DEVELOPING MATHEMATICS LEARNING MEDIA BASED STOP MOTION ANIMATION IN THE SUBJECT CIRCLE TANGENT FOR GRADE VIII JUNIOR HIGH SCHOOL

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ABSTRACT

The use of media in mathematics learning is used to assist students in understanding learning materials. The background of this development research is the absence of media that used in mathematics learning at SMP Muhammadiyah Seyegan and SMP Muhammadiyah Kasihan besides textbooks and worksheets as a learning resource. The purpose of this study was to develop learning media stop motion animation based on material tangent to the circle and to determine eligibility based on the assessment of experts and the students' responses. This research, the method used is Research and Development method. The subjects were expert lecturers, subject teachers, and students in grade VIII SMP and SMP Muhammadiyah Seyegan and SMP Muhammadiyah Kasihan. The object of this study is the learning media stop motion animation in the material tangent to the circle for grade VIII Junior High School. The stage of collecting data through direct observation, interviews, and questionnaires with research instruments such as questionnaires. The data analysis technique used is the analysis of qualitative data. The results showed that the developed learning media are included in the category of very decent (ideals percentage of 85.98%). Judging from the aspect of media, materials, and instructional media student responses are developed each get an average score of 89.5 respectively (criterion ideals 85.6%), 71.5 (percentage ideals 89.38%), and 57.85 (percentage ideals 82.64%). Thus mathematics learning media stop motion animation based on material circle tangent to class VIII SMP fit for use by students and teachers as a learning medium.

Keywords: mathematics learning media, stop motion, tangent to the circle

INTRODUCTION

Mathematics is a branch of science that is very close to daily life. In an increasingly advanced era, science has experienced very rapid development. Likewise with the quality of community education. However, on the other hand, it does not mean that there are no obstacles or problems encountered in the community learning process. Some obstacles are still often found in the learning of several subjects such as the still low student learning outcomes, including mathematics learning. This, of course, is inseparable from the factors that influence, for example, there is still a paradigm in the community about "mathematics is difficult, the lack of variety of methods or learning models used, the limited availability of learning media, and the lack of students' own motivation to learn.

One important thing that is able to support the achievement of student learning success is the interest that exists in students. However, teachers often pay less attention to how much interest there is in students to participate in a series of learning processes so that teaching and learning activities undertaken by teachers and students become less meaningful and the knowledge delivered cannot be absorbed properly by students. Therefore teachers need to explore the potential and interests of students so that teachers can provide interesting and meaningful learning innovations.

Success in education depends on the learning process. According to Moh. Usman Uzer (2011: 4) learning is a process that contains a series of actions of teachers and students on the basis of reciprocal relationships that take place in educational situations to achieve certain goals. Therefore we need a good relationship and cooperation between the teacher and students to achieve the expected goals.

Based on the results of observations of mathematics learning conducted on August 8, 2015, in class VIII C of Muhammadiyah Kasihan Middle School, the researcher found a problem in the form of a

lack of interest in students' mathematics learning. Some indications found in the observations include, there are some students who tend to be lazy during math class hours, students seem to experience boredom while attending learning in class, a busy classroom atmosphere, there are some children who prefer to talk with their friends when learning takes place, students often complain of difficulties when asked to do exercises, and students are less able to make use of existing learning resources well as indicated by the presence of some students who do not bring textbooks. Meanwhile, based on observations made at Muhammadiyah 1 Seyegan Middle School, there were also several indications that showed the students' difficulties in learning mathematics. Some of the indications found were not much different from the results of observations made at Kasihan Muhammadiyah Middle School. Some of them are, the class conditions are crowded when learning takes place, there are some students who prefer to talk with their friends rather than pay attention to the teacher's explanation, and students are less able to use the learning resources properly as indicated by the presence of some students who do not immediately prepare textbooks when learning will begin. In addition, based on observations in both schools, most students revealed that they still considered mathematics to be a difficult subject because in mathematics learning there were many numbers and formulas used in solving mathematical problems. Preliminary observations also show that the material that is considered the most difficult is tangent circle material. This material problem will be found when students are asked to describe the tangent of a circle and determine the length of the tangent of two circles.

When viewed from its development period, eighth-grade junior high school students are entering the transition from childhood to adolescence, where they need something that can attract attention, curiosity, or new things that are different from what they normally receive during learning mathematics. Therefore, learning mathematics that can be applied to students of class VIII is learning that is fun, interesting, not boring, easy to understand, and can increase student learning interest.

One of the predictable ways to increase student interest in learning is to use instructional video media in the form of stop motion animated videos that contain a series of materials that are tailored to the syllabus of the subject. Stop motion animation is an animation technique for making physically manipulated objects appear visibly on their own. The object is moved little by little in each frame to be photographed, creating the illusion of movement when a series of frames are played sequentially and continuously. In its development, stop motion animation is often used by young people to deliver virtual messages to friends or closest people in expressing or conveying something memorable. In addition, in this increasingly advanced era, electronic learning media such as computers, laptops, tablets, projectors, and smartphones are already familiar among the people and are also increasingly easy to obtain. Therefore, the writer is interested in developing learning media that uses stop motion animation video as a tool in understanding mathematics subject matter and conducts research with the title development of Mathematics Learning Media Based on Stop Motion Animated Video on Tangent Circles in Class VIII Middle School.

Based on the description above, the objectives to be achieved from this research are:

1. To find out the steps for developing stop motion animation video learning media on tangent circles for SMP VIII that is easily understood by students.
2. To find out the feasibility of developed learning media.

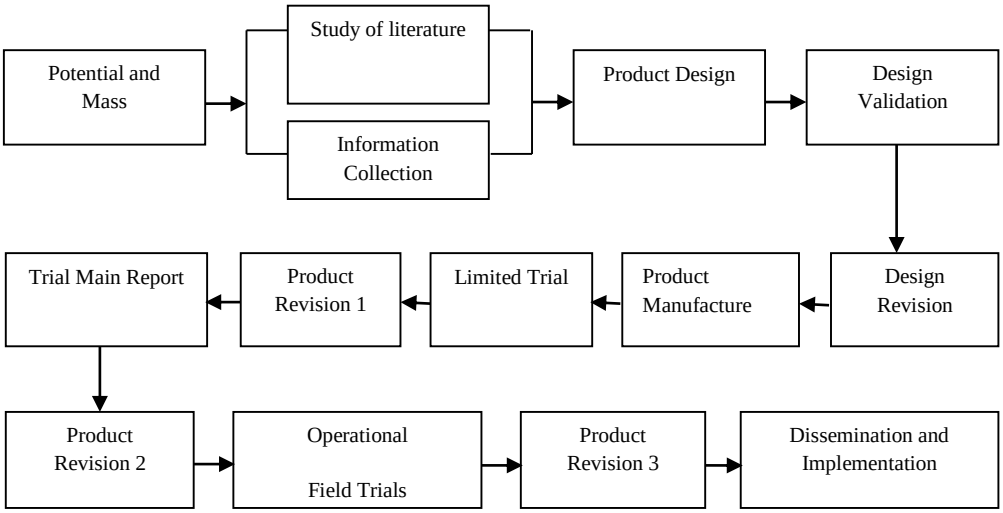
METHODS

A. Development Model

This study uses a research and development model**.**

B. Development Procedure

The development procedure used in this study refers to the steps of development research proposed by Sugiyono (2015: 48) shown in the following figure:



Picture 1. Research and Development Steps

C. Research and Development Trial Subjects

The subjects of this development research were expert lecturers, subject teachers, and eighth-grade students of Seyegan Muhammadiyah Middle School and Kasihan Muhammadiyah Middle School.

D. Data Collection Techniques and Instruments

In this study, the data collection techniques used were direct observation, interviews, and questionnaires with a research instrument in the form of a questionnaire. For data collection through a questionnaire consisting of media expert eligibility test instruments, material expert feasibility test instruments, and student response test instruments.

After all, data has been collected, the average is calculated using the formula**:**

$$\bar{X} = \frac{\sum_i^n X_i}{N}$$

Information :

$\bar{X}$ = Average score

$\sum_i^n X_i$ = Total score

N = Number of Assessors

Furthermore, the data in the form of average scores are converted into qualitative forms using the guideline table for ideal evaluation criteria with the following conditions:

Table 1. Guidelines for Ideal Assessment Criteria

No	Qualitative Score Range	Qualitative Category
1	$X > \bar{X}_i + 1{,}8sb_i$	Very decent
2	$\bar{X}_i + 0{,}6sb_i < X \leq \bar{X}_i + 1{,}8sb_i$	Worthy
3	$\bar{X}_i - 0{,}6sb_i < X \leq \bar{X}_i + 0{,}6sb_i$	Decent enough
4	$\bar{X}_i - 1{,}8sb_i < X \leq \bar{X}_i - 0{,}6sb_i$	Not feasible
5	$X \leq \bar{X}_i - 1{,}8sb_i$	Very Inadequate

RESULT AND DISCUSSION

A. Trial Data

The trial data in this study were obtained through several steps, namely:

1. Potential and Problems

   At the potential and problem stage, the researcher made observations at Muhammadiyah Seyegan Middle School and Kasihan Muhammadiyah Middle School. Observation results

show the teacher has never used learning media in the learning process other than printed books and worksheets.

2. Data Collection
   At the data collection stage, the researchers conducted a literature study and observations at school. The literature study stage examines relevant research.
3. Product Design
   At the product design stage the researchers carried out three stages, namely:
   a. Determine competency standards, basic competencies, indicators, and subject matter to be presented in instructional media. In this study, the researcher raised the subject of the tangent circle.
   b. Arrange learning media that contains tangent points of the circle in consultation with supervisors and experts.
   c. Develop research instruments consisting of media expert evaluation questionnaires, material expert evaluation questionnaires, and student response assessment questionnaires.
4. Design Validation
   At this stage of design validation, the learning media developed are validated by media experts and material experts. For design validation, Mr. Syariful Fahmi, M.Pd. as a multimedia lecturer at Ahmad Dahlan University and Mr. Edhy Nusantara, S.T. as a teacher of Muhammadiyah Seyegan Middle School ICT. The material validation was carried out by a lecturer in mathematics at Universitas Ahmad Dahlan and a mathematics teacher at SMP Muhammadiyah Seyegan.
5. Design improvements
   Improvements to the design of instructional media are based on suggestions and input from media experts and material experts.
6. Product Testing
   The product trial is carried out after the instructional media is improved based on expert advice and input. Product trials at SMP Muhammadiyah Seyegan were conducted on November 2, 2016, and product trials at SMP Muhammadiyah Kasihan were conducted on October 29, 2016. In this trial, the number of respondents at each school was ten students.
7. Product Revision I
   Product revision is based on the results of the product trial data analysis. Forms of improvement made are widening the video display.
8. Usage Trial
   The trial run is done after the instructional media is repaired based on the results of the product trial data analysis. The trial run at Muhammadiyah Seyegan Middle School was conducted on November 4, 2016, with 21 respondents. Meanwhile, the product trial at Kasihan Muhammadiyah Middle School was conducted on November 5, 2016, with 27 respondents.
9. Product Revision II
   In this research, development does not continue at the product revision stage II and stops at the trial use phase.

B. Data Analysis

The data analysis phase is carried out after the researcher has trialed the product and used it. Data analysis is intended to determine the quality and feasibility of learning media in terms of media, material, and student assessment.

1. Media Expert
   Data analysis for media experts aims to determine the feasibility of the product in terms of media.

Table 2. Media Expert Trial Data

No	Evaluator	Score
1.	Syariful Fahmi, M.Pd.	101
2.	Edi Nusantara, S.T.	96
Total Score		197

From the above table, an average score of 98.5 is obtained, based on the criteria table for the feasibility of learning media, instructional media fall into the very feasible category.

2. Meteorologist

Data analysis for material experts aims to determine the feasibility of the product in terms of material.

Table 3. Experimental Data Material Experts

No	Evaluator	Score
1.	Harina Fitriyani, M.Pd.	70
2.	Marjiyem, M.Pd.	73
Total Score		143

From the table above an average score of 71.5 is obtained. So based on the criteria table for the feasibility of instructional media, instructional media fall into the very feasible category.

3. Student Response

Analysis of student responses consists of data analysis based on the results of product trials and usage trials.

a. Product Trial

Analysis of student response data on product trials aims to determine the feasibility of instructional media in the learning process.

Table 4. Analysis of Product Trial Data

No	Evaluator	Number of Respondents	Score
1.	SMP Muhammadiyah Seyegan	10	550
2.	SMP Muhammadiyah Kasihan	10	618
Total		20	1168
Average Score			58,4

From the above table, an average score of 58.4 is obtained. So, based on the criteria table the students' responses to learning media fall into the feasible category.

b. Usage Trial

Analysis of the data used for the trial is intended to obtain research data as a determinant of the feasibility of the product being developed.

Table 5. Analysis of Usage Trial Data

No	Evaluator	Number of Respondents	Score
1.	SMP Muhammadiyah Seyegan	21	1206
2.	SMP Muhammadiyah Kasihan	27	1544
Total		48	2750
Average Score			57,31

From the above table, an average score of 57.31 is obtained. So, based on the criteria table the students' responses to learning media fall into the feasible category.

C. Product Revision

The revision of instructional media products is carried out after the researchers validate it with experts. Product revision consists of four stages, namely media expert revision, material expert revision, product revision I, and product revision II.

D. Final Product Review

After going through the steps of development research, a final product in the form of a learning media based on stop motion animation with subject tangent circles for class VIII SMP with a decent category and can be used as a learning medium for students or teachers both in the school environment and outside the school.

CONCLUSION

Based on the results of the development of mathematics learning media based on stop motion animation on tangent circles for grades VIII SMP it can be concluded that:

1. The steps in developing learning media are as follows:
   a. At the potential, problem, and data collection stages were carried out at Seyegan Muhammadiyah Middle School and Kasihan Muhammadiyah Middle School. From this stage, information was obtained about the learning resources used by the teacher in the learning process which were still in the form of printed books and worksheets.
   b. At the product design stage, the researcher makes a mathematics learning media design with the subject tangent circle with an initial duration of approximately 20 minutes.
   c. At the product validation stage, it is carried out by media experts and material experts and is declared feasible with some improvements.
   d. At the design, the revision stage is based on expert input.
   e. The trial phase was carried out at Seyegan Muhammadiyah Middle School and Kasihan Muhammadiyah Middle School with a total of 10 student respondents in each school.
   f. Product revision I was based on respondents' suggestions and input on product trials.
   g. The trial phase for use was conducted at Muhammadiyah Seyegan Middle School with a total of 21 student respondents and in Kasihan Muhammadiyah Middle School with 27 student respondents.
   h. Product revision II was carried out based on an analysis of the results of the trial run data. The form of improvement expected by respondents to the learning media developed is to pay more attention to the neatness of writing and going forward to be developed at other subject and grade levels.
2. Based on the results of the development and analysis of the data it can be concluded that the results of the research and development of mathematics learning media based on stop motion animation on tangent circles for the VIII grade of junior high school are deemed appropriate as learning media. This learning media is included in the very feasible category with an ideal percentage of 85.98%.

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