

DEVELOPMENT OF MATHEMATICS LEARNING MEDIA BASED ON INTERACTIVE MULTIMEDIA USING ADOBE FLASH CS6 IN THE SUBMISSION OF CULTURAL RULES OF HIGH SCHOOL CLASS XI

Utari Dwi Rahmawati^a, Edi Prajitno^b

Program Studi Pendidikan Matematika FKIP UAD

Jl. Prof. Dr. Soepomo, SH. Janturan Yogyakarta

^autaridwi_r@yahoo.com, ^bediprajitno@yahoo.com

ABSTRACT

Middle school math learning has many diverse issues, including the lack of school facilities and students' interest in learning mathematics courses, which are still low. This study aims to develop media-based interactive multimedia learning math using Adobe Flash CS6 and determine the feasibility of the learning media. This study using ADDIE development research. Subject trials in the development of instructional media consists of the validation test subjects and subjects of research. Subject of validation that media expert lecturers and subject matter experts Ahmad Dahlan University and teacher of mathematics majors of class XI IPA at SMAN 2 Banguntapan. The subjects were students of class XI SMA Negeri 2 Banguntapan. These data collection techniques such as observation, interviews, questionnaires, and tests. Analysis of data using qualitative data analysis is then converted into quantitative. As for the success criteria set out in this research is the minimum feasibility of the product is on the value of Agreed. Product development based on the development of mathematical learning media interactive multimedia using Adobe Flash CS6 on the subject of the enumeration rules High School Class XI Science majors are declared eligible to be used as a medium of learning based on assessment questionnaire with an average score 40.72727273 with the agreed categories. Based on these assessments, the multimedia learning of mathematics is fit for use as a medium of learning.

Keywords: Developing, Multimedia, Adobe Flash CS6

INTRODUCTION

High school mathematics learning has a variety of diverse problems, including the lack of facilities in schools and students' interest in learning about mathematics which is still low and many other problems. In observations made at SMA Negeri 2, Banguntapan for students still consider mathematics to be a difficult subject. This is because mathematics is a subject of many formulas and is difficult for students to understand. In addition, abstract mathematical objects and the need for a logical mindset are also considered factors that cause students to have difficulty understanding mathematical concepts. As a result, students become lazy and less interested in learning mathematics. After conducting an interview with Ms. Heni Kristiana as a mathematics teacher in class XI at SMA Negeri 2 Banguntapan, it was found that the use of learning media is limited and the lack of use of learning media used by teachers is one of the causes of students being difficult and bored with the lessons they receive. Learning methods are only focused on lectures and practice questions and the use of very limited media without any variation in other learning media.

Multimedia development using a computer certainly utilizes software or software, one of the software that can be utilized is Adobe Flash CS6. Adobe Flash is used to create vector images and animated images. Files generated from this software have a Shockwave Flash (.swf) file extension and can be played on a web browser that has Adobe Flash Player installed. This software uses a programming language called ActionScript that first appeared in Adobe Flash CS5.

The subject of enumeration rules taught to class XI high school students majoring in Natural Sciences in the even semester is one of the material that can be delivered with the help of simulations or models of real experiences, a realistic mathematical approach will help the development of instructional media on this material. Through the use of Adobe Flash CS6 software and realistic mathematical approaches, learning material for colonial rule can be presented with various animations that illustrate

examples of problems in human life and ways to obtain formulas based on realistic mathematical approaches, as well as exercises.

The above description has illustrated the importance of developing good and innovative learning media, based on the background that has been presented, the researchers intend to develop interactive multimedia-based learning media using a realistic mathematical approach and Adobe Flash CS6 software as interactive multimedia development software. The development of instructional media on the subject of enumeration rules for class XI even semester high school.

The objectives of this study are:

1. Developing interactive multimedia-based learning media using Adobe Flash CS6 Software in mathematics learning for students of class XI in the science major.
2. Describe the feasibility of the developed mathematics learning media.

METHODS

This study uses the ADDIE model development research. This model consists of Analysis, Design, Development, Implementation, and Evaluation. This research develops mathematics learning media using Adobe Flash CS6 on enumeration rules material in science majors high schools which are packaged on CD.

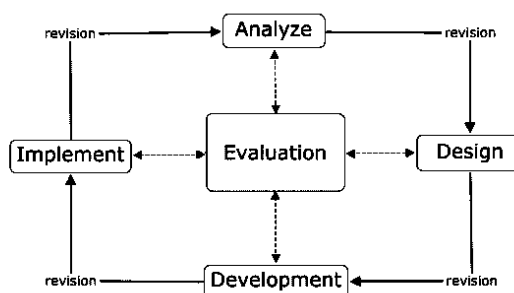


Figure 1. ADDIE according to Reiser

The development procedure is an explanation of the established development model. The author focuses on the development of high school mathematics learning media in class XI majoring in science enumeration rules in the form of interactive learning CDs. The steps taken in the development procedure include:

1. Analyze

In this stage, the researchers conducted several analyzes to get an idea of the media to be developed. The analysis conducted was an analysis of the needs of instructional media, carried out by observation and interviews with mathematics teachers in SMA Negeri 2 Banguntapan and students of class XI majoring in Natural Sciences in SMA Negeri 2 Banguntapan. This aims to determine the learning process of teachers in class and the difficulties of students in learning mathematics.

2. Design

In this step, there is a need for clarification of the learning program that is designed so that the program reaches the expected learning goals. In the design step, the focus of attention needs to be focused on efforts to study the problem and determine alternative solutions that will be taken to be able to overcome the problem of learning that has been identified through the analysis step. This can be done by designing a developed learning media (storyboard) and developing a media assessment instrument.

3. Develop

The development step includes making and modifying teaching materials or learning materials to achieve the specified learning objectives. Development steps can include creating or modifying appropriate media to be used in delivering enumeration rules. Besides the process of translating the

design of learning media based on several aspects. The small class trial phase is carried out by involving 10 students.

4. Implement

The implement step has the meaning of the delivery of learning material from the teacher or instructor to students. So that this stage of product testing is carried out at one school involving 1 class. Product testing aims to determine the feasibility of developed learning media.

5. Evaluate

Evaluation is a process carried out to provide value to learning programs. At this stage, the media are evaluated based on the results of a media expert questionnaire, material experts and student responses, so that conclusions can be drawn whether the developed media is suitable for use in learning.

This trial was conducted to obtain data that would be used as a basis for revising the product. Before being tested, the product is evaluated by several experts. The trial run is done after obtaining validation from the expert input obtained is presented as a basis for revising the product.

The purpose of the trial is to determine the feasibility of the learning media developed. The stages that are passed are:

- a. Expert Validation
- b. Expert revision
- c. Product trials
- d. Revision
- e. Data retrieval
- f. The final product

The test subjects in the development of instructional media consisted of validation test subjects and research subjects. The subject of validation was the lecturer of media expert and material expert at Ahmad Dahlan University as well as the mathematics teacher in class XI of the Department of Natural Sciences at SMA Negeri 2 Banguntapan. The subjects of the study were students of class XI of SMA Negeri 2 Banguntapan. Based on the design of the trials carried out for the subjects of the trials were 10 high school students of class XI. While the research respondents were high school students in class XI in one class.

The data obtained in this research development are qualitative and quantitative data: Data Kualitatif :

- a. Qualitative data in the form of categories are SS (Strongly Agree), S (Agree), CS (Fairly Agree), KS (Less Agree), and TS (Disagree).
- b. Quantitative data in the form of assessment scores are TS (1), KS (2), CS (3), S (4), SS (5).

The instruments used to collect data in this study are:

a. Questionnaire for material and learning experts

The questionnaire was given to material and learning experts whose purpose was to evaluate learning media before being trialed to students and find out the appropriateness of instructional media in terms of educational aspects. Before being used, this questionnaire was first validated by the validator. This questionnaire was made and developed based on the evaluation criteria of learning media.

b. Questionnaire for media experts

This questionnaire was given to media experts whose aim was to evaluate learning media before being tested on students. Before using the questionnaire, it is validated by the validator. This questionnaire contains aspects to determine the quality of learning media display that will be tested.

c. Questionnaire for students

This questionnaire was given to 10 small class students and one class (large class) students whose aim was to find out the quality of learning media techniques. This questionnaire consists

of aspects to determine the feasibility of learning media subject matter enumeration rules that have been tested.

The data obtained will be processed through data analysis to determine the quality of the resulting development products. Data obtained from questionnaires for material experts and media experts are not converted to quantitative. This is because media experts prioritize comments and suggestions. Comments and suggestions given by material experts and media experts will be used to improve products developed before the trial process in the field. While the results of the assessment obtained from respondents testing the product and testing the use will be analyzed through the following stages:

- 1) The type of data taken is in the form of qualitative data and then converted to quantitative.
- 2) After the data is collected, then calculate the average score.
- 3) Changing the value of each aspect of the criteria in each component of the mathematics learning media into qualitative values with ideal assessment criteria.
- 4) Determine the overall value of learning media by calculating the average score of all subject matter. Then it is changed to a qualitative value in accordance with the criteria of an ideal research category on the material enumeration rules.

The results of the analysis of the data obtained are used as a basis for knowing the quality of the products produced. The success criteria set in this study are that the minimum feasibility of the product is at a value of B (Good). So that the results of improvements from material experts, media experts and students if they have obtained the category B (Good), then the product developed is suitable for use by teachers and students as a medium for learning mathematics on the subject of enumeration rules.

RESULTS AND DISCUSSION

Broadly speaking, the stages that were passed in developing interactive multimedia-based mathematics learning media are preliminary research, data collection, media development, validation, and testing. From the problems that have been explained before, the researcher provides alternative solutions by developing interactive multimedia-based mathematics learning media on the material of enumeration rules.

At the data collection stage, the researchers conducted two activities namely literature study and interviews. At the literature study stage, the researcher examines research that is relevant to the research to be conducted. In addition to reviewing relevant research, researchers also conducted interviews with mathematics subject teachers in Negeri 2 Banguntapan, Mrs. Heni Kristiana. The interview revealed that the lack of learning media in schools also caused a lack of student interest in learning. Interactive learning media in the form of CDs is thought to be able to attract students' interest in learning mathematics at the high school.

To develop interactive multimedia-based mathematics learning media on enumeration rules, the researcher went through several stages, namely:

- a. Stage 1

Determine the Decree, BC, and Indicators of the material to be reviewed namely:

 - 1) Competency Standards:
 1. Using statistical rules, enumeration rules, and the nature of opportunities in problem-solving.
 - 2) Basic competence:
 - 1.4 Using permutation multiplication rules, and combinations in problem-solving.
 - 1.5 Determine the sample space of an experiment.
- b. Stage 2
 - a) Make interactive multimedia-based mathematical learning media design on enumeration rules material and make it using Adobe Flash CS6 software.
 - 1) Storyboard

Storyboard is a flowchart of learning media programs. Storyboard in making interactive multimedia-based mathematics learning media is shown in the appendix.

2) Product Design

In this stage the researcher takes the following steps:

- i) Determine the subject matter that will be presented. This development research takes the subject of testing the XI class of high school on the material enumeration rules.
 - ii) Develop learning media in which there are teaching and evaluation materials. In the developed learning media, the animation and colors used are adapted to the students' condition, namely students in class XI of high school so that researchers use animation and materials that help students be interested in and easily understand the material on learning media.
- 3) Develop research instruments which include: questionnaires for experts and questionnaires for students. The questionnaire made in this study there were 3 questionnaires, namely a questionnaire for expert material assessment, a questionnaire for media experts and a student assessment questionnaire.
 - 4) Making media.
Media creation is the process of translating designs and storyboards on the actual display in Adobe Flash CS6. The results of media creation are included in the appendix.
- b) Make a feasibility instrument to assess the feasibility of instructional media then be validated by competent lecturers and experts. The instrument for testing the feasibility of instructional media consisted of a material expert test questionnaire and a media expert eligibility test. In addition, researchers also created a questionnaire for students aimed at knowing the response to the learning media created. Of course, before an instrument or questionnaire is given it is necessary to examine each questionnaire to re-examine the shortcomings of each instrument by a competent expert.

c. Tahap 3

After the learning media is packaged in the form of a learning CD, the next step is to conduct a questionnaire study and then validate the learning media to the material experts and media experts to find out the feasibility of the learning media.

Based on the data analysis technique used, the data obtained from the assessment of material experts, media experts, and students are processed and the results are as follows:

1. Media Validation Questionnaire by Media Experts

The feasibility of instructional media was assessed by one media expert, Ahmad Dahlan University Lecturer in the field of multimedia computers. Based on the calculation of the score of the results of the assessment of media experts is 89. The results indicate that the developed learning media in terms of multimedia display included in the very feasible category.

2. Material Validation Questionnaire By Material Expert

The feasibility of the learning material was assessed by two material experts, namely Ahmad Dahlan University lecturer and mathematics teacher at SMAN 2 Banguntapan. Based on the calculation of the average score of material expert assessment results is 52.5. These results indicate that the developed learning media in terms of material included in the feasible category.

3. Student Research Questionnaire

Student responses to the learning media developed, are known based on questionnaires given and filled out by students in trials and research.

Table 1. Results of Calculation of Student Response Questionnaire from each Class during Research

No	Class	Total score	Category
1	XI IPA 1	807	Agree
2	XI IPA 3	985	Agree
Average		40,72727273	Agree

Based on the table, it can be seen that students' responses to learning media are already well indicated by a score of 37.5 in the trials and increased in research with a score of 40.8.

Product revision is done in order to produce learning media in accordance with the expected criteria. Based on suggestions from media experts, material experts and students are as follows:

- a. The word "Skip" on the media opening page is replaced by the Indonesian language ("Skip").
- b. Button animations on the Competency page are made bouncing.
- c. Need to minimize and maximize buttons.
- d. There is a need for videos on learning material.
- e. Name input is needed before the evaluation begins.
- f. The question numbers on the evaluation are not parallel.
- g. It is necessary to score information and pass information when completing evaluation questions.
- h. Credit is needed (closing when exiting the learning media).
- i. The use of material and examples is not consistent with learning media.
- j. An explanation of the differences in permutations and combinations that are not yet clear and complete.
- k. Lack of explanation in the form of drawings on learning material.
- l. Other examples of questions about the material need to be added.
- m. The material needs narration
- n. There needs to be a discussion about the evaluation.
- o. The narrative voice is enlarged.

Interactive multimedia-based mathematics learning media on enumeration rules material has been developed in accordance with the ADDIE model. Interactive multimedia-based learning media for mathematics is expected to be appropriate for use in learning and able to attract learning interest to improve student achievement. After conducting a trial, research and revision process, it can be seen that almost all aspects show the results of the "Agree" category. So that the product developed is suitable for use by teachers and students as a medium for learning mathematics on the subject of enumeration rules.

CONCLUSION

The conclusions obtained from this research development are:

1. This learning multimedia was developed using the revised ADDIE model based on suggestions and input from supervisors, media experts, material experts as well as students of SMA Negeri 2 Banguntapan. This model consists of Analysis, Design, Development, Implementation, and Evaluation. This research develops mathematics learning media using Adobe Flash CS6 on enumeration rules material in science majors high schools which are packaged on CD. In this learning, multimedia consists of 6 sub-chapters of material namely the rules of multiplication, factorial, permutation, combination, binomial Newton and the concept of sample space. In addition, the material in the interactive mathematics learning multimedia there are also evaluations, instructions for use, competency standards, basic competencies and indicators for high school students in grade XI.
2. The product of the development of interactive multimedia-based mathematics learning media using Adobe Flash CS6 on the subject of enumeration rules for Class XI High School Science Department has feasible results to be used as a learning media based on questionnaire assessment with an average score of 40.72727273 with the agreed category. Based on the assessment, this mathematics learning multimedia is appropriate to be used as a learning medium.

REFERENCESS

- Arikunto, Suharsimi. 2013. *Dasar-dasar Evaluasi Pendidikan*. Jakarta: Bumi Aksara.
- Arsyad, Azhar. 2014. *Media Pembelajaran*. Jakarta: Rajawali Pers.
- Hamalik, Oemar. 2009. *Perencanaan Pengajaran Berdasarkan Pendekatan Sistem*. Jakarta: Bumi Aksara.
- Mayer, Richard E. 2009. *Multimedia Learning. Prinsip-prinsip dan Aplikasi*. Yogyakarta: Pustaka Pelajar.
- Prawiradilaga, Dewi Salma, 2009. *Prinsip Disain Pembelajaran*. Jakarta: Kencana.
- Purwanto, Ngalm. 2013. *Psikologi Pendidikan*. Bandung: Rosda.
- Sanjaya, Wina. 2013. *Strategi Pembelajaran*. Jakarta: Kencana.
- Sudijono, Anas. 1987. *Pengantar Statistik Pendidikan*. Jakarta: Rajawali Press.
- Sugihartono,dkk. 2007. *Psikologi Pendidikan*. Yogyakarta: UNY Press.
- Sukino. 2013. *Matematika untuk SMA/MA Kelas XI Kelompok Wajib Semester 2*. Jakarta: Erlangga.
- Supatmono, Catur. 2009. *Matematika Asyik*. Jakarta: Grasindo.
- Widoyoko, Eko P. 2014. *Evaluasi Program Pembelajaran*. Yogyakarta: Pustaka Pelajar.
- Wiroidikromo, Sartono. 2007. *Matematika untuk SMA Kelas XI 2 Program Ilmu Alam*. Jakarta: Erlangga.