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Designing Interactive Multimedia Role Playing Game with Discovery Learning Method for Vocational High School Students

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ABSTRACT

This research aims to produce learning multimedia based on role playing game with Discovery Learning method in Multimedia Design subject. The making of this multimedia is motivated by the difficulty of improving learning outcomes in Multimedia Design subjects and the need for media assistance to help improve learning outcomes in these subjects. Based on this, a way of learning and media that can help students in learning Multimedia Design subjects are needed, one method that can be used is called the Discovery Learning method. Discovery Learning is a method where learning theory is defined as a learning process that occurs when the learner is not presented with the lesson in its final form, but is expected to organize it himself. This research used the Research and Development (R&D) method. The results of this study are: 1) the multimedia built is declared feasible to use with a percentage of 84.32% media experts and 82.00% material experts, 2) student assessment of multimedia gets a percentage of 86.95%, 3) this multimedia can improve the learning outcomes, there's an increase from the average from 45.8 to 67.3.

ARTICLE INFO

1. INTRODUCTION

"Learning in Vocational High School environment is carried out within the framework of the formation of the Graduate Competency Standards of students in Indonesia". They must pay attention to the demands of the real working world, developing and implementing their skills to the standardized competencies in Indonesia, but in reality, the graduates of Vocational High School seem to be lacking care about their quality so they don't match the competencies they must achieve, as emphasized by Sudira that "Vocational High School graduates lack concern and connection with quality...". One of the causes of the lack of quality of them is the learning process, this is emphasized by Rahman that "The quality of education is closely related to the learning implementation process which is influenced by many factors, one of which is the learning process". Improving the quality of education can be achieved in various ways, one of which is improving the learning process and providing adequate teaching materials, as emphasized by Sudira "Improving the quality of vocational secondary education can be achieved in various ways, including through improving the quality of learning and providing adequate teaching materials / modules ...".

Based on the above, a preliminary study related to the learning process was conducted. Based on data from preliminary studies at three Vocational High Schools in Bandung, Indonesia. Two private schools and one public school through questionnaires and interviews with teachers, information was obtained that students experienced difficulties in one subject. The subject is Multimedia Design, with a percentage above 50% of approximately 70 students. Students feel difficulties, especially 18% in the sub chapter of Multimedia Etymology in a total of 8 sub chapters, besides they got average scores under 70 so that there is still a need to improve learning outcomes in the subject. Students feel confusion due to the presentation of material in the form of concepts, they tend to be unusual in getting material in the form of concepts because they are always accustomed to practicum without knowing the concept first so that they consider the material abstract. The teacher's habit of delivering practical learning suddenly gets learning in the form of theory, making students less enthusiastic, besides that, the use of media is only in the form of a blackboard, PowerPoint and module distribution in the form of portable document format (pdf).

Based on the results of preliminary research, the way the material is delivered, the use of media that is less varied and the confusion of the material caused by the lack of learning outcomes and motivation causes the lack of learning outcomes from students to be the main contributing factor to the difficulty of students when studying Multimedia Design.

From these problems, one of idea to solve them is to update the media used, namely with learning media. According to Arsyad in the book Learning Media suggests that: Learning media can fulfil three main functions when the media is used for individuals, groups or large groups of listeners, namely: (1) motivate interest or action, (2) present information and (3) provide instructions.

Of the various types of learning media, interactive multimedia with learning genre can be chosen to help students, this is emphasized by Munir "By using interactive multimedia with learning genre that can combine media in the learning process, it will help educators create interactive presentation patterns". Interactive multimedia is an integration of several media elements (audio, video, graphics, text, animation, etc.) into a synergistic and symbiotic whole that produces more benefits for end users than one of the media elements can provide individually. Reddi in Munir. With interactive multimedia, the task of educators will be easier,

this is emphasized by Munir that "...in the field of learning, the presence of learning media already helps educators in achieving their learning goals".

One of the interactive multimedia is called games, the term is not foreign anymore especially among young students. Games have become the main focus of their lives, this is emphasized in an international journal by Kurt Squire and Henry Jenkins which states that "Games become the central focus of the students' lives: they play games in classes, in their off-hours, even as part of their private contemplation." For teenagers, they are usually very fond of playing games. They can spend a lot of time playing games and sometimes longer than their time studying independently at home, this is reinforced by Simpson and Clem's opinion in Wijana that: " ...92% of children ages 2-17 play video and computer games, middle schoolers are the most avid players; eighth grade boys average 23 hours a week and girls 12 hours ..." and Gros "The gender disparity in the amount of time spent playing computer games is greater for 14-18-year-olds than for 8-13-year-olds." as emphasized by Kurt Squire and Jenry Jenkins ".... games have tremendous educational potential". The advantages possessed by games can be utilized as one of the interactive multimedia that can help students and teachers effectively, interestingly and fun.

So many game genres exist, but the game that will be used by the author is Role Playing Game (RPG) because the genre in recent years has increased rapidly in society as emphasized by Anders et al. in his journal entitled Role Playing Games: The State of Knowledge states that "Therefore, in recent years, RPGs have been the subject of rapidly increasing interest..." and because the RPG genre has many variations. "...is possibly one of the most widely varying game forms around" Anders et al.

The game will be used in learning environment as a learning media, which obviously will not escape the learning method. The learning method that will be adapted into this game is the Discovery Learning method. "The Discovery Learning method is understanding concepts, meanings, and relationships, through an intuitive process to finally come to a conclusion" Budiningsih. The discovery learning method requires that students can draw their own conclusions in learning, as emphasized by Balim The discovery learning method necessitates the students' commenting on the concepts, information, and incidents by discussing and asking questions and reaching the information themselves, in other words, discovering and finding the solution through practice.

Based on the introduction above, the author decided to conduct a study with a title of "Designing Interactive Multimedia Role Playing Game with Discovery Learning Method for Vocational High School Students ".

2. METHODS

2.1. Research Methods and Design

In this study the author uses Research & Development (R&D) research. This research aims to produce products, emphasized by Borg, W.R &; Gall, M.D that R&D is a method for developing and testing a product.

In addition to the R&D method for multimedia development, to determine the improvement of student learning outcomes, the author added an experimental design to see the improvement of student learning outcomes. The experimental design used in this study was pre-experimental with Sugiyono's One Group Pretest-Postest design as shown below:

Tabel 1. Pre-experimental desain one group pretest posttest by sugiyono

Initial Test	Treatment	Final Test
X	O	X

Information:
O = Pre test
O = Post test
X = Treatment (Multimedia use)

Before using learning through designed multimedia (X), students are given a pretest first. After using multimedia, students are given a post-test test through multimedia to be able to see the improvement of student learning outcomes.

2.2. Research Procedure

The procedure that will be carried out in this research consists of several stages, which are as follows:

1. Preparatory Stage

At this stage the author conducts a field study, in the form of interviews and collecting questionnaires with vocational students who are studying Multimedia Design in order to find out what problems exist in the subject, then studying which curriculum is being adapted by the school chosen, this is done so that the product made by the author still refers to the applicable curriculum. Activities at the preliminary study stage are directed at the following analysis process:

a. Collecting information related to problems that arise in the implementation of Multimedia Design learning, especially those related to learning media and student learning outcomes so far.
b. Literature study collects data in the form of theories that support the making of multimedia, then designs how it is applied in the process of making multimedia and the learning process. The sources obtained come from journals, papers, books and so on.
c. Collecting information about the Discovery Learning method in learning, then adapted and implemented in learning multimedia.
d. Literature study on Visual Novel-based Role-Playing Game that will be adapted in learning multimedia, how the plot, how to play and the rules.

2. Planning Phase

The design stage is carried out after conducting a preliminary study and based on a preliminary study. The author plans to make a lesson plans (RPP) to design the learning process in the game, designing what material will be taken for learning multimedia, adjusting methods with games, making questions, then proceeding with making flowcharts and storyboards.

3. Development Stage

At this stage, the author starts making interactive learning multimedia. The model to be used in software development in this study is Ian Sommerville's waterfall model, in addition to using the R&D method, the stages of making applications are also carried out with a waterfall design system. According to Sommerville, the waterfall model requires process activities of specification, development, validation, evolution and represents the system as a separate process and has phases such as specification requirements, software design, implementation, testing and so on.

2.3. Research Variables

Variables that will be measured using instruments, namely:

1. Expert opinion and lecturer interest in the delivery of Multimedia Design material using game-based interactive learning multimedia.
2. Feasibility of game-based interactive learning multimedia using the Discovery Learning method in Multimedia Design subjects.
3. Student responses after using game-based interactive learning multimedia with the Discovery Learning method in Multimedia Design subjects.
4. The feasibility of questions for learning outcomes used in learning evaluations integrated in multimedia.

2.4. Research Instruments

The research instruments that will be used in this study are:

1. Field Study Instrument

Field study instruments are used to determine the views of teachers and students on Multimedia Design subjects. This instrument is in the form of observations, questionnaires and interviews developed in accordance with the theory of multimedia learning. In this process the author tries to get initial information to find out a complete picture of the problem, so the author conducts interviews and distributes questionnaires to parties representing the object of research.

2. Expert Validation Instrument

Expert validation instruments are carried out to verify and expert validation of role-playing game-based multimedia for learning in accordance with the results of field surveys and literature studies. If it is feasible, then the multimedia can be submitted to a predetermined sample.

$$p = \frac{score\ of\ data\ collection\ results}{ideal\ score} \times 100\ \%$$

3. Data analysis of Student Assessment of Multimedia

The instrument used to assess students' views on the media was a questionnaire.

$$p = \frac{f}{n} x\ 100\ \%$$

4. Data Analysis of Pretest Post-test Questions and Improvement in Learning Outcomes

The instrument used is a multiple-choice test at the final evaluation stage of multimedia. The results of increasing learning outcomes compare the initial value of students derived from the pre-test value with the post-test value after using multimedia. If there is an increase in the previous value along with an increase in the average student score, then the multimedia is said to improve student learning outcomes.

$$Indeks\ Gain = \frac{S\ Post - S\ Pre}{SMI - S\ Pre}$$

3. RESULTS AND DISCUSSION

3.1. Research Results

1. Analysis Levels

This stage begins with literature studies and field studies. Field studies were conducted by distributing questionnaires and interviewing students and teachers of Multimedia Design subjects, based on the results of the distribution of questionnaires and interviews obtained as follows:

a. Learning methods that are usually used by teachers are practicums, demonstrations and lectures.
b. The emergence of student motivation problems in learning due to the lack of supporting media in it.
c. Teachers have not used special multimedia, usually still tend to use power points and modules in the form of pdfs.
d. Material in the form of theory, especially Multimedia Etymology, Multimedia Products and Form Drawings is the most difficult material.
e. Different characters or conditions of students, they consider material that is easy to learn is material where they are already talented or trained with the material such as animation material and sketch drawings.

2. Planning Phase

The Multimedia Etymology material contained in this learning is Definition, Tools and Multimedia Components, the learning method used is Discovery Learning based on the Discovery Learning method, the stages used are as follows:

a. Stimulation (stimulation/ stimulation of stimulation)
b. Problem Statement
c. Data Collection (Pengumpulan Data)
d. Data Processing
e. Verification
f. Generalization

Flowchart is a description of the flow of a multimedia. The flowchart created will describe the game flow (story) in the process of developing a role-playing game-based learning multimedia.

Storyboard is a picture design of the multimedia to be developed so that it can facilitate the next process, in the form of pictures or sketches where each picture is given a description of the form, function and action and then visualized into multimedia.

To see the increase in student learning outcomes, previously an instrument must be made to become a measuring tool for students, namely in the form of questions. The question has been judged by material experts and indicator experts, for the form and results of the judgment of the question attached in the appendix. Then the question is tested on students who have studied Multimedia Design to determine whether the question is valid, reliable, has a good differentiator or not and sorts out the level of difficulty.

3. Development Stage

The development stage is a stage that is developed from the data contained in the analysis and design stage, consisting of making interfaces, multimedia testing and expert validation. The following is an example of a multimedia interface that has been made:

Table 2. Multimedia display example

Information	Display
Start page, users can start creating an account or log in with an account, if that has been created previously	
Advanced page, if you already have an account	

4. Validation Phase

Furthermore, the validation was carried out by multimedia experts both from the side of media experts and material experts.

a. Media Expert Validation Results
   The aspects seen are aspects of Interaction Usability, Accessibility, Reusability and Standards Compliance. The validation results can be seen in the following table:

Table 3. Media expert validation results

Aspects	Number of Items	Nilai Ideal	Value	Presented
Interaction Usability	11	55	48	87.27%
Accessibility	1	5	4	80%
Reusability	2	10	9	90%
Standards Compliance	4	20	16	80%
			Average:	84.32%

b. Material Expert Validation Results

The aspects seen consist of aspects of Content Quality, Learning Goal Alignment, Feedback and Adaptation, Motivation and Presentation Design. The validation results can be seen in the following table:

Table 4. Material expert validation results

Aspects	Number of Items	Nilai Ideal	Value	Presented
Content Quality	4	20	18	90%
Learning Goal Alignment	16	80	64	80%
Feedback and Adaptation	1	5	3	60%
Motivation	1	5	4	80%
Presentation Design	3	15	15	100%
			Average:	82.00 %

This research was conducted at Vocational High School Public "Pendidikan Umum (PU)" Bandung, with 40 respondents. Before students use multimedia, students are given a pretest first after which multimedia is given.

To determine the level of success of multimedia in learning, the gain value of the overall average of the upper, middle and lower groups is calculated as follows:

$$Indeks\ Gain = \frac{S\ Post - S\ Pre}{SMI - S\ Pre}$$

$$Indeks\ Gain = \frac{67.3 - 45.8}{100 - 45.8}$$

$$\boldsymbol{Indeks\ Gain = \ 0,397}$$

Based on the data obtained, it can be said that role playing game-based learning multimedia can improve student learning outcomes from Multimedia Design subjects. This can be seen from the results of the comparison of group averages before using multimedia and after using this multimedia with average results before using multimedia of 45.8 and after using multimedia the average is 67.3, then reinforced by the calculation of the Gain index which shows an increase in ability of 0.39% with moderate criteria so that it can be stated that there is an increase in student learning outcomes.

3.2. Discussion of Research Results

1. Discussion of the Analysis Phase

Questionnaires and interviews were conducted with 36 students who had studied Multimedia Design subjects in one state vocational school and two private vocational schools with the result that they found it difficult to learn Multimedia Design with many factors, explained in the Research Results section.

In the user analysis, this multimedia is planned to be shown to students who have studied Multimedia Design only, but in order to make this research more visible the improvement stage, the users will also be shown to students who have not studied Multimedia Design as well.

In analyzing software requirements, sometimes there are some difficulties, namely determining which applications are expected to help in a fairly fast time in designing and building this game-based multimedia, because many applications have the same functions and benefits.

In analyzing hardware requirements, sometimes there are also difficulties, namely in working on this multimedia, not every computer can be used, from several experiments it can be concluded that a minimum specification of Intel Pentium 4 or AMD is needed, with 128 MB of RAM and 64 MB of graphics memory, besides that the screen size is also at least 1024 x 768 or 14 "because if it is less than that, then this multimedia will not be seen in its entirety so that the display that will be shown is not optimal.

2. Planning Phase Discussion

In the preparation of the material, no significant problems were found, this is because there are already many teaching materials in the form of books and modules (not in the form of multimedia) that are already widely on the market and used by teachers or students. But in adjusting the material and learning methods, sometimes difficulties are felt, namely with the difficulty of adjusting the stages of the method to the stages of the game, this is because there are many stages that must exist and not all stages are suitable for the course of the game so that it must continue to be adjusted back to multimedia.

The flowchart underwent several revisions, ranging from revisions to gameplay from beginning to end that were still not quite right, the use of databases in flowcharts, the use of forms that were still considered a little ambiguous, but each of these stages had passed and the flowchart was finally approved to be made a storyboard.

In the storyboard stage, there are not so many problems because storyboard design tends to be free, especially in multimedia decoration (colors, sounds, assets) depending on the taste to be made by the writer but still based on the title, analysis stage and flowchart design.

The last stage is the stage of making questions, this stage is arguably the longest stage in its preparation, because there are many steps that must be faced starting from finding reliable book sources, revising the indicators that have been made and breaking them into question indicators, searching for appropriate operational verbs and the right choice in the question after the question is finished, the question is judged by experts, there are at least two experts needed to find out the feasibility of the questions that will be used to test students, namely material experts and indicator experts, material experts are tasked with checking whether there is a discrepancy in the theory used with reality and indicator experts to check whether the indicators used with questions are appropriate besides that indicator experts also check the level of difficulty of the questions (C1, C2, C3). After undergoing several revisions, finally the questions have been approved by material experts and indicator experts, then the questions must be tested for validity to the students.

In the question trial, the trial was tested on children who had learned Multimedia Design, the trial went well.

3. Development Stage Discussion

The development phase begins with the design and construction of the interface, starting from the search for assets, adjusting the color and type of font used and adjusting the entire storyboard from several steps, asset search is the longest step, because the author has to find any asset that is in accordance with multimedia, assets are then found in several forums that provide free assets that are not licensed so that they can be used anywhere even for re-selling.

In making this multimedia requires a long time because there are many parts, making it must be done diligently, because the psychic state (mood) is very influential in the progress of making this multimedia.

After creating the interface and then continuing with the multimedia testing whether there are shortcomings or errors in the function function, the author here uses black box testing in accordance with the research benchmark, when testing the black box at first there are still many errors, for example such as games that do not run properly and there are function functions that still do not run such as login and register functions, But this can be overcome and the next black box testing goes well.

4. Validation Phase Discussion

The results of this validation stage can be seen in the subchapter of the validation stage from the validation stage carried out the trial stage (trials 1, 2 and 3) trial 3 is the actual research, in the phase one trial found various kinds of problems, one of the biggest is the unpreparedness of the computer in running this multimedia, this is due to lack of preparation and the absence of checking the computer before because the laboratory the previous day

was very busy scheduled, What happens is that there are some computers that do not have browsers that have flash players so not all students can play them.

In the second phase of the trial, the problems that appeared began to decrease compared to the phase one trial but there was still a fatal error, namely there was one button that did not run even though the button led to the next chapter so that the author inevitably had to make improvements first, then it was discovered that the error in multimedia was due to a typo in the code.

4. CONCLUSION

A. Conclusion

Based on the research that has been done in designing and building role playing game-based learning multimedia with the Discovery Learning method in Multimedia Design subjects, the following conclusions are obtained:
  1. Game-based learning multimedia is designed and built based on problems in the field. The problem that arises is the difficulty of understanding conceptual Multimedia Design so that it needs to be assisted by using media. This multimedia is made with several stages, namely the analysis, planning, development and validation stages. The analysis stage begins with a literature study and field study, the planning stage is carried out by making lesson plans, flowcharts and storyboards, the development stage is carried out by making multimedia and the validation stage is carried out by testing the multimedia to students.
  2. Game-based learning multimedia with the Discovery Learning method increases student learning outcomes by 0.39% obtained from the gain test with a moderate category, this is also indicated by an increase in the average student score from 45.8 to 67.3. Media experts, material experts and students assessed the multimedia application with a very good category shown by the percentage sequentially 84.32%, 82.00% and 88.50%.

B. Suggestion

Based on the results of research conducted by the author, there are several suggestions for further development including:
  1. This game-based learning multimedia only improves students' abilities at a moderate level, this is because there is still a slight mismatch between the existing material and the practice questions tested, so it is better to often hold a review between questions and material in advance so that they can be prepared more thoroughly.
  2. The characters in this multimedia can be made more with more complex stories so as to increase students' interest in trying it.
  3. Adding a save game in the game because when tested sometimes there are technical errors such as sudden blackouts or sudden computer shutdowns, so that data is lost.

AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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