education units is carried out in an interactive, inspiring, fun, challenging manner, motivating students to participate actively and providing sufficient space for initiative,

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creativity, and independence according to their talents, interest and the physical and psychological development of students [2]. Learning that tends to be applicable or practical will require additional information. In practical learning to visualize teaching materials, sometimes obstacles are caused by limited teachers, equipment, tools, materials, costs, and so on, where the process of conveying information is not only conveyed verbally (lectures). Sudjana and Rivai said that learning media can enhance student's learning process in teaching, which in turn is expected to enhance the learning outcomes they achieve and have skills.[3]

Skills Currently, almost all fields of activity carried out by modern humans have used computer services, one of which is in the field of education[4]. In the world of computer education, as a result of modern technology, it opens up incredible possibilities to become an educational tool[5][6]. Especially in learning, computers can be used as a tool to convey information or ideas contained in learning to students and also as a medium that allows students to learn independently to understand a concept. This can happen because computers can combine text, sound, color, images, motion, and video, and create intelligence capable of presenting interactive processes[7]. Based on the research results, it is also revealed that technology has great potential to improve the quality of learning [8].

In the Dictionary of Computers and Information Technology by Jack Febrian, multimedia is a combination of various media (file formats) in the form of text, images (vector or bitmap), graphics, sound, animation, video, interaction, and others, which have been packaged into digital files (computerized) to convey messages to the public.[9] Interactive, also called interaction, is an activity or activity between two objects (hardware/software and user) that provides a reciprocal effect. The advantage of interactive multimedia is that it inherently forces users to interact with the material [10][11][12]. These interactions vary from the simplest to the most complex. In simple interactions, for example, the user must press the keyboard or click with the mouse to move between pages (displays) or enter answers to an exercise, and the computer responds by providing the correct answer through feedback.

One of the subjects taught at Vocational High Schools (SMK), especially in the Computer Network Engineering (TKJ) skill package, is diagnosing PC and Peripheral operating problems. This subject is one of the Productive subjects. In learning to diagnose PC and Peripheral operating problems, students must be active and master the previous material they studied because the material presented in learning to diagnose PC and Peripheral operating problems is interconnected and complementary between one material and another.

At SMKN 1 Hiliran Gumanti in the TKJ major, there is a subject for diagnosing PC and Peripheral operating problems. Based on observations and interviews with subject teachers, in learning to Diagnose PC and Peripheral Operation Problems so far, the teacher explains the material using the lecture method. This makes students feel confused in doing the exercises (in solving PC and peripheral operating problems). The learning

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process only relies on the level of students' ability to memorize so students do not understand in depth the substance of the material; students are less able to connect between the material being studied and real life and are less able to utilize the knowledge obtained to support their lives. Various problems in the field have found that student learning outcomes in Diagnosing PC and Peripheral Operation Problems are still relatively low moreover, learning input from the student's perspective is already low, and students are passive in learning [13][14], moreover, learning input from the student's perspective is already low, and students are passive in learning

Multimedia can be interpreted as a communication and information medium by combining text, images, graphics, video, audio, and animation used to convey a certain message through computer media and other electronic equipment (VCD, projector, and video) in an integrated manner [15]. According to Vaughan, multimedia combines text, art, sound images, animation, and video delivered by computer or digitally simulated and can be delivered and or controlled interactively [16]. Furthermore, according to Hofsetter; and Suyanto (2005), multimedia uses computers to create and combine text, graphics, audio, and moving images (video and animation) by combining links and tools that allow users to navigate, interact, create, and communicate. The use of media that can be used actively is called interactive multimedia.

Based on the definition by Hofstetter (2001), "interactive multimedia is the use of computers to combine text, graphics, audio, moving images (video and animation) into a single unit with the right links and tools that enable multimedia users to navigate, interact, create, and communicate.". What is said to be interactive multimedia is multimedia that can handle user interaction with applications. In many applications, the user can choose what to do next, ask questions, and get answers that affect the computer to do the previous functions consisting of text, images, graphics, photos, audio, video, and animation in an integrated manner.

Interactive multimedia learning media designed using the AdobeFlash CS5 application. This media contains text explaining the material, images, sound, video, and animated images to enhance the appearance and evaluation questions. So that students easily understand concepts and can attract students' attention and interest in learning. This interactive multimedia learning media can be used on a PC or laptop. Using this product can be done without installing the AdobeFlash CS5 program first because the main file is presented in the extension (.exe). The use of interactive multimedia learning media provides students with the opportunity to develop their creativity to deepen the subject matter in diagnosing problems with PC operation and the peripherals provided. When students experience problems in understanding the material, they can explore the available text and video information so that students can learn more easily and effectively.

The use of interactive multimedia learning media is intended to assist teachers in conveying material and also assist students in understanding the material being taught. Besides that, loading subject matter can be modified to be more interesting and easy to understand, making the learning atmosphere fun. Using interactive multimedia learning

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media can combine many media in the learning process, so the learning process will develop well to assist teachers in creating interactive presentation patterns. Thus, interactive media is needed in learning [17], to create interactive learning [18]. Interactive learning media is the right solution to use because it can describe abstract material with animation and simulation, the time used is relatively short compared to describing it verbally, and the learning process can be done repeatedly.

Based on this, it is necessary to develop a learning media in the form of interactive multimedia for subjects diagnosing PC and Peripheral operating problems. This aims to improve the quality of learning processes and products in Vocational Schools, especially in improving the learning paradigm in a more innovative and collaborative direction. So with this interactive multimedia learning media, it is hoped that students will find it easier to understand the contents of the material diagnosing PC and Peripheral operating problems. So the authors aim to develop interactive multimedia in learning to diagnose PC and Peripheral operating problems in Vocational High Schools.

2. RESEARCH METHOD

This type of research is development research. The development model used is the IDI (Instructional Development Institute) development model. In the IDI model, development uses the principles of a systems approach, which includes three stages, namely define (needs analysis), develop, and evaluate. The research subjects were TKJ students and teachers at SMK N 1 Hiliran Gumanti. The research population was all class X students at SMK N 1 Hiliran Gumanti, while the research sample used purposive sampling, namely 39 classes.

The research instruments developed to collect data in this research are validation sheets, questionnaires, and tests where (1) validation sheets are used to determine the validity of interactive multimedia learning media by experts. Analysis of the validity of the media developed was carried out using a Likert scale based on the validation sheet. (2) A questionnaire to test the practicality of the media for students was described using a Likert scale. (3) The effectiveness sheet to see the effectiveness of the media developed was seen from student learning outcomes before and after using the media using the learning result test sheet.

The data analysis technique used in this research is the descriptive data analysis technique, describing the validity, practicality, and effectiveness of using interactive multimedia. (1) Validity analysis, data from interactive multimedia validation in the form of media content and design validation, media validity is analyzed using descriptive statistics. (2) Practicality analysis, assessment results via questionnaires on interactive multimedia from teachers and students. This assessment will obtain responses from teachers and students regarding the practicality of interactive multimedia. The questionnaire consists of questions to determine the practicality of interactive multimedia. Alternative answers consist of strongly agree, agree, disagree, and disagree. The practicality of interactive multimedia learning media is determined by concluding the responses given by teachers and students to the questions in the questionnaire. (3) Effectiveness analysis. The

effectiveness of interactive multimedia learning media is measured by analyzing student learning outcomes through tests obtained during research. Student learning outcomes are calculated based on the individual completeness obtained by students. Before the test is given, a trial is conducted to determine the validity, reliability, difficulty index, and differentiability of the questions to be tested.

3. RESULTS AND DISCUSSION

3.1 Results

This research produced a product in the form of interactive multimedia learning media on the subject of diagnosing PC operating problems and peripherals subject matter to repairing peripherals for class X Vocational High School TKJ (Computer Network Engineering) Department. The process of making interactive multimedia learning media is under the media development process and tests the validity, practicality, and effectiveness

Validity Test Results

Data collection on the validity of interactive multimedia as a learning medium uses a questionnaire. In this case, the researcher gave a questionnaire to five media experts and material experts. The first validator validates the content or material in the media. Validation aspects include the syllabus, lesson plan (RPP), and teaching materials that use important aspects of accuracy in developing syllabi, lesson plans, and materials for conformity with the curriculum used. Meanwhile, the second validator validates the developed media display design. This includes the appearance of the media and the language used.

The assessment of each aspect of the indicator provided by the validator is calculated, summed up, and a percentage of the assessment according to the aspects that have been made. Media validation is a validation of the media that has been designed, while content or material validation is the validation of the summary of the material in the media. The following is a table of validation results from the media validator.

Table 1. Validation Result Data

Number	Assessment Aspects	Rating percentage	Category
1	Contents	96,25	Very valid
2	Interest	95	Very valid
3	Media	89,33	Valid
4	Languages	86,66	Valid

The validation results seen from the media and language aspects obtained an average design validation of 88% with a very valid category.

From Table 1, it can be taken that the overall average validation of interactive multimedia learning media is 91.81% so it can be concluded that interactive multimedia

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learning media is included in the "very valid" category.

The developed interactive multimedia learning media has fulfilled the content or material aspects with an average percentage value of 95.62%. At the same time, the design aspect of interactive multimedia learning media has an average percentage value of 87.99%. If the two aspects are added to the validity scores obtained from each validator, the average percentage validation value is 91.80%. The value obtained is in the category of a very valid validity level.

Regarding the content of interactive multimedia learning media, the validator stated that the interactive multimedia learning media developed as one of the learning media by the curriculum and student interests. The content validation value of the developed media obtained an average percentage value of 95.63% with a very valid category. Content validation is a requirement relating to the process of determining the correct concepts by the applicable curriculum. The high validation results for content validation indicate that the developed interactive multimedia learning media is by the current curriculum.

From the description of the results of the validation of media aspects and content or material aspects, interactive multimedia learning media developed as multimedia learning media in the subject of diagnosing PC and peripheral operating problems are declared valid. Even though the validation results show valid criteria, this interactive multimedia learning media is imperfect. Therefore, the validator provides several suggestions for improvement. Based on the recommendation from the validator, the interactive multimedia learning media was revised to be suitable for use and tested for learning. This is the opinion of Akker, the material components in the product being developed must be based on content validity (knowledge), and all components must be connected consistently with each other (construct validity); if the product being developed meets these requirements, then it is considered valid.[19] Operate citations of other works should be made to avoid plagiarism. When referring to a reference item, please use the reference number as in or for multiple references. Should be employed for any reference citation at the beginning of a sentence. For any reference with more than 3 or more authors, only the first author will be written, followed by et al. (e.g. in). Examples of reference items of different categories are shown in the References section. Each item in the references section should be typed using a 10-point font size.

Practicality Test data based on the responses of practitioners/teachers and students

Practicality is related to the ease of use of the developed interactive multimedia. Practicality data was obtained through a questionnaire which was filled in by two teachers, namely Mr Rahmat Hidayat, S. Kom, M. Kom, and Mrs Tri Rahmayanti, S. Pd. From the questionnaire contents; it could be seen the practicality of the media. Based on ease of use, time effectiveness, media interpretation, and its equivalent, an overall average of 89.37% is obtained with the media category "Very Practical". The results can be seen in the following table,

Table 2. Data from the practicality of interactive multimedia learning media according

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to the teacher's response

Number	Assessment Aspects	Rating percentage	Category
1	Ease of Use	100	Very Practical
2	Time effectiveness	87,5	Very Practical
3	Media interpretation	80	Practical
4	Equivalence	90	Very Practical

Media practicality also requires input in the form of responses from students. This data is obtained after learning through a questionnaire given to students. Based on the acquisition of the average recapitulation seen from the aspect of ease of use of the media, appearance, attractiveness of the media and time efficiency is 85.25% with the category "Very Practical". The results can be seen in the following table,

Table 3. Data on practicality results of interactive multimedia learning media according to student responses

Number	Assessment Aspects	Rating percentage	Category
1	Ease of Use of Media	86,63	Very Practical
2	Media appearance and appeal	81,32	Practical
3	Time efficiency	87,79	Very Practical
4	Average	85,25	Very Practical

From the aspect of time used in its implementation, this interactive multimedia learning media is categorized as very practical. This means that this media can help teachers to allocate time to deliver learning material to the demands of the curriculum. The developed interactive multimedia learning media has a good interpretation value so that teachers who use interactive multimedia learning media can easily understand it. In addition, this interactive multimedia learning media also has very good equivalence so that it can be used as a guide for teachers in making and designing good learning media under the demands of the curriculum. According to Trianto, "One of the advantages of learning media is the perception of the same concept.[20]

The results of teacher practicality obtained can be seen in Table 4.4 above. The first practitioner assessed that the developed interactive multimedia was in the Very Practical category with an average percentage of 86.70%. In comparison, the second practitioner gave a Very Practical assessment with an average percentage of 92.10%. The two practitioners mentioned above can be summed up, and the score for the practicality of the media is 89.37% with very practical criteria

Interactive Multimedia Effectiveness

D The test that is used is first to test the validity, reliability, and different power index of the sola to be tested. Based on SPSS calculations, 25 valid and 5 invalid questions were obtained from the 30 questions tested. At the same time, the reliability of the questions obtained a Cronbach's Alpha score of 0.739 with a high-reliability interpretation. For more details on the reliability test results, see Appendix 15. Meanwhile, from

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calculating the difficulty index of the test items carried out on 30 test items, 4 questions were obtained in the easy classification, 2 difficult questions, and 24 questions in the medium classification.

The effectiveness test results were obtained through tests on students before and after learning using interactive multimedia learning media. The pretest and posttest results can be seen in the table below:

Table 4. The results of the pretest and posttest trials

Test	KKM	Rating percentage	Category
Pre-test	16	69,89	42,10%
Post-test	32	81,36	84,21%

From the data obtained, 16 students have completed (42.10%), and as many as 22 students have not completed (57.89%) Data on learning outcomes were taken after learning was carried out using interactive multimedia learning media. From the data obtained, 32 students completed (84.21%), and as many as 6 students have not completed (15.78%). These results have concluded that interactive multimedia learning media are the effective criteria for use in material for repairing peripherals.

3.2 Discussion

The effectiveness of interactive multimedia learning media is seen from its ability to activate students in learning and make it easier to understand learning material. Learning outcomes are abilities students possess after they go through the learning experience process. The learning experience is in the form of effective learning activities and can achieve the goals of good learning outcomes. The purpose of the assessment of learning outcomes is to measure the level of success of the teaching and learning process that has been implemented

The description above shows that the use of the developed interactive multimedia learning media makes it easier for students to understand the material so that student learning outcomes can be improved. As Rasyid and Mansyur state, evaluation determines how far the learning process has been achieved[21]. Learning outcomes are obtained from the tests given as objective tests. Objective tests consist of 25 questions. According to Trianto, "The learning outcomes test is a test item used to determine student learning outcomes after participating in learning activities".[20] After student learning outcomes are obtained, the test results are compared with the KKM set by the school to obtain an overview of the achievement of individual student completeness. This is the opinion of Trianto: The minimum completeness criterion is the learning mastery criterion determined by the educational unit (each school)"[20].

The effectiveness of learning media will affect the learning outcome because some students feel happy with new experiences [22]–[24]. Students who learn with learning media or educational products will be interested because they have found something new [25], [26]. The new Educational product challenges students to hard work to understand the

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mathematics problem [27], [28]. The best learning media that has developed with the best procedure increase some variable that affects the learning results [29]–[31]. Paying attention to the learning media to increase or improve learning results is the best way for teachers and every school element [32]. Therefore, every element of schools should think about what the learning media will bring to manage classrooms every day [33], [34]. Learning media is an accountability of the school element to improve the learning process and learning result [35], [36]. This media will be a way to improve the student's skills in learning mathematics.

4. CONCLUSION

The results showed that interactive multimedia learning media products for diagnosing PC and peripheral operating problems had been developed in interactive multimedia according to the development procedure. In general, the quality of this interactive multimedia product is included in the practical and effective criteria for use. Based on the evaluation results of media experts and content or material, this interactive multimedia learning media is feasible and tested to be used as an alternative interactive multimedia learning media for subjects diagnosing PC and peripheral operating problems.

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