



MACROMEDIA FLASH TO DEVELOP MATHEMATICS LEARNING MEDIA ON THE MATERIAL OF POLYHEDRON

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ABSTRACT

This study aims to determine the process of developing interactive learning media in a valid, practical, and effective material of polyhedron. This research used Research and Development (R&D) with analysis, Design, development, implementation, and evaluation model. The developed product was interactive learning media based on the Macromedia Flash application, then tested on students. The collecting data techniques used in this study were questionnaires, observation, and learning outcomes tests. The instruments used were expert validation sheets, teacher and student questionnaires, and student learning outcomes tests. The data analysis technique used was descriptive data analysis. Based on the validation results from experts on instructional media, teacher and student response questionnaires and learning outcome tests were considered very valid. Referring to the analysis of teacher and student responses, they generally gave positive responses, which means that this learning media was considered practical. In addition, the average test result of student learning fulfilled the minimum completeness criteria, so it was assumed to be effective. Thus, interactive learning media based on the Macromedia Flash application was considered valid, practical, and effective.

Keywords: Learning media; macromedia flash; Polyhedron

1. INTRODUCTION

The educational paradigm in the 21st century is marked by the use of technology in learning as demand for the industrial era 4.0 (Pakpahan & Fitriani, 2020). The emergence of the Coronavirus Disease (Covid-19) outbreak that has hit the world, including Indonesia, has made technology easier to apply in the industry 4.0 era. The virus that initially appeared in Wuhan, China, has changed aspects of life, including in the field of education, especially the learning process carried out in

schools. The government, through the Ministry of Education and Culture has issued a policy not to conduct face-to-face learning in schools to avoid the spread of the COVID-19 virus (Zahra, Wardhani, & Krisnani, 2020: 49). All teaching and learning activities have been carried out online. Therefore, a teacher must be competent in using technology in the learning process to achieve learning objectives (Sumantri, 2015: 303). The teacher should be creative in developing various interactive learning media by using information and communication technology and the updated communication to facilitate the students' learning. Due to this digital era, students are not satisfied with conventional education, they highly expect the learning environment that enables to achieve the learning objectives through interesting and pleasing ways (Nafi'ah & Utami, 2017: 103-112).

One of the mathematical materials with a high level of difficulty and abstraction is the Polyhedron material (Nurhikmayati, 2017). The same thing was also stated by Maisyarah & Prahmana (2020) that geometry material is a complex material for students. In fact, these materials are often found in students' daily lives, such as cupboards, dice, cardboard and so on (Umam & Yudi, 2016: 86).

Based on the observations conducted in Madrasah Tsanawiyah Islamiyah (MTs) class VIII, the teacher has difficulty conveying Polyhedron material through online learning, so he tries to draw shapes as learning media or looks for images of shapes and then sends them to students. However, according to him, the media is less attractive because the students do not seem interested, so they do not pay attention to the learning. As a result, the students do not master the concept of building space. In addition, the researchers also conducted interviews with several students at the school, they said that mathematics is the most frightening subject especially in the material of building space, while the concept understanding is vital in mathematics learning to support the students' ability in understanding the further mathematics learning materials as in problem solving (Fauzi, Sawitri, & Syahrir, 2020). Likewise, the teacher always gives assignments in every meeting. Even though the teacher has explained the material, the students do not understand the material explained, and as a consequence they are threaten to be given low scores.

According to Fauzi, Sawitri, & Syahrir (2020) stating teacher misunderstandings in teaching mathematics in class also needs to be considered, because there are still some teachers who give some pressure to their students in memorizing the mathematical formulas given, resulting in the students who forget these formulas quickly. This condition will continue to occur when the

mathematics teacher considers himself/ herself a source of learning for students and ignores the role of learning media (Sundayana, 2013: 3). Therefore, it is important for teachers to choose methods and use appropriate learning media so that they can help students more easily understand the concepts being studied.

A systematic and effective learning process in accordance with the times can be achieved by using methods that are multi-directional or interactive, both between teachers and students as well as interactions between students and students (Arsyad, 2016: 15). One of the interactive learning materials that can support interactive learning is namely, the interactive media of two or more media combinations (audio, text, graphic, picture, animation, and video) which the users manipulate to control instruction or a natural behavior of a presentation (Wibawanto, 2017: 3). The interactive multimedia can reduce conventional learning and make students understand the material better (Wicaksono, 2016: 124).

One of the uses of technology that has become an innovation in today's interactive learning media is the application of macromedia flash, which is software that has advantages in displaying multimedia, a combination of graphics, animation, sound, and interactive user (Wibawanto, 2017; Marnita & Ernawati, 2017; Guan, Song, & Li, 2018; Reffiane & Bayutama, 2019). Based on the research conducted by Sigit Priatmoko (2008) who stated that the comparison between the students' learning outcomes that used learning media based PowerPoint application are lower than using the learning media based macromedia flash. Macromedia flash is a program that is used to create interesting vector and bitmap animations for making an interactive and dynamic website. In addition, the application can also be used to make a logo animation, movie, interactive menu, interactive stuffing icon, and other websites (Putri & Rakhmawati, 2018: 75). Furthermore, the Macromedia Flash application works on Windows systems, has a broad and sophisticated range of capabilities (Tanrere & Side, 2012: 158), as well as make it easier for students to draw or understand spatial shapes (Umam & Yudi, 2016: 86) and multimedia has some characteristics like integration, diversity, and interaction that enable people to communicate information or ideas with digital (Abdulrahman & Faruk, 2020). By using learning media, teachers can easily convey mathematical concepts. Therefore, the interactive learning media using macromedia flash application is the mathematics learning material that has the benefit to make uninteresting learning atmosphere become more interesting one and decrease the students' boredom during the learning and teaching

process because the material presentation is equipped with images, voice, video, animation, and text (Putri & Rakhmawati, 2018: 73).

This is in line with the research conducted by (Ramli, 2015: 146) that by applying learning media that can facilitate communication, the teaching and learning process make students comfortable, so that learning objectives can be achieved optimally. Moreover, the study conducted by (Batubara & Sari, 2020: 82) revealed that the use of learning media in the form of video tutorials during the covid-19 pandemic can complement online learning facilities. Likewise, research conducted by Nurzaelani & Kasman (2019) explains that using interactive media for national integration based on mobile learning is very effective. Likewise, the research implemented by Vita Ayu Dwi (2019) found that learning videos can improve student learning achievement (Erlela, 2019: 9).

From several previous studies, all of them generally use learning media, either audio media, visual media, or both. Therefore, researchers are also interested in developing multimedia different from previous ones, namely interactive media based on macromedia flash specifically for Polyhedron material. Thus, this research aims to develop interactive learning media using the macromedia flash application on Polyhedron material.

2. METHODS

This research is a Research and Development (RND), a method used to produce specific products and test the effectiveness of the products. The development model used in this research is ADDIE (Analysis, Design, Development, Implementation, Evaluation). This development model shows clear and careful steps to produce a product because when viewed from the working procedure, the ADDIE development model is very systematic, specifically at every step that were passed. It always refers to the previous step that has been improved so that an effective product is obtained. The test subjects in this study were ten students of class VIII MTs Darusshalihin Berru, South Sulawesi. The instruments used were validation sheets, student response questionnaires, teacher response questionnaires, and learning outcomes tests. The analytical techniques used were validity, practicality, and effectiveness analysis techniques.

3. RESULTS & DISCUSSION

Results

Learning media development based on the macromedia flash application was carried out using the ADDIE development model, which consists of 5 stages: Analysis, Design, Development, Implementation, and Evaluation.

Analysis stage, the first stage in this research was the performance analysis stage. This stage aimed to discover and clarify the problems faced in schools related to the learning media used so far. After conducting a performance analysis or interview, it was known that the media used was to explain and describe the shape of the room or look for pictures of the building. The second stage was need analysis which aimed to analyze the needs of students to increase interest in learning, quality of learning, and presentation of students' learning. Referring to the observations that had been made in MTs class VIII by interviewing subject teachers, they stated that of many mathematics materials taught, the spatial material was tough to teach because students had difficulty in understanding the material. To make mathematics learning well conveyed and accepted by students, the latest innovations in learning mathematics are needed, namely by utilizing learning technology to boost students' motivation and interest in learning.

Design stage, the design stage is a follow-up to the analysis stage. Designing learning media requires a design sketch to help make learning media. The sketch is poured in a flowchart and storyboard. (1) Flowchart, the following is a flowchart of learning media using macromedia flash:

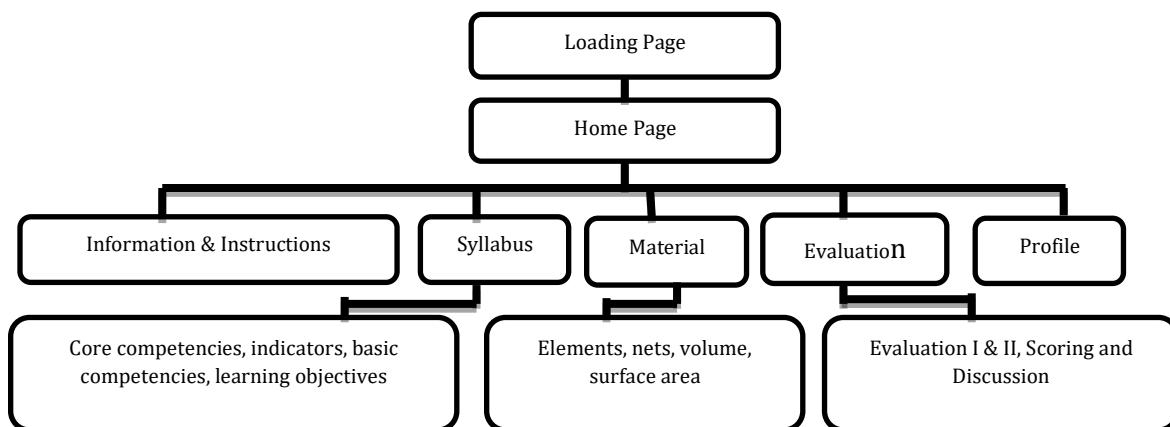


Figure 1. Interactive learning media flowchart plan

(2) Storyboard, based on the flowchart above, the storyboard can be described as follows: (a) Frame of loading page, the initial loading page frame is the initial display that contains the loading display and welcome words and the start button to continue to the menu frame. (b) Homepage frame, the initial page frame contains the title of the material and the buttons that contain the function to display the frame according to the name on the button. The buttons are in the form of instructions, syllabus, materials, evaluation and profile buttons, as shown in Figure 2.



Figure 2. Homepage frame

(c) Information and instructions frame, information and instructions frame contains information about the key functions used in the media and instructions for their use. (d) Syllabus frame, the syllabus frame contains text that includes core competencies, basic competencies, indicators, and learning objectives. (e) Material frame, the material frame contains text (including the title of the material and content), images, audio, animation and material buttons. In this case, there are 4 main materials contained in this learning media including elements, nets, volume and surface area, as shown in Figure 3 below.



Figure 3. Frame material

(f) Evaluation frame, the evaluation frame contains 20 number of practice questions in the form of multiple choices that students will answer. After answering the questions, the page will be replaced showing the number of scores obtained from the results. In addition to the questions, there is an evaluation discussion after the scores are displayed, as shown in Figure 4.

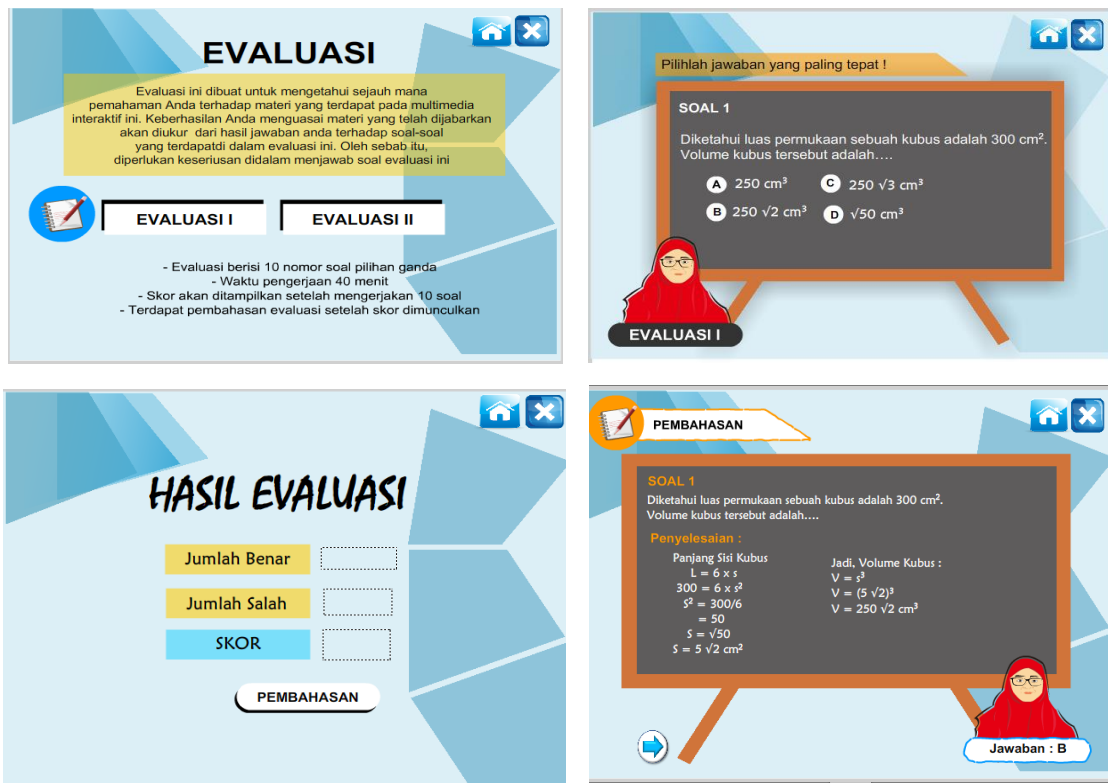


Figure 4. Evaluation Frame

Development stage, during this development stage, several things were carried out including: (a) Designing the learning media, the media that has been designed by researchers and produces prototype I was then created and developed. This media was developed using macromedia flash application. The content of this learning material consists of materials obtained from the mathematics textbook for class VIII MTs/ Junior high school context. (b) Product eligibility validation, after the learning media has been created, product feasibility validation was carried out. The validation of this learning media was carried out by expert validators and asks for theoretical and practical considerations. The validator provided comments and suggestions on the product then the author revised according to the improvement comments. After revising, the validator team assessed the learning media that had been made on the provided validation sheet.

The following is a summary of the assessment results by the validator or team of experts, in table 1 below.

Table 1. Summary of assessment results by expert team

Research Tools	Value	Category
Material	3,17	Valid
Media	3,24	Valid
Teachers' Response Questionnaire	3,28	Valid
Students' Response Questionnaire	3,96	Very Valid
Learning Outcome Test	3,94	Very Valid
Total	3,51	Very Valid

Table 1 shows that the learning media, materials, teacher response questionnaires, student response questionnaires, and learning outcomes tests are in the very valid category because the value of 3.51 is in the interval $3.5 M < 4$. It was revealed that the learning media, materials, teacher response questionnaires, student response questionnaires and learning outcomes tests are appropriate for implementation.

Implementation stage, at this stage, all media designs that have been developed were implemented after revision. The learning media used the macromedia flash application and was tested through online learning by using a website to display learning media and via WhatsApp to

communicate with students. This was due to the Covid-19 pandemic, which required all learning to be done online.

The results of teacher and student responses to learning media using macromedia flash applications are 80% and 89%, respectively, with very positive categories and can be declared practical. Meanwhile, the student learning outcomes test results were obtained with a completeness score of 80% with the complete category and could be declared effective.

Evaluation stage, the last stage of the ADDIE development model was the evaluation stage. At this stage, revisions were made based on suggestions from the implementation stage to improve the interactive learning media that had been developed.

Discussion

Designing a media using macromedia flash application as an interactive learning tool that can be used by teachers and students in the learning process was intended purposively so that students can learn independently. After the learning media and research instruments were declared valid by the validator, only a limited trial was conducted with 1 math teacher and 10 online students due to the Covid-19 pandemic by sending the learning media to the math teacher through email giving the assessment result through WhatsApp. Whereas, for the students, the researchers put the learning media into the website so the students can access it wherever they are, and send the assessment result through WhatsApp. Based on the validation results, it shows that the learning material, media, teacher's response questionnaire, students' response questionnaire, and the test of the students' learning outcomes overall if it is seen from the mean score that is categorized as high validity due to the value of 3.51 is in interval $3.5 \leq M < 4$.

The product's practicality can be seen from the teacher response questionnaire analysis and student response questionnaires. The criteria that is determined to state that the teacher and the students give positive response is if the presentation value given by the teacher and the students is minimum 70% (Arsyad, 2016: 169-170). From the assessment of the teacher's response questionnaire, 80% with the positive response category and the assessment of the student response questionnaire, the results obtained are 85.68% with the positive response category and are declared practical.

The effectiveness of a product according to Arsyad (2016: 163) supported by the results of the analysis of several components of effectiveness, one of which is a test of student learning outcomes. From the assessment of the results of the analysis of student learning outcomes, the percentage obtained is 80% with the complete category. From all aspects, it shows that interactive learning media based on macromedia flash application can be said to be effective. Moreover, the criteria for completeness classically are as long as 75% of the students achieve a minimum score of 75 (Kunandar, 2014: 127).

The last stage of the development of this interactive learning media is the evaluation stage. According to Syahroni dan Nurfitriyanti (2017: 267) This stage is the most important to do to evaluate the shortcomings of the learning media designed in order to produce better learning media.

Based on the results of validation by a team of experts and teacher response questionnaires by mathematics teachers as well as student response questionnaires, and learning outcomes tests, it can be inferred that interactive learning media based on the application of macromedia flash on Polyhedron material is feasible to be applied in learning activities based on aspects of validity, practicality and effectiveness. It is in line with the research results conducted by Masykur, Nofrizal, & Syazali (2017) who stated that the feasibility and attractiveness of macromedia flash show that the validation result of the learning media is the valid category, and the attractiveness of the developing mathematics learning media using macromedia flash based on the students' responses is in very attractive category.

This is also in line with the research conducted by Wulandari, Siagian, & Sibuea, (2019) that all aspects of the assessment of learning media for subjects developed using macromedia flash as a whole are in the very good category. Likewise, the study conducted by Marnita & Ernawati (2017) found that the use of interactive multimedia using macromedia flash can improve students' creative thinking skills.

The interactive learning media-based macromedia flash application is one of the interactive learning media that can be used in mathematics learning processes and give a lot of benefits for the education world. Learning mathematics is not only fixated on the textbooks, but also it needs new innovations in order to make the learning process more interesting or attractive. One of the ways that can be done to make the attractive learning process is by developing an interactive learning

media. The research result of this study is a product in the form of interactive learning media-based macromedia flash application. The novelty value of this learning media is that this media can be accessed in the website and the researchers' Telegram channel. In addition, the other strength of this media is that the researchers also provided the link for downloading the macromedia flash application to make the users easier to search and use the application.

4. CONCLUSION

Based on the results of research and discussion, it can be concluded that the process of developing interactive learning media based on macromedia flash applications used the ADDIE development model which consists of 5 stages, namely Analysis, namely conducting observations and interviews. In addition, the design which was conducted by planning learning media, making flowcharts and storyboards as a solution to the problems obtained at the analysis stage. The development stage which realized media designs that have been made at the design stage into products are ready to be validated by a team of experts. The Implementation that which applied valid learning media to test subjects to obtain practicality and effectiveness data. Furthermore, the evaluation stage was done by making enhancements and improvements to learning media based on suggestions from users.

From several stages of the development of interactive learning media based on the macromedia flash application, it was found that the validated learning media were in the very valid category with an average of 3.51. This media is also stated to be practical by looking at the analysis of teacher responses and student responses respectively, 80% and 89% are in the positive category. This learning media is also declared effective by looking at the results of the analysis of the learning outcomes test and by obtaining a learning completeness score of 80%.

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