

DEVELOPMENT OF MATHEMATIC LEARNING MEDIA ON POLYGON MATERIALS BASED ON MACROMEDIA FLASH PROFESSIONAL 8

Herfiana Alvionita^a, Widayati^b

Program Studi Pendidikan Matematika Universitas Ahmad Dahlan
Jalan Ring Road Selatan, Tamanan, Banguntapan, Bantul Yogyakarta

herfianaalvionita@gmail.com, ummutsabit64@gmail.com

ABSTRACT

The use of instructional media in mathematics learning has not been maximally utilized. The teaching materials used are difficult to understand. The limitations of learning media cause students to feel difficulties in understanding the material. This development research aims to determine the development of mathematics learning media on Polygonmaterial based on Macromedia flash professional eight and the feasibility of mathematics learning media products in supporting mathematics learning on Polygonmaterial. This study uses the Research and Development (R & D) research and development model developed covering the research and data collection stages, planning, developing draft products, initial field trials, and revising trials' results. Subjects in the research and development of learning media were material experts, media experts, and students' responses to Muhammadiyah Junior High School 2 (SMP 2 Muhammadiyah) Depok and State Junior High School 4 (SMP Negeri 4) Patuk. This study's object is a medium of learning mathematics of Polygonmaterial based on Macromedia flash professional 8. This learning media has gone through a revision stage based on suggestions and input from material experts and media experts and student responses. The results showed that the assessment by material experts averaged 73.67 with very good categories. The assessment by media experts on average was 51.67 with good categories, and the assessment of student responses averaged 74.92 with excellent categories. These results show that mathematics learning media on Polygonmaterials based on Macromedia Flash Professional 8 is suitable for the learning process and gets positive responses from students.

Keywords: Learning Media, Polygon, Macromedia Flash Professional 8

INTRODUCTION

The development of information and communication technology is a big challenge for education. The rapid development of technology and communication must receive serious attention from education practitioners so that the world of education is not out of date and strides. Education must be proactive in technological development. The rapid technology now also supports the creation of modern learning media, namely by utilizing computer technology. Learning media using computers is expected to increase interest and motivation in learning and help students understand mathematical material. Indeed, learning will be more exciting and more varied. Students need media to learn mathematics so that the abstractness of mathematics can be learned quickly with models or teaching aids presented on the media used. The media are all physical tools that can present messages and stimulate students to learn (Briggs in Arief S Sadiman et al.: 2014).

The development of learning media can use software found on computers. One software or software that can be used to develop learning media is Macromedia Flash Professional 8. This software was chosen because Macromedia Flash Professional8 can make a variety of exciting animations. Macromedia Flash Professional 8 also has many advantages and uses, especially in delivering subject matter to students interested in learning it. These advantages include drawing, animation, and sound that have their charm and make it easy to learn and understand the subject matter, making it suitable for an exciting and fun learning tool, one of them on the Polygon material.

In Suherman et al. (2003: 16-17), there are several opinions from experts who define the notion of mathematics. In their mathematical dictionary, James and James say that mathematics is the science

of logic about forms, structures, quantities, and concepts related to one another, with numbers. large area which is divided into three areas, namely algebra, analysis, and geometry. Reys et al., In their book, say that mathematics is the study of patterns and relationships, distant or thought patterns, art, language, and instruments. From the opinion of some experts, it can be concluded that mathematics is a discipline that studies everything that is logical, definite, and related to one another and puts forward the language of symbols rather than sounds and the disciplines that are most associated with it. human life. The meaning of learning according to several experts at Winataputra, Udin S., et al. (2011: 1.4 - 1.46), namely: Bell-Gredler (1986: 1) states that learning is a process carried out by humans to obtain various competencies, skills, and attitudes. Ability (competence), skills (skills), and attitudes (attitudes) are obtained gradually and continuously from infancy to old age through a series of lifelong learning processes.

Learning is the process of acquiring knowledge by reading and using experience as knowledge that guides future behavior. Walker & Hess (Arsyad, 2014: 219-220) provide criteria in reviewing learning media software based on quality: 1) Quality of content and objectives. 2) Quality of learning. 3) Technical quality. Meanwhile, according to Wahono (2006) there are three aspects and criteria for instructional media, including: 1) Software engineering aspects. 2) Learning Design Aspects. 3) Visual Communication Aspects. Based on the That explanation, it is necessary to pay attention to these instructional media development qualities. The aspects contained in the quality of the media are used as a basis for developing a learning media and as a reference in the formulation of questionnaire grids to assess the learning media developed. However, not all of them serve as a reference because it is adapted to the learning media developed to be by its function. Based on the results of interviews conducted by researchers with Ms. Ratnaningsih, S.Pd. A mathematics teacher at SMP Muhammadiyah 2 Depok found that teachers' teaching materials only refer to textbooks as teaching references. Teaching materials used by schools are difficult to understand. The limitation of learning media and reference to learning materials causes students to feel difficulty understanding the material.

The same thing was also found by researchers at SMP Negeri 4 Patuk Gunung Munidul Yogyakarta. Learning media in the form of teaching aids used by Mr. Kristanto, S.Pd. as a mathematical teacher already exists, but has not been fully utilized because it only explains it without giving examples in real life. Teachers also only use LKS and textbooks as they are used so that there are still many students who occupy themselves when the learning process takes place in mathematics. In this case, students ignore the delivery of material made by the teacher. Teachers lack instructional media use in the learning process because teachers have not utilized learning media to the fullest. The use of instructional media is very important to convey mathematical material, one of which is Polygon. In the field, the use of expository methods is still widely chosen by teachers in delivering Polygon. This method causes students to get bored to learn and understand the material. Students only listen and record the teacher's explanation so that the time used in learning is also less effective.

Many schools already have computer laboratories to support the learning process, which includes SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk. The school itself has also added additional learning technology facilities such as projectors. Based on the results of interviews with mathematics teachers in both junior high schools, it can be information that the existence of computer laboratory facilities is still rarely used for learning mathematics. For learning mathematics, the subject of the Polygon has used simple mathematical teaching aids. However, so far, there has been no learning media using Macromedia Flash Professional 8 in delivering Polygon. Researchers are interested in developing learning media based on Macromedia Flash Professional 8 as teaching materials. The Learning Media developed is a mathematics learning media based on Macromedia Flash Professional 8 through a study entitled Development of Mathematics Learning Media on Macromedia Flash Professional 8-Based Polygon Materials.

The purpose of developing teaching materials in the form of instructional media is as follows:

1. It was knowing the development of mathematics learning media on Macromedia Flash Professional 8-based Polygon material.

2. It was knowing the feasibility of mathematics learning media products in supporting mathematics learning in the Polygon material.

METHODS

The research method used is the research and development method. Research and development is a process or steps to develop a new product or improve existing products, which can be accounted for (Syaodih, Nana: 2013, 164). This research is focused on developing mathematics learning media based on Macromedia Flash Professional 8, which is packaged in the form of Compact Disc (CD) for seventh-grade students of Bangun Datar subject. According to Borg and Gall (1989) (Syaodih, Nana: 2013,169-170), there are ten steps to implementing research and development strategies.

1. Research and information collecting
2. Planning
3. Develop a preliminary form of product
4. Preliminary field testing.
5. Main product revision
6. Main field testing.
7. Operational product revision
8. Operational field testing
9. Final product revision
10. Dissemination and implementation

Research subjects are:

1. Media Expert and Material Expert

The media expert and material expert in question are mathematics lecturers. Media experts will provide an assessment of Macromedia Flash Professional 8-based mathematics learning media that is developed based on the quality of the media, the feasibility of presentation, and the feasibility of graphics. The material expert will provide an assessment of the Macromedia Flash Professional 8-based mathematics learning media that is developed based on the quality of the content and the suitability of the scientific method.

2. Education Practitioners

The education practitioners referred to in this study are mathematics teachers at SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk. They will provide responses on Macromedia Flash Professional 8-based mathematics learning media developed before being trialed to students. Responses and input obtained from education practitioners, researchers will revise the learning media in mathematics to optimal the final teaching results.

3. Learners

Learners are the subjects of trials to assess product eligibility. The test subject for this research is students of SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk class VII. In testing mathematics learning media based on Macromedia Flash Professional 8, students are asked to pay attention when they teach using learning media based on Macromedia Flash Professional 8. Then students are given a questionnaire sheet to provide an assessment of the developed mathematics learning media. The assessment results through a questionnaire can be analyzed whether the products developed are by the expected results. Students are also asked to provide input or suggestions for revising mathematics teaching materials based on Macromedia Flash Professional 8. The results of the product revision are the final products of the research and development carried out.

Data collection techniques using questionnaires (questionnaire). Sugiyono (2015: 199), in his book, said that the questionnaire is a data collection technique that is done by giving a set of written questions to respondents. The instrument in this study was a questionnaire aimed at material experts, media experts, and students. The evaluation questionnaire is used to measure the content, presentation, language, and visual learning media feasibility to be developed. In this case, researchers will create

three questionnaires aimed at material experts, media experts, and students.

RESULTS AND DISCUSSION

This research resulted in a product in mathematics learning media on Polygon based on Macromedia flash Professional 8. The concept built in this media is the application of mathematics learning, especially on Polygon. This learning media was developed using research and development methods with a research and development strategy, according to Borg and Gall (1989). While the developer software used is Macromedia Flash Professional 8. Following is a description of the stages of developing learning media:

1. Research and Data Collection

This research and data collection phase is the initial stage of media development. The results of research and data collection are used as guidelines and considerations in instructional media preparation. Research and data collection include the measurement of needs. The existence of instructional media in learning mathematics is needed to overcome schools' problems, especially in learning mathematics. As happened at the junior high school level/equivalent around us, learning media is still needed to support learning activities both for classical learning in class and independent learning. The results of observations and interviews of mathematics teachers in SMP Negeri 4 Patuk and SMP Muhammadiyah 2 Depok obtained information as follows:

- a. The speed of students' understanding of the material from one student to another varies.
 - b. The media used in schools tend to be on elaborating materials and practice questions, so students tend to be passive and not invited to participate actively in learning.
 - c. The media used still needs to be improved both in terms of content and appearance.
 - d. Not yet available interactive learning media for teaching specific material.
- ### 2. Planning. At the planning stage the researcher considers the elements contained in media content. The design must be adapted to the curriculum and student characteristics. The activities carried out at this stage are:
- a. Outline the content of learning media
 - b. Prepare reference books, collect pictures, materials, and questions related to class VII Polygon material.
 - c. Arranging Polygon materials The arrangement of this material is made to make it easier to pour the contents and flow of materials on the designed media. Polygons include triangles and rectangles.
 - d. The making of software used to develop learning media is Macromedia Flash Professional 8. The preparation of this software is done by installing the Macromedia Flash Professional 8 application on the computer used as a developer tool.
 - e. Structuring the media content (flowchart) of learning media. Before compiling the storyboard, the researcher arranged the structure of the learning media content based on an outline of the media content that had been compiled.
 - f. Describe the content of the material. In general, the material description contains details of the content of the material to be published in the media so that the appearance of each media becomes clearer.
 - g. Create a storyboard. The storyboard explains in detail the flow of the media in learning including the layout of the media content and navigation to provide an overview of the media.
- ### 3. Product Draft Development Stage. At this stage, the activities are carried out to create interactive multimedia-based learning media in applications.
- a. Early Media Products. Learning media was developed with Macromedia Flash Professional 8. The program is created using the main display which contains the main navigation buttons. Its navigation is as a means of calling other.swf files containing comparison material.
 - b. Consultation with supervisors. The initial product that has been made is then consulted with the supervisor.

- c. Validation by experts. Validation was carried out by material experts and media experts. At this stage the expert provides an assessment of the media that has been made.
- d. Product Repair. After evaluating the learning media by both material experts and media experts, several revisions were made based on the advice of material experts and media experts.

The results of the product evaluation by the validator are based on the ideal evaluation criteria, according to Djemari Mardapi (2012: 162), presented in Table 1.

Table 1. Ideal Assessment Criteria

No	Score	Criteria
1.	$X_k > \bar{X}_l + 1,80SB_i$	Very good
2.	$\bar{X}_l + 0,60SB_i < X_k \leq \bar{X}_l + 1,80SB_i$	Good
3.	$\bar{X}_l - 0,60SB_i < X_k \leq \bar{X}_l + 0,60SB_i$	Enough
4.	$\bar{X}_l - 1,80SB_i < X_k \leq \bar{X}_l - 0,60SB_i$	Less
5.	$X_k \leq \bar{X}_l - 1,80SB_i$	Very less

Three material experts, namely Drs, assessed learning media assessment mathematics. H Edi Prajitno, M.Pd, lecturer in mathematics education at Ahmad Dahlan University, Ratnaningsih, S.Pd. is a teacher from SMP Muhammadiyah 2 Depok and Kristianta, S.Pd. Who is a teacher from SMP Negeri 4 Patuk. The assessment of the material experts' eligibility questionnaire calculation results can be seen in Table 2 below.

Table 2. Results of Calculation of Expert Material Assessment

No.	Assessment	Score
1.	Drs. H Edi Prajitno, M.Pd	72
2.	Kristanta Adi B, S.Pd	75
3.	Ratnaningsih, S.Pd	74
	Mean	73,67
	Criteria	Very Good

The results above indicate that the Mathematics Learning Media on Macromedia Flash Professional 8-based Polygon Material for Middle School Students Class VII judged in terms of material included in the criteria is very high. Media experts assess the feasibility of the product in terms of media. The referred media expert is UAD Mathematics Education media expert lecturer, namely Anggit Prabowo M.Pd. At the same time, the mathematics teacher is Ratnaningsih, S.Pd. is a teacher from SMP Muhammadiyah 2 Depok and Kristianta, S.Pd. Who is a teacher from SMP Negeri 4 Patuk. An assessment of the results of a feasibility questionnaire by media experts can be seen in Table 3.

Table 3. Results of Calculation of Media Expert Rating

No.	Assessment	Score
1.	Anggit Prabowo, M.Pd	51
2.	Kristanta Adi B, S.Pd	52
3.	Ratnaningsih, S.Pd	52
	Mean	51,67
	Criteria	Very Good

The above results indicate that the Mathematics Learning Media on Macromedia Flash Professional 8 Polygon Material for Middle School Class VII students is assessed in terms of the media included in the very high criteria. Student responses to the product are known based on the results of the questioner filled out by students. When testing, the student response can be seen in Table 4 below.

Table 4. Results of Calculation of Student Response Assessment

No.	School	Mean
1.	SMP Muhammadiyah 2 Depok	74,93
2.	SMP Negeri 4 Patuk	74,91
	Mean	74,92
	Criteria	Very Good

Based on the table above, an overall average of 74.92 is obtained. The mathematics interactive learning media is stated in the very high category.

CONCLUSION

Based on the results of this research and development, it can be concluded that:

1. Developing Learning Media based on Macromedia Flash Professional 8 In developing mathematics learning for grade VII junior high school students, the material is taken according to the determined development procedures. In this study, the procedures used are by developing the R&D model described by Nana Syaodih. The steps taken include:
 - a. Research and data collection (research and information collecting).
 - b. Planning
 - c. Development of product drafts (develop a preliminary form of product).
 - d. Preliminary field testing (preliminary field testing).
 - e. Evaluation
2. The quality of mathematics interactive learning media is measured based on the results of assessments from media experts and material experts. Media experts' average score for media quality reaches 51.33, which belongs to the Very High category. Simultaneously, material experts' average score reaches 77.33, which is included in the Very High category. Based on experts' assessment and advice, learning media that have been developed and revised, the media is feasible to use and try out.
3. The overall average score of all aspects of the results of the student assessment questionnaire data at SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk was 74.92 or included in the Very High category. This shows that interactive learning media in mathematics gets positive responses from students. Students give an excellent response to the quality of learning media developed.

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