Using Animated Multimedia in Computer and Basic Network Subject

Wahyudin[1], Munir[2], Muhamad Nursalman[3], Yaya Wihardi[4], Enjang Ali Nurdin[5], Herbert[6]
{wahyudin_sanusi@upi.edu[1], munir@upi.edu[2], nursalman@upi.edu[3], yayawihardi@upi.edu[4], enjang_cs@upi.edu[5], herbert@upi.edu[6]}

Department of Computer Science Education, Universitas Pendidikan Indonesia[1,2,3,4,5,6]

Abstract. This research aims to determine how the application of demonstration teaching methods based on multimedia animation can improve learning outcomes on subjects Computer and Basic Network at Vocational High School 11 Bandung. The method used in this research is a quasi-experimental method with a nonequivalent control group design that uses 2 classes as the research object with 70 students. The results show that demonstration teaching methods based on multimedia animation can improve learning outcomes in subjects Computers and Basic Network higher by 27% compared to without using multimedia that is equal to 13%. In addition, this multimedia also has a high influence on students' interest in learning. While the results of the assessment in the form of student questionnaires to the multimedia show in the category very well by obtaining the average value of 83.73%.

Keywords: Demonstration, Multimedia, Animation, Learning outcome

1   Introduction

The world of education especially in Indonesia, one of the main topics of Vocational High School is low quality of the graduates, as proved by the low and incompatibility of competence graduates with competence expected by the industry or employment [1] this is reinforced by the statement of the Minister of Education and Culture, whether one of the heavy challenges of manpower in Vocational High School (VHS) is the competence of educators who are still low [2]. Therefore, it needs more and more innovation that can improve the quality of education in Indonesia.

Initial research conducted by the authors using interview methods to teacher said that the subjects are quite difficult to be taught to students of X TKJ class in VHS 11 Bandung is a computer and basic network with material about the computer assemble, this is supported also from student questionnaire results that have been spread to XI TKJ class in VHS 11 Bandung which showed that of 33 students, 52% said computer assembly material is difficult to understand, 27% said BIOS Configuration material on computer, 15% said computer assembly test material and the rest said operating system installation material, XI class is chosen because it has studied the materials so that knowing the difficulties that will be experienced by class X. From the results of these studies, the authors decided to choose the material assembly of computers on subjects Computer and Basic Network.

One effort to simplify the understanding of computer assembly materials is to use multimedia learning because by using multimedia-based computer animation can provide a

different learning atmosphere [3] and also the use of multimedia can make students learn more deeply and seriously [4], animation is an attempt to make static presentations come alive [5]. Multimedia learning can also make students more interested in learning, this is supported by student questionnaire results from 33 students as much as 82% said that using multimedia can help the process of understanding the material.

The use of learning multimedia has been proven to improve student learning outcomes with the use of instructional media applications on subjects of computer network topology [6]. Hypothesis test shows t_{count} value of 7,460 while t_{table} is 1,997. Because $t_{count} > t_{table}$ then H0 rejected and Ha accepted. And for the normalized gain value, the experimental class is higher than the control class, the normalized gain value of the experimental class is $g = 0.866$ or in the good category and in the control class $g = 0.687$ or in the medium category. In addition, the use of multimedia in learning can increase the attractiveness of students to follow the learning without using multimedia in the learning method [7].

Meanwhile, the learning method is a reference to a learning approach including its purpose, its syntax, its environment, and its management system [8]. So, the learning method is an approach used in learning activities. One example of a learning method that has been frequently used and has been proven to improve student learning outcomes is a demonstration in research [9]. The results showed that teacher activity increased by 18.75% from 76.25% in the first cycle to 95% in cycle II. While the student activity increased by 28.20%, from 63.75% in the first cycle to 91.95% in cycle II. Observation of teacher and student activity by applying a demonstration method in science learning goes well and achieves success. Student learning outcomes increased by 22.75% from 72.7% in the first cycle to 95.45% in cycle II.

In addition, using demonstration methods is more effective than group learning methods with an average difference of 12.54 for school A and 45.07 for school B [10]. Demonstration method is a show about the process of the occurrence of an event or object to the appearance of exemplary behavior in order to be known and understood by the learners in real or imitation [11]. The demonstration method is started by a teacher who demonstrates directly about a learning material whether assisted with a learning tool or not and is immediately followed by the student so that the demonstrated knowledge or skills will be more meaningful in the memory of the students and is expected to facilitate the students to understand the lesson that is being taught by the teacher.

Then the use of demonstration learning methods supported by subject teachers, this can be seen from the results of interviews subject Computer and Basic Network which essentially explain the suitability of demonstration methods because these are not imaginable subjects that require examples of problems in the implementation. In addition to the continuity between learning methods with multimedia animation, to maximize the knowledge and understanding gained by students, the improvement of students' ability is identical to the learning outcomes at school. Learning outcomes are the abilities that students have after receive learning experience [12], this is supported by the results of previous studies on the quality of Indonesian education, learning outcomes is one aspect that needs to be improved in Indonesia [13].

The learning method used by the researcher is the demonstration method. Demonstration learning method is a show about the process of occurrence of an event, on until the appearance of exemplary behavior in order to be understood learners both real and artificial [14]. Animation is the process of recording and playing back a sequence of stills to achieve the illusion of continuous motion [15]. Animation is images that move with speed, direction, and a certain way [16]. Learning outcomes of learners are essentially behavioral. Behavior includes the fields of cognitive, affective and psychomotor [12]. As a result of the change, the

process can be demonstrated in the form of knowledge, skills, abilities, and changes in other aspects that exist in the learning individual.

2   Methodology

2.1   Research methods

In this study, the researcher used quasi-experimental research methods. The researcher wants to examine the influence of using animation multimedia based on demonstration methods in student learning outcomes on the computer and basic network subjects. In building a multimedia learning researcher using the Comprehensive Life Cycle model, it is consisting of five phases: analysis, design, development, implementation, and assessment.

2.2   Research design

The design used in this research is the design of a non-equivalent control group design. The design of this study placed the subjects into two class groups, namely the experimental class and the control class. In the experimental class, interactive web-based multimedia applications using the demonstration learning method will be applied, while in the control class will be treated using learning as usual. The experimental group and the control group will be given pretest first, after which given the different treatment and the last one will be given a posttest.

2.3   Research procedures

The research procedure that will be used in this research consists of six stages, namely pre-research, analysis and multimedia design, development of animation-based multimedia learning, research implementation, analysis of research results, and preparation of reports described in **Figure 1**.

1. **Pre-research stage**

Pre-research stage is the stage to collect data in the field. The data obtained determines the requirements needed in the making of research instruments and the making of multimedia by involving students, teachers, and learning objectives. In this stage, the researcher will perform data collection through field study and literature study.

2. **Analysis and learning design stage**

The result data of the pre-research stage will be used in this step to find out the necessary requirements in supporting the research. The analysis and design phase is divided into two parts, namely the needs analysis, and the determination of the implementation plan of learning and research instruments.

3. **Learning multimedia development stage**

In this stage will be made flowchart based on RPP. Flowcharts that have been made will be validated by the media expert, when feasible then proceeded to the making of storyboards, making the interface, coding, mapping the elements of multimedia learning made, and testing.

Testing in this stage using expert media validation test to determine the feasibility of multimedia made. If multimedia is considered feasible to be used then conducted the research phase, but if there are deficiencies then made improvements.
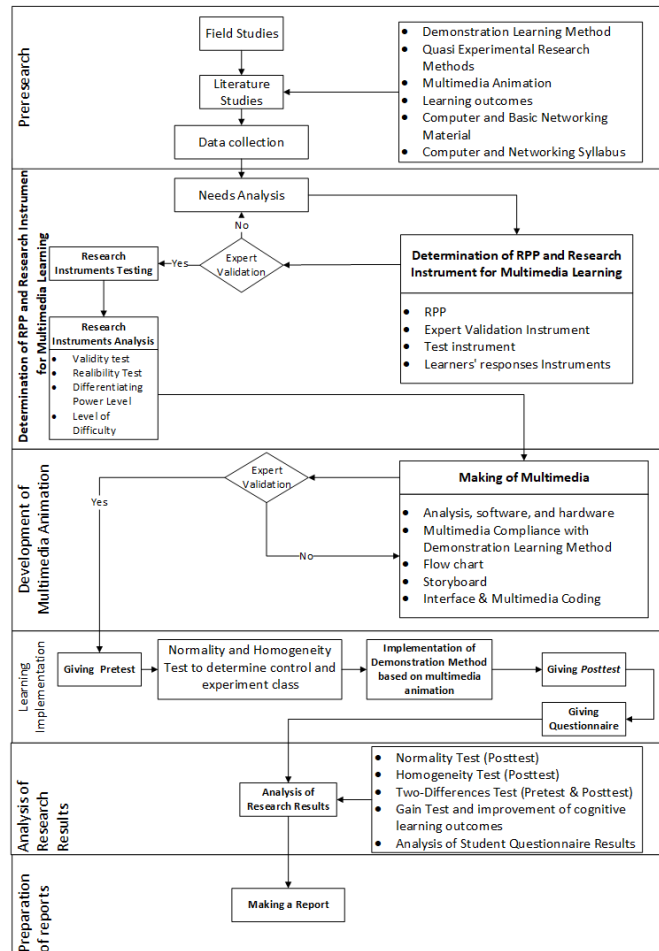

Fig. 1. Research procedures.

4. Learning implementation stage

In this stage, the multimedia that has been created and is worthy to use will be applied to the students in the experimental class in Computer and Basic Networking lessons. As for the control class, learning using conventional methods of lectures with the help of Microsoft Powerpoint media is given. In addition, either the control class or the experimental class will be pretest given before the students get the treatment and posttest given after the students get treatment to know the students' understanding. Then at the end of this stage students who are in the experimental class will be given a questionnaire about how students' responses to learning using demonstration methods base on animated multimedia.

5. **Analysis of research result stage**

   After the research phase is completed, the data obtained will be processed and analyzed. The data consist of the result of material validation by material expert and media validation by media expert, pretest and posttest result, and the result of the questionnaire of student response to multimedia. For the analysis of pretest and posttest results using a normality test, homogeneity test, two-difference difference test, and gain index analysis.

6. **Report preparation stage**

   In this stage, a compilation report will be prepared for the entire study.

2.4 Population and sample

The population used in this study is all students of X class. Samples used are X MM 1 and X MM 2 class which is determined by using a purposive sampling technique. Purposive sampling is a technique of determining the sample with certain considerations [17]. While in the selection of control and experimental classes, computer and basic network subject teachers gave recommendation that X MM 1 as experimental class and X MM 2 as the control class this is because when class division, divided equally so that the two classes have characteristics that almost same.

2.5 Research instrument

- Field Study Instrument, the instruments were used are questionnaires and interviews. Questionnaires are given to students to obtaining data on subjects, difficult materials according to students and obtain data of interest using learning multimedia. While the interview is done to subject teachers with the aim of confirming data about subjects, grades of students and knowing the teacher's view of learning multimedia ever used so far. Based on the data obtained will get the need to making the learning multimedia and the problems that occur in learning.
- Learning Instruments, The Learning Implementation Plan in this instrument is customized based on the class itself. For the control class, the adjustment to the learning steps of the Powerpoint lecture method is applied. As for the experimental class adapted to the steps of Demonstration learning methods in multimedia animation.
- Expert Validation Instrument, Expert validation instruments are used to assess the feasibility of a multimedia-based Demonstration learning method. This instrument is addressed to material experts and media experts. The measurement scale used is the Rating-Scale measurement scale.
- Study Response Instrument, this instrument is used to find out the students' responses to the learning of Demonstration methods based on multimedia animation. The instrument used was a questionnaire based on Wahono to given for the experimental class students after completing the learning. The measurement scale used is the Rating-Scale measurement scale. Multimedia aspects assessed include software aspects, learning aspects, and aspects of visual communication.
- Test Instrument, this test instrument is used to determine how far the material is understanding by the students after using multimedia. Tests are made referring to the syllabus and RPP, consisting of two tests the pretest and posttest that include the cognitive domain C1, C2, and C3.

2.6   Data analysis technique

- Instrument Field Study Data Analysis, Data obtained from field studies can be formulated directly because it is the result of interviews and open questionnaires.
- Instrument Expert Validation Data Analysis, Data obtained from field studies can be formulated directly because it is the result of interviews and open questionnaires.
- Student Response on Multimedia Data Analysis, Data obtained from field studies can be formulated directly because it is the result of interviews and open questionnaires.
- Instrument Assessment of Student Learning Result Data Analysis, Data obtained from field studies can be formulated directly because it is the result of interviews and open questionnaires.

3   Results and discussion

3.1   Pre-research stage

The results of field studies and literature study researchers conclude that making learning media and using appropriate learning methods to support learning, such as animated multimedia with Demonstration methods will make students have more time to understand the material.

3.2   Analysis and design of learning stage

The results of the analysis and design phase of the research are the design of RPP and research instruments. The material used in learning multimedia is computer assembly, installation, and simulation. These materials refer to the syllabus used VHS 11 Bandung applying the latest revision of curriculum 2013. Questions have been compiled by researchers then tested to subject experts and educational experts, he is lecturers Education Computer Science UPI. Questions declared eligible amounted to 57. The questions were first tested on the students of XI TKJ class in VHS I Pasundan who has studied the material assembly computer to know the level of validity, reliability, difficulty, and the differentiating power of these questions. Once tested, this instrument is used for Pretest, Posttest, and evaluation of learning media. Once calculated using the Anatest V4 application, the reliability test results obtained from the test instrument test result is 0.86 which it is have very high reliability, and is calculated by Microsoft Excel, the result of a question worthy to be used amounted to 47 problems and the corrected amounted to 10 questions.

3.3   Animation multimedia development stage

In this stage, the researcher designed and built animation-based multimedia learning following the stages of the Whole Life Cycle model developed by Munir and produced a multimedia analysis and design of flowcharts, storyboards, interface creation, operational and feasibility testing. The step method can described in Table 1.

Table 1. Step Method in Media

Demonstration Learning Step	Media Demonstration Learning Step
Preparation phase	Students start a multimedia application and register an account then sign in using an account that has been created, while the teacher observes students who have created an account on the database
Implementation Phase	Applications convey greetings and convey the purpose of learning to be achieved, then the application provides an explanation of the learning stage to be implemented and questions as a substitute for the process of question and answers with the teacher. The application demonstrates the material directly to the students, then the students do trials using the applications that material have been studied.
Evaluation Stage	Students evaluate in the application by answering questions, when completed the application will display the value obtained by the students.

The table above describes the stage of demonstration learning method applied to media that is created so that the use of media remains in accordance with the method of demonstration learning. Then the flowchart and storyboard explain the flow of multimedia from the beginning until multimedia is finished. The flowchart gives a comprehensive overview while on the storyboard gives a clearer picture because the application screen will be explained one by one. From the design that has been made, next is the process of making the interface. Development is done using a game engine call Construct 2, the sample start page can be seen in **Figure 2-5**.
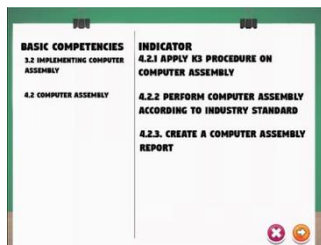

Fig. 2. Delivering Learning Objectives
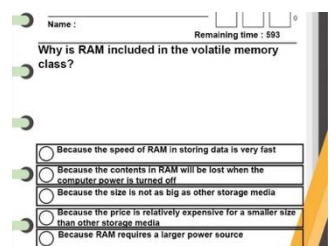

Fig. 3. Submission of Teaching Materials

Last, we performed operational testing through a black box and feasibility tests by media experts, in this case, is a lecturer of Computer Science Education and Computer and Network subject teachers. The results can be seen in the Table 2 below.

Table 2. Feasibility Test Results

Aspect	Number of Items	Ideal	Score Lecturer of Media Experts (%)	Teacher Rating (%)
Quality of Content / Material	4	20	90%	85%
Learning	4	20	90%	95%
Feedback and Adaptation	1	5	100%	80%
Motivation	1	5	80%	100%
Design Presentation	1	5	100%	80%
User Interaction	3	15	93%	86.67%
Accessibility	1	5	80%	100%
Reuse	1	5	100%	100%
Standards Compliance	1	5	80%	80%
Average			90.37%	89.63%

Based on the table, obtained the value of multimedia judgment from media experts lecturer by 90% for the quality aspect of content/material with very good criteria, 90% for learning aspects with very good criteria, 100% for feedback and adaptation aspects with criteria very good, 80% for motivation aspect with good criteria, 100% for motivation aspect with very good criteria, 93,33% for user interaction aspect with very good criteria, 80% for accessibility aspect with good criteria, 100% for usage aspect back with very good criteria, and 80% for standard aspects of compliance with good criteria, While the value of multimedia judgment from subject teachers obtained 85% for content quality aspects with good criteria, 95% for learning aspects with very good criteria, 80% for feedback and adaptation aspects with good criteria, 100% for motivation aspect with very good criteria, 80% for motivation aspect with k good criteria, 86.67% for user interaction aspect with very good criteria, 100% for accessibility aspect with very good criteria, 100% for reuse aspect with very good criteria, and 80% for standard compliance aspect with good criteria. The average of all aspects of multimedia by expert lecturers and subject teachers won 90.37% and 89.63% of the eligibility categories that fall into the category very good.

3.4 Learning implementation stage

This research was conducted at VHS 11 Bandung by taking samples of two classes. The timing of this research begins in September 2nd week by following the schedule that has been prepared in school, this is done so as not to interfere with the existing learning schedule. The implementation of this research was conducted during a meeting in the control class and experimental class. The implementation of this research is as follows:

- Giving Pretest, at this stage the researcher gives pretest to both research classes. Giving is done to know the initial understanding of students related to the material to be given later. Questions are given to the students as much as 20 items.
- Implementation of Demonstration Method based on Multimedia Animation, after learning multimedia passes the expert test validation process. Then the multimedia that has been developed is used in the implementation stage. The use of animated multimedia is used in the experimental class conducted during a single meeting.
- Giving Post-test, doing the learning, at this stage the researcher gives posttest on control class and experiment class. Posttest giving is done to know the final understanding of students. Problem posttest was given to students as much as 20 items.
- Giving Questionnaire Student Feedback to Multimedia, after using multimedia-based multimedia animation learning, students in the experimental class were given a questionnaire to find out the students' responses to multimedia.

3.5   Stage analysis of research result

This research was conducted at VHS 11 Bandung with once meetings in the control class and experiment class, the breakdown of the research are shown in Table 3 and Table 4.

Table 3. Student's Cognitive Improvement.

Class	Pretest Score			Posttest Score		
	C1	C2	C3	C1	C2	C3
Experiment	1.65	1.71	1.94	2.56	3.41	3.24
Control	1.22	1.50	1.92	1.83	1.83	3.11

Table 4. Student's Cognitive Improvement.

Class	Gain <g>		
	C1	C2	C3
Experiment	0.27	0.21	0.42
Control	0.14	0.04	0.39

The grade of cognitive improvement <g> on the C1 aspect for the experimental class is 0.27 and is included in the low category, while the <g> value in the C1 aspect of the control class is 0.14 is included in the low category. In the C2 aspect for the experimental class, the value of <g> is 0.21 and is included in the low category, while the control class <g> is 0.04 which belongs to the low category. The <g> value obtained in the C3 aspect for the experimental class is 0.42 and is included in the moderate category, while the control class is 0.39 and is included in the moderate category. It can be concluded that the value of cognitive improvement <g> (C1-C3) in both classes included in the low category. Next to determine whether the gain index belongs to low, medium, or high category.

The gain value obtained in the control class is 0.13 and in the experimental class is 0.27 it can be stated that the resulting gain is included in the low category. From these calculations, it can be concluded that the use of this multimedia can improve students' cognitive. This is reflected in the average pretest and posttest values that have improved in both classes. After students do learning using multimedia, students are given a multimedia assessment

questionnaire. The questionnaire consists of three aspects, namely aspects of software, aspects of learning, and visual aspects. The average result of these three aspects is as follows:

- Software Aspect   = 82.84%
- Learning Aspect   = 85.42%
- Visual Communication Aspect   = 82.94%
- Average   = 83.73%

The percentage value obtained is then interpreted using Likert's measurement scale to find out the criteria of each aspect. Results of student responses to multimedia learning for each aspect of the software aspects of 82.84% with very good criteria, learning aspects of 85.42% with very good criteria, and visual communication aspects of 82.94% with very good criteria. Based on the three aspects of the assessment, the average percentage of the overall student questionnaire result was 83.73%, including in a very good category.

4   Conclusions

Based on research that has been done in designing and making multimedia animation with this demonstration method, it can be concluded:

1. The application of the Demonstration method based on multimedia animation has been done.
2. The results showed student learning outcomes by using Demonstration methods based on multimedia
3. animation has increased in Computer and Basic Network learning.
4. Students' responses to learning methods based on multimedia animation demonstration get excellent results.

The recommendations that the researcher can convey to this research, including:

1. It is necessary to develop side actions to keep the focus of the students when given treatment or treatment using the method of Demonstration based multimedia animation.
2. Because there are still fewer assessment aspects of the students to multimedia learning, it is necessary to develop special stages related to the needs of students on animation-based multimedia learning.
3. For further research, it is necessary to develop Demonstration method based on multimedia animation not only in the desktop version but also the smartphone version so that learning can also be done outside the classroom and students who do not have a computer or laptop can also access the multimedia
4. Because there is still an increase of low student learning outcomes, it is necessary to develop further research to improve student learning outcomes.
5. Validation of media experts is advised to choose experts from outside educational institutions and have experience in related fields, for example, people who work in startup company applications.

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