Development of instructional multimedia for mathematics based on Adobe Flash and Wondershare Quiz Creator

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Abstract. The purpose of this study is to determine the development of multimedia-based learning mathematics Adobe Flash (AF) and Wondershare Quiz Creator (WQC). This research is a Research and Development with ADDIE development model which has five stages: analysis, design, development, implementation, and evaluation (ADDIE). The subject of this research is the students of VII Secondary School. The research instruments are observation sheet, motivation questionnaire and learning result test. The validation results indicate that multimedia learning is ready to be implemented to students; the results of learning mathematics students after using multimedia learning Adobe Flash is categorized as good, and students who learn to use multimedia learning using Wondershare Quiz Creator is categorized as good, while students who used conventional learning were categorized as quite good. WQC and AF multimedia can improve students' learning motivation. Learning Multimedia Adobe Flash with an animated view that attracts more interest students compared with WQC. AF-based and WQC-based multimedia is feasible to use in mathematics learning as an attempt to overcome students' difficulties in understanding mathematical concepts.

1. Introduction

Utilization of computer technology, either software that is ready to use or is designed personally as a computer application, influences the students' response and learning outcomes. The development of technology is the main trigger of the increasing number of innovations created in the world of education [1]. The form of software or the result of the application of this technology must have good impact to the students and teachers, so that the students' expectations are in sync with the learning objectives conveyed by the teacher. The learning factors are influenced by environmental factors [2], the use of instructional media [3] [4] availability of learning resources and methods.

Multimedia has a big role in learning, because through multimedia students can learn anytime and anywhere, not limited by space and time, just as when students use mobile phones and others. Interactive multimedia has the potential to create high quality learning and suggests that representations of these words and pictures [5][6]. Adobe Flash (AF) is one of instructional multimedia in the form of the appropriate application to support mathematics subjects that are useful to improve understanding and mastery of students in learning a difficult subject matter, while Wondershare Quiz Creator (WQC) is an application that can support learning mathematics in the form
of learning evaluation. Students use WQC made by teachers on learning evaluation activities [7]. These multimedia help students understand based on what is seen, heard and observed [8][9].

Multimedia learning can make the learning process becomes more interactive without neglecting the messages to be conveyed in the learning, so that both instructional multimedia is able to help complete the role of teachers as a facilitator in teaching and learning activities and can be a tool of interaction between teachers, students and learning materials. Development of both instructional multimedia will be realized well if supported by the use of appropriate and easy learning development model. One of the learning models that demonstrate easy-to-learn and simple design stages is the ADDIE (Analysis-Design-Develop-Implement-Evaluate) model [10]. The implementation of the systematic ADDIE model is expected to help a program designer, teacher, and instructor in creating effective, efficient, and engaging learning programs that produce an effective design. This study took three classes as a class of research with different learning models. The purpose of this research is to develop multimedia based on Adobe Flash and Wondershare Quiz Creator and to know the result of learning mathematics and students’ learning motivation after students learn using Instructional multimedia using Adobe Flash and Wondershare Quiz Creator.

2. Method
The research design used in this study is a quasi-experiment. The research design is Non Equivalent Control Group Design. In this study, there are two groups of Experimental Class and a Control Class that were not randomly selected. In Class Experiment I, students of Class 7G got treatment using instructional multimedia based on Adobe Flash, and in Class Experiment II, students of Class 7H got treatment using Wondershare Quiz Creator. While Class 7D is a Control Class who got treatment using Conventional learning. Types of data used are quantitative data and qualitative data. Quantitative data were obtained from test instruments given in the pretest and the posttest. Qualitative data were obtained from the observation sheet of activities of teachers and students, questionnaire of motivation to learn and scale score of students’ attitudes.

3. Results and discussion
3.1. Analysis phase
The first thing researchers do was to analyze what are the problems, complaints, difficulties, and needs of students in learning; to determine the goals to be achieved, namely, to improve students' mathematics learning outcomes and their learning motivation; and to determine what media is appropriate to achieve the goals and to solve their problems. In this study, the researcher develops two instructional media: in experiment class I using instructional multimedia based on Adobe Flash and in experiment class II using instructional multimedia Wondershare Quiz Creator.

3.2. Design phase
After the analysis stage was done and generate some data of students needs to take over, at this stage the researchers began to design the development of both instructional multimedia that contain the formulation of learning objectives and the appropriate strategies to use the instructional media. This stage examines the results of the analysis stage and the alternative solutions afterwards. The steps of designing instructional materials based on Adobe Flash-based are: determining the topic of teaching materials; determining the concept of teaching materials; and creating the frames of teaching materials. Step 1 is to design what kind of background color, the form of teaching materials, the animation, the writing letters, the concepts, and some points to be included into the teaching materials.

The next is the selection of colors and shapes of text, the concepts and inserting images related to materials about triangle and rectangle. At this stage, the form of teaching materials began to be seen because it is filled with background color, student animated images, and writings. The frames of teaching materials as well as other components, like clock, date, and music, start to be inserted. There is also the creation of buttons to select the menu, namely, the home menu to go to the main screen, the menu of standard of competence and basic competence that consists of various competence standards.
and basic competences to be achieved, the menu of materials that contains materials about triangle and rectangle, the menu of evaluation that contains the questions of test, and the menu of instruction that contains the instructions to use instructional materials based on Adobe Flash. The design stage of instructional multimedia Wondershare Quiz Creator are explained as follows: The first step researchers do is to choose what kind of questions will be made. Because this quiz is available in the multimedia and is more effective when answering in a closed quiz, the selected quiz is multiple choice and the true or false quiz. This type of quiz made it easier for researchers to check student score and the applications provided more accurate correction. The next step of design is to determine the background and the concept of instructional multimedia Wondershare Quiz Creator.

In determining the background of the question, the researchers made a background related to education. Colors and fonts were adjusted to make it interesting. There was addition of other components for more beautiful background and display of the quiz. The addition were the titles, music, animation, short video about subject matter triangle and rectangle that can be seen by students, passing rate information, timing of the quiz, etcetera. For the researcher, in order to record the students’ total score in the teacher's online account, the researcher added the students’ identity column to fill before students took the quiz. Researchers asked for some data such as email, full name, class, and the number of attendance list. The Screen of data appears at the beginning, so that the student who does not fill the form can not get into the screen of worksheet or quiz. In other words, it is inevitable for the students to fill students’ identity.

After the students opened the quiz file manually or through the link in the email, the next step was to fill in their identity. After the data was completed, then students can start the interactive quiz by selecting the start button. Students were asked to read the problem well and choose the right answer by clicking on the selected answer. When the answer had been selected then the screen would automatically change to the next question. Therefore, students were asked to answer it properly and correctly, not in a hurry, and think carefully. Work time is in the top right corner of the screen, so students can measure the time needed to answer each question.

If the student chooses the true or false answer, it will be responded directly by the application along with the correct way of completion and answer. However, the answers that have been done by the student (if the student answers incorrectly) can not be changed again until the quiz time runs out. The quiz has an automatic scoring system. If the student chooses the correct answer then it will be given score 10, if it is wrong then it will be given score 0. It applies to each question. The total score or student score will be calculated automatically by the system by summing score of each question. Teachers can only change the score of each question but not the total score.

3.3. Development phase
The result of the blueprint or the design was developed into something real. It means that, all the problems, solutions and designs contained in the blue print subsequently were developed and compiled into teaching material. At the design stage, it has been explained how the instructional materials based on Adobe Flash became a product. However, the next is that the instructional materials that have been designed should be developed in order to become teaching material that has an interesting and moving animation.

3.4. Implementation phase
This stage is the application of a product or multimedia to students. Implementation of multimedia is in line with the schedule of research conducted in schools. The material discussed at the first meeting is the properties of triangle and rectangle. Stages of learning from the first to the third meeting are done repeatedly, the difference is in material given.

3.5. Evaluation phase
Evaluation is the final stage of development in the ADDIE model. At this stage, the researcher evaluates whether the product used is successful for students, teachers and schools. Developed
products can also treat student problems that have been found previously. The developed product should be able to improve the learning result of mathematics and student learning motivation. The way to measure students’ learning outcomes is from the results of pretest and posttest. If there is an increase, then it can be inferred that the product of instructional multimedia based on Adobe Flash is successful. At this stage, the researcher try to find out the result of learning mathematics after getting the instructional model given. The three classes were given different treatment in order to find which model gives a significant impact in the research of learning instruction based on technology. Each instructions has different model: AF, WQC and Conventional. In conventional learning, teachers do not use technology in teaching mathematics, that is, expository teaching in which teacher's role is more dominant.

Development of instructional multimedia based on Adobe Flash and Wondershare Quiz Creator in each stage has been run in accordance to the development model stage of ADDIE (Analysis, Design, Development, Implementation, Evaluation). The results of the study of Experimental Class I, of Experimental Class II, and Control Class are presented in table 1.

| Class      | Pretest | Posttest |
|------------|---------|----------|
| Experiment I | 10.79   | 18.73    |
| Experiment II | 10.15   | 18.09    |
| Control     | 11.32   | 16.35    |
| Ideal Score | 24      | 24       |

Table 1 shows that in the pretest there are differences in the result of those three classes with an insignificant value difference. This shows that initial competences of those three classes of the research subjects are relatively the same. Posttest result shows that experiment class I and II have different scores from that of control class. It is supported by the result of Variant Analysis (ANOVA) with value of Sig. = 0.011 smaller than the Alpha = 0.05. It means that there is significant difference in Experiment Class I, Experiment Class II and Control Class. Based on Post Hoc result with LSD test, it can be concluded that that Experiment Class I and Experiment Class II are better than Control Class. Students’ motivation of Experiment Class I seen from indicator of interest percentage is 77% and that of Experiment Class II is 67%. It can be concluded that the motivation of experiment classes is good. Statistically, the increase of students’ learning achievement of Experiment Class I, of Experiment Class II and Control Class can be seen based on the value of N-Gain in the table 2.

| Class      | N-Gain | Criteria |
|------------|--------|----------|
| Experiment I | 0.61   | Moderate |
| Experiment II | 0.57   | Moderate |
| Control     | 0.41   | Moderate |

Those three classes fulfill the same criteria of N-Gain, namely, criteria of moderate. However, the value of N-Gain of each class has apparent differences. Experiment class I has the biggest N-Gain value of 0.61, the next is experiment class II with N-Gain value of 0.57 and control class got the smallest N-Gain value of 0.41.

4. Conclusion
The development of instructional multimedia based on Adobe Flash and Wondershare Quiz Creator in terms of the stages has been in line with the stages of development model ADDIE (Analysis, Design, Development, Implementation, Evaluation). The result of students achievement after treated using the instructional media Adobe Flash and Wondershare Quiz Creator is better than Conventional teaching. The students’ motivation with the treatment of both multimedia is also categorized as good. Both multimedia are proofed to improve students’ learning motivation. However, instructional multimedia
Adobe Flash is more preferable and interesting with attractive animation. There is significant difference in the result of learning mathematics after using instructional multimedia Adobe Flash, Wondershare Quiz Creator and Conventional teaching. If the N-Gains are ranked, it can be seen that the first place is taken by class with Adobe Flash instructional multimedia, the second place is by Wondershare Quiz Creator and the third place is by Conventional teaching.

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