DEVELOPMENT LEARNING MEDIA BASED ON MACROMEDIA FLASH ON MATRIX MATERIAL

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ABSTRACT

Mathematics is a compulsory subject at the secondary school level, especially on matrix material, sometimes students are still difficult to distinguish rows and columns. It is not easy to do multiplications on matrices. Learning media are expected to be a facility that supports learning. This study aims to develop learning tools based on Macromedia flash subject matter matrix class XI. In developing this learning media based on using Research and Development with the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). This research was conducted at Islamic Senior High School (MA) Muallimin Yogyakarta. The research instrument used was a questionnaire. The quantitative data analysis technique calculates the score of the developed learning media's feasibility test results. The results of research on the development of interactive learning media mathematics based on Macromedia flash subject matter matrix XI based on the quality of each indicator in terms of material experts in the excellent category with an average percentage score of 86.84%, in terms of media experts in the category are very feasible with a percentage score an average of 88.33%, and student responses in the exciting category with an average percentage score of 77.37. The learning media based on Macromedia flash subject matter matrix XI class material is very feasible in the learning process.
Keywords: Macromedia Flash Learning Media, Macromedia Flash, Matrices.

INTRODUCTION

James and James (1976) in E Suherman said that Mathematics is the science of logic regarding the form, composition, quantity, and concepts related to one another with a large number divided into three fields: algebra, analysis, and geometry. Mathematics is also one component of a series of learning which has an important role in education. Mathematics is also one of the fields of study that supports the development of science and technology. In school, institutions also apply mathematics as a subject. In mathematics, there is much material that students must learn when attending secondary school, one of which is the matrix. The matrix itself is taught in class XI at the SMA / SMK / MA level. The matrix is also a challenging material for students, based on interviews of 5 students at MA Muallimin on May 13, 2019. It was found that students had difficulty in distinguishing rows and columns in matrices. Students are still often upside down in determining which rows in the matrix and columns in the matrix. Students also find it difficult to determine multiplications with different orders.

Based on the results of interviews with teachers at MA Muallimin on May 13, 2019, students rarely pay attention to the material delivered by the teacher when conducting the learning process in the classroom. This is because students are less interested in learning in the classroom. This causes students not to understand the material greeted by the teacher. In conducting learning, teachers rarely use learning media, especially those using projectors, so projectors' use is still not optimal. Therefore, we need learning media that can be used in the learning process and optimize projectors' use in the classroom during learning.

As time goes by and the rapid progress of technology, many software can help teachers conduct the classroom's learning process. Teachers usually use learning media, and learning media forms are also various types, some in hardware and some in software. Macromedia Flash software can be used to create interactive and non-interactive animations and can be used to make learning media. By making the animation, it is hoped that it can attract students' learning, interest so that they are more willing to

pay attention to the teacher's material. This study aims to develop learning media that can help students learn mathematics, especially on matrix material.

Based on the above problem limitation, the formulation of the problem in this study is as follows: 1) How to develop Macromedia flash learning tools for class XI matrix material at MA Mu'allimin? 2) nIs the Macromedia flash learning material matrix class XI developed at MA Mu'allimin feasible to be applied as a learning medium?

This research and development objectives are: 1) Knowing the procedure for making Macromedia flash learning materials for class XI matrix material at MA Mu'alimin, which is appropriate for use in the learning process. 2) Producing Macromedia flash learning matrix material products for class XI at MA Mu'alimin.

METHODS

This type of research is included in the research development of the development of mathematics learning media. Research and development methods (Research and development) are research methods used to produce specific products and test them (Sugiyono, 2015: 407). The product produced in this study is a mathematics learning media subject matter Matrix using Macromedia flash 8. The subject of this study is MA Mu'alimin students in class XI on the subject matter Matrix. The steps in this study use the ADDIE development model, namely Analysis, Design, Development, Implementation, and Evaluation. The type of data taken in qualitative data is converted to quantitative scale 5 in Table 1.

Table 1. Rules for granting scale using a Likert scale

Information	Score
SA (Strongly Agree)	5
A (Agree)	4
D (Doubtful)	3
DA (Disagree)	2
SD (Strongly Disagree)	1

(Sugiyono, 2015:135)

From the data that has been collected, we calculate the average using the formula:

$$K = \frac{F}{N \times I \times R} \times 100\% \quad \text{…………………………….. (1)}$$

Information:

K: Percentage of eligibility

F: The total number of respondents' answers

N: Highest questionnaire score

I: Number of questions in the questionnaire

R: Number of respondents

(Palelupu dan Cholik, 2014: 4)

After knowing the results of the feasibility calculation, then interpreted according to Table 2.

Table 2. Implementation Criteria for Feasibility Assessment Validators

Percentage	Criteria
0% - 20%	Very bad
21% - 40%	Not good
41% - 60%	Enough
61% - 80%	Well
81% - 100%	Very good

Learning media is appropriate if all aspects of the questionnaire receive a minimum of 61% percentage with good and very good criteria.

The trial data of the development of learning tools based on Macromedia flash-based learning media subject matter Matrix XI MA Muallimin was obtained using the R & D (Research and

Development) method ADDIE model development research process. The development steps are as follows:

1. Analysis

   In the analysis phase, researchers conducted several analyzes to obtain a picture of the learning media to be developed. The analysis conducted by researchers is a needs analysis, Material Analysis, and Curriculum Analysis. Analysis of needs is done as a basis for development and a description of the actions. From the results of observations and interviews at MA Muallimin, it was found that there was potential in the form of LCD facilities and laboratories. Still, several problems were found, and from the problem, it was found that the development of mathematics learning media was one of the solutions in helping teachers overcome problems in the learning process for the delivery of material varies. Hence, students are more motivated to take mathematics learning especially on matrix material. After analyzing the needs, the next step is to choose the material to be developed in the learning media. The selection of this material is made by consulting with mathematics teachers at MA Muallimin. The matrix material is allowed to be chosen as the subject of the development of instructional media. Curriculum analysis is obtained by studying learning material, Core Competencies (CC), Basic Competencies (BC), Indicators, and learning objectives

2. Design

   After the analysis phase, the next stage is the design stage. Several steps create a design, interface design, and research instrument design in this stage. The final result of research and development activities is a new product design, complete with specifications. Product design must be realized in a flowchart to be used as a guide to assess and create it. Based on the resulting flowchart, the researcher then makes an interface design for each display design is very important to be a guideline for making each part of the learning media. Instructional media assessment instruments are made to assess instructional media's feasibility before being used in the learning process. Before being used to determine learning media, assessment instruments are first examined by experts, namely lecturers, who are competent to improve the contents of these instruments. There are three assessment instruments used in research to assess learning media, namely instruments for material experts, instruments for media experts, and student response instruments, and Mr. Syariful Fahmi, M. Pd review the instruments. Moreover, the review given by him has been given inputs used to improve the instrument's quality.

3. Development

   Media development is translating instructional media's design into actual appearance, the interface's appearance. Developing a validation and trial process is also carried out on the media's initial product so that the learning media is suitable for use in learning. In this development stage, the material expert validation and media expert validation are carried out. Material experts consist of two people, namely Dra. Sumargyani, M.Pd. is a mathematics education lecturer at Ahmad Dahlan University, and Mr. Zulfi Jalal Munsin, S. Pd, a mathematics subject teacher at MA Muallimin. While the media experts consisted of two people, namely Mr. Syariful Fahmi, M. Pd. This is a Mathematics Education lecturer at Ahmad Dahlan University and Mr. Zulfi Jalal Munsin, S. Pd, a mathematics teacher at MA Muallimin. Limited trials were conducted to determine the level of response and input from students before being used in large classes. The trials were carried out after the learning media was improved in the previous stage. This trial was given to 5 MA Mualimin students with heterogeneous or evenly distributed abilities from high, medium, and low. This is done so that the responses and input provided represent all aspects of a class. So the results achieved can improve the quality of learning media developed. The mathematics teacher chose the five students taking part in the limited trial because the most familiar level of student intelligence was the school's teacher in question. In contrast, the teacher explained to students about the learning media developed after the researcher divided the questionnaire to be filled out by students in the limited trial. The questionnaire results filled out by students at the time of the trial were then calculated to know the media's eligibility level.

4. Implementation

    A large class test is a final stage in the process of developing learning media. Trials were given to 30 students of class V MIA 1 Ma Mualimin. The study chose class V MIA 1 because the school's mathematics teacher recommended it. The researcher presented this learning media in the learning process. After finishing using the learning media, researchers distributed student response questionnaires to determine student responses to the learning process.

5. Evaluation

    Evaluation is the final stage of the ADDIE development model. Evaluation can be defined as a process carried out by someone to assess something; in this case, the learning media's quality. The assessment is given to several parts, namely the quality of instructional media based on material aspects, the quality of instructional media based on media appearance, and student responses to learning media. The assessment is used as a reference in determining the appropriateness of the learning media developed. Before evaluating the learning media, they are first validated by experts, and invalidation there are inputs and suggestions from experts, both material experts and media experts.

RESULTS AND DISCUSSION

The feasibility of the learning material was assessed by two material experts, namely Ahmad Dahlan University lecturer and Mathematics teacher MA Mualimin. The implementation criteria for the validity assessment are implemented according to Table 3.

Table 3. Results of Calculation of Material Expert Instruments in Three Aspects

No	Aspect	Percentage of Eligibility	Eligibility Category
1	Theory	92,86%	Very good
2	Learning	78,57%	Well
	Linguistic	90,00%	Very good

Table 4. Overall Results of Calculation of Material Expert Instruments

No	Respondents	Percentage of Eligibility	Eligibility Category
1	Expert Material 1	95,79%	Very good
2	Expert Material 2	77,89%	Well
Average Percentage		86,84%	Very good

Based on Table 4 above, it can be seen that the average percentage of expert media judgment was 86.84%. These results indicate that the learning media developed are seen in terms of the excellent category's material.

The feasibility of instructional media based on media aspects was assessed by two media experts, namely Ahmad Dahlan University lecturer and mathematics teacher MA Mualimin. The results of the eligibility questionnaire calculations by media experts can be seen in Table 5.

Table 5. Calculation of Feasibility by Media Experts

No	Aspect	Percentage of Eligibility	Qualitative Category
1	Programming	90,00%	Very worthy
2	Display	88,13%	Very worthy

Table 6. Overall Results of Media Expert Questionnaire Calculations

No	Evaluator	Percentage of Eligibility	Qualitative Category
1	Media expert 1	96,67%	Very worthy
2	Media expert 2	80,00%	Worthy
Average Percentage		88,33%	Very worthy

Based on Table 6 above, it can be seen that the average percentage of eligibility for assessment by media experts is 88.33%. These results indicate that the developed learning media in terms of media are included in the very feasible category.

Student responses to the developing learning media can be known through the questionnaire's results and filled out by Ma Mualimin during limited trials and large class trials. The results of calculating student response questionnaires can be seen in Table 7.

Table 7. Results of Calculation of Questionnaire Student Response Against Three Aspects

No	Aspect	Limited trial		Large class trials	
		Average percentage score	Qualitative Category	Average percentage score	Qualitative Category
1	Media	80,00%	Interesting	79,62%	Interesting
2	Theory	80,80%	Interesting	77,33%	Interesting
3	Effectiveness for students	78,29%	Interesting	75,14%	Interesting

Table 8. Results of Calculation of Student Questionnaire

No	Trial Sample	Percentage of Response	Qualitative Category
1	Limited trial	79,58%	Interesting
2	Large class trials	77,37%	Interesting

Based on Table 8 above, it can be seen that the results of student responses in limited trials are 79.58%, so the learning media developed are included in the exciting category. In comparison, the results of student responses in large class trials are 77.37%, so that the learning media developed are included in the exciting category.

The data was obtained from experts and students' assessment in quantitative data based on the data analysis technique used. The quantitative data generated are then analyzed for each assessment instrument. The final score obtained is converted to a qualitatively feasible level of product using ideal rating criteria. Based on the ideal assessment obtained by the quality of mathematics learning media of every evaluation. The combined calculation of the material expert questionnaire, media expert questionnaire, and student responses to learning media can be seen in Table 9.

Table 9. Combined Calculations of Learning Media

No	Aspect	Average percentage	Eligibility category
1	Media	88,33%	Very decent
2	Theory	86,84%	Very good
3	Limited trial	79,58%	Interesting
4	Large class trials	77,37%	Interesting
	Total	83,03%	Very decent

The average percentage of the final score obtained for learning media that has been developed is 83.03%. This learning media is stated as feasible as a source of learning mathematics on the subject matter matrix for class XI students.

At the time of product validation, the material experts and media experts made several product revisions to get good results. After all the stages have been passed, this research's final product is obtained, namely the development of learning media using Macromedia flash on the matrix's subject matter, using the ADDIE development model. Learning media has been successfully developed and tested by media experts, material experts, and students in schools. A trial was conducted to determine the feasibility of the resulting media. During the trial phase, revisions were made based on experts, material experts, and media experts' suggestions and input. The trials conducted obtained a percentage of 80.03% so that the learning media included in the category fit to be used as a learning resource. The

advantage of the developed learning media lies in the media indicators, which have the highest 79.62% average. While the learning media's weakness lies in the effectiveness indicator for students because it has the lowest average percentage of 75.14%.

Thus the researcher's questions have been answered by successfully developing learning tools based on Macromedia flash matrix subject matter using the ADDIE method. The developed media has very decent quality, meaning that the learning media is very suitable to be used as a learning resource.

CONCLUSION

From the results of this development study, it can be concluded as follows:

1. The steps of developing learning media for class XI based on Macromedia flash material subject matter matrix.
   a. How to collect information for the development of learning media class XI based on Macromedia flash matrix subject matter that is by analyzing, the results of the analysis are the use of projectors in the classroom that is less than optimal, learning media that uses projectors and mathematics learning especially in matrix material requires learning innovation in the form of media learning. The material analysis was then carried out in consultation with a mathematics teacher in class V MIA and selected Matrix material. A technology analysis was carried out to find out the software by the researchers' abilities and develop learning media using Macromedia Flash 8 Professional software.
   b. Learning media design begins with making flowcharts, views, and storyboards in advance so that the flow of making media can be read. Then make the opening display design (loading), intro display design, main menu display design, display user manual design, material menu display design, profile display design, material display design, practice question display design, evaluation display design, display design arrangement, design video display, CC / BC display design, indicator display design, and finally exit design.
   c. Researchers choose lecturers and teachers who are competent in their fields to validate the learning media. The learning media is validated by two material experts and two media experts to get an assessment in the form of input and suggestions regarding the quality of learning media.
   d. Researchers make revisions to the learning media based on input and suggestions from the validator.
2. Feasibility of learning media developed in support of learning matrix material.
   a. Testing is done twice, namely limited trials and large class trials. Limited trials were given to 5 students with heterogeneous or uniform ability from high, medium, and low. It is intended that the responses and input provided can represent all aspects of the class. In contrast, large class trials were conducted on 30 students. Researchers present these learning media in the learning process. After completing the learning media, researchers distributed student response instruments to determine student responses to the learning process using learning media.
   b. This study's data analysis technique is a descriptive qualitative analysis technique that describes product development results in learning media for class XI based on Macromedia flash matrix subject matter. Done by collecting data, display data, data reduction, and data verification.
   c. When viewed from the aspect of material expert judgment, instructional media's feasibility has an average percentage of 86.84%, so it shows that the learning media developed when viewed from the aspect of material assessment are in the very good category.
   d. When viewed from the aspect of assessment by media experts, instructional media's feasibility has an average percentage of 88.33%, so it shows that the learning media developed when viewed from the aspect of assessment of media experts are in the very feasible category.

e. When viewed from students' responses, learning media's feasibility has an average percentage of 77.37%, showing that the learning media developed when viewed from students' responses are in the exciting category.

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