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Development of Animated Videos as a Medium for Learning Mathematics Class XI at State High School 2 Gomo

Amin Otoni Harefa[1] Agnes Renostini Harefa[2] Famati Zebua[3]
Mathematics Education Study Program, Faculty of Teacher Training and Education, Nias University, Nias Regency, North Sumatra Province, Indonesia[1,2,3]
Email : fzebuafama@gmail.com[3]

Abstract

Various obstacles in this study include students not being able to learn independently, the lack of teaching materials that can support learning, and the unavailability of animated video media as a mathematics learning medium. So that students wait for the teacher's presence in learning. This study aims to develop animated videos as a valid, practical and effective mathematical learning medium. This type of research is development research with the Plomp development model. Based on the results of the study, animated videos as mathematics learning media developed have been tested very valid by material validators with a percentage of 97.33%, linguists with a percentage of 100%, and media experts with a percentage of 93.04%, practicality levels with an average percentage of 94.81% and effectiveness levels with a percentage of 95.23% each categorized as very valid, practical and effective.

Keywords: Animated Videos, Learning Media

INTRODUCTION

In accordance with the results of observations on students of class XI SMA Negeri 2 Gomo, questions were given in the form of questionnaires on 20 students related to student interests and motivations as well as student difficulties in learning mathematics, showing that the percentage of student interest in learning, namely 62.68% is classified as "Enough" criteria and the percentage of student learning motivation is 40%, and student difficulties with a percentage of 69%. From the results of an interview with one of the teachers of mathematics subjects and several students of class XI science, several problems were found, namely the lack of mental readiness to learn students, limited teaching materials, knowledge of students who have a limited application context, have difficulty in solving math problems, are unable to learn independently, and the unavailability of learning media, making it difficult to understand the material being taught.

With the problems faced by these students, So as a professional educator, you should innovate and find effective, efficient and practical solutions that are closely related to technology and encourage an educator to follow the rapid development of technology. One of the researchers' choices to improve the quality of learners to learn mathematics is animated videos. The animated video contains colorful images, so students are expected to be happy and able to focus on the subject matter (Hariati, et al 2020: 19). Based on the problems found by the researcher, the researcher formulated the following problem: what is the process of developing animated videos as a medium for learning mathematics in the transformation material of Class XI High School? how is the validity of animated videos as a medium for learning mathematics in the transformation material of Class XI High School? how is the practicality of animated video as a medium for learning mathematics in the transformation material of Class XI High School? how is the effectiveness of animated videos as a medium for learning mathematics in the transformation material of Class XI High School? So that through the development of animated

videos as a medium for learning mathematics, it is hoped that it will be a tool for educators and students to distribute material in a short period of time, and fun because of the real visualization of reading books and minimizing the difficulty of learning mathematics.

Mathematics Learning

Mathematics learning is the process of providing learning experiences to students through a series of planned activities so that students gain competence about the mathematics material being studied. Hamdunah et al (2017:136) who state, "learning. Mathematics equips students to have the ability to think logically, systematic, critical, analytical, creative, and cooperative ability." According to Hamzah and Muhlisrarini (2014:65) states that: Mathematics learning is a process designed with the aim of creating an environmental atmosphere allowing a person to carry out mathematics learning activities, and the process is centered on teachers teaching mathematics by involving the active participation of students in it.

Mathematics learning serves to develop the ability to communicate by using numbers and symbols as well as the sharpness of reasoning that can help clarify and solve problems in everyday life (Ministry of Education and Culture in Amir 2016: 9). So, mathematics learning is a teaching and learning process that goes through a series of activities between teachers to students in an effort to understand the meanings and relationships and symbols and equip students to have the ability to think logically, systematic, critical, analytical, creative, and cooperative abilities.

Learning Media

The word media comes from the Latin medius, which literally means "middle", "intermediary", or introduction (Jalinus and Ambiyar, 2016:2). According to the Association of Education and Communication Technology/AECT in Fikri, Madona (2018:8) etymologically, the word "media" is the plural of "medium", which comes from the Latin "medius" which means 'middle'. In Indonesian, the word "medium" can be interpreted as 'between' or 'medium' so that the notion of media can lead to something that delivers or forwards information (message) between the source (the message giver) and the recipient of the message.

According to Amka (2018:16) argues about the definition of learning media that: Learning media can be defined as physical aids and non-physical which is deliberately used as an intermediary between educators and students in understanding learning materials to be more effective and efficient. Meanwhile, according to Cahyadi (2019: 3) states that: Learning media is a tool, means, intermediary, and liaison to spread, carry or convey messages (messages) and ideas, so that it can stimulate students' thoughts, feelings, deeds, interests and attention in such a way that the teaching and learning process occurs in students.

Learning media is one of the important roles in learning in teaching and learning activities (Nurdyansyah, 2019: 44). In line with the opinion of Apryansyab et al (2020: 9) Learning media is one of the ways educators deliver information and material to students in a teaching and learning process. So from the above understanding, it can be concluded that learning media is a tool used by educators in delivering messages, ideas or ideas and learning materials that can stimulate the thoughts, feelings, deeds, interests and attention of students to learn.

Animated Videos

Video comes from Latin, namely from the word vidi or visum which means to see or have vision (Apriyansyab et al, 2020: 4). Munir (Fadhli, 2015:26) "Video is a technology of capture, recording, and storage, and reconstructing still sequence sequences by presenting scenes in motion electronically." Meanwhile, according to Purwanti (2015: 44) video is a process of recording and viewing which of course involves technology related to what can be seen,

especially live images (moving; motion). According to Munir in Permatasari et al (2019:33) Animation comes from English, animation of the word to anime which means "to animate". Animation is a fixed image that is arranged sequentially and recorded using a camera." In line according to Enterprise (2020:1) animation is a set of objects arranged in an orderly manner with a certain duration that can form a moving image. Based on the opinions above, it can be concluded that animated video is a medium that combines audio media and visual media to attract the attention of students, is able to present objects in detail and can help teachers in conveying material to students in understanding lessons that are difficult in nature.

Advantages and Disadvantages of Video Media

Video has several advantages, namely it can improve students to learn independently, be able to convey messages well and can be watched again and can compare more than two at the same time. Besides the advantages, there are also disadvantages of video, according to Johari et al (2014,10), the disadvantages of video include: Can only be used with the help of projectors and speakers when used in the learning process in the classroom; Requires considerable costs for the purposes of making learning videos; and it takes quite a long time in the process of making until the creation of a learning video.

Terms of Reference

The frame of reference is a framework that contains the main points of thought about the rational underlying a study, the formulation of the problem to which you want to find the answer, the purpose of the research and the benefits of the research results. Based on the background presented that learning is not yet effective, this research procedure can be described in the following chart:

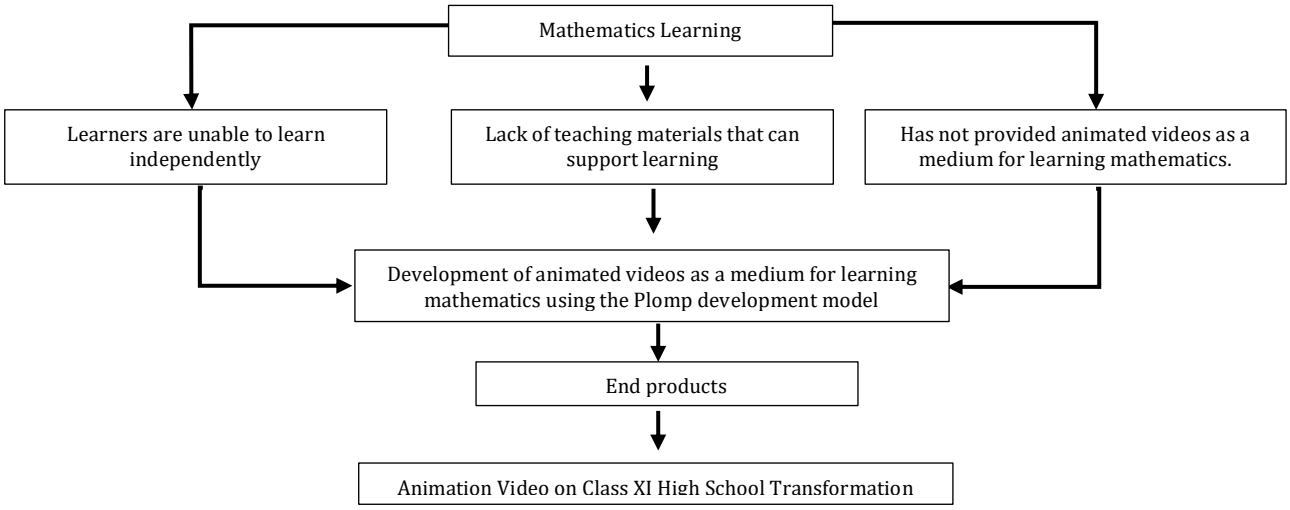


Figure 1. Terms of Reference

RESEARCH METHODS

Development Model

A study is conducted to find something new that can add insight, add knowledge that can be utilized by the wider community. This research is a type of research development (research and devolopment). Sugiyono in Koriaty and Agustani (2016: 280) states that, "research and development methods or research and devolopment are research methods used to produce certain products, and test the effectiveness of these products". In addition, the definition of development according to Saputro (2017: 8) The Research & Development (R&D) method is a research method in a certain field of expertise, which is followed by certain by-products and

has the effectiveness of a product. Furthermore, according to Samsu (2017: 175) argues that: This research and development is essentially that the research is carried out to develop previous research products on an ongoing basis, so that there are ideal changes and developments as expected.

Some of the understandings above, it can be concluded that development research (Researc and Development) is research that is used to make changes and developments that produce a product and have the effectiveness of certain products. In research, the development of animated videos as a medium for learning mathematics can be developed using the plomp development model. The model was developed by Tjeerd Plomp. The Plomp model consists of 3 stages, namely the preliminary research phase, the development or prototyping phase and the assessment phase (Plomp, 2013: 19).

Data Analysis Techniques

Validity Questionnaire Data Analysis

Table 1. Validation Questionnaire Likert Scale

No	Quantitative Analysis	Skor
1	Excellent	5
2	Good	4
3	Good Enough	3
4	Not Good Enough	2
5	Very Less Good	1

Modified from Riyana, et al. (2020:258)

To see the validity of the media (animated video) developed, the following steps are carried out: Determine the average rating obtained from each validator; The average score obtained from each validator is summed, then averaged again with the maximum score until the average score from the validators is obtained; and the validity of the product (animated video) can be determined by converting the average of the validator's total score into qualitative values by using the following formula:

$$\text{Validity (V)} = \frac{\text{Number of scores}}{\text{Maximum score}} \text{x} 100\%$$

Table 2. Media Validity Criteria (Animated Video)

No	Skor	Category
1	$V > 80\%$	Very valid
2	$65\% < V \leq 80\%$	Valid
3	$41\% < V \leq 65\%$	Quite valid
4	$20\% < V \leq 40\%$	Less valid
5	$V \leq 20\%$	Very less valid

Modified from Riyana, et al. (2020:258), Apriansyab, et al (2019:13)

Based on table 2, it can be concluded that the learning video is said to be valid if the achievement target reaches a valid value of >65%.

Practicality Questionnaire Analysis

Table 3. Category Criteria for Percentage of Student and Teacher Response Questionnaires

Valuation	Category	Skor
SS	Totally Agree	5

S	Agree	4
CS	Simply Agree	3
KS	Disagree	2
STS	Strongly disagree	1

(Modified from Apriansyab, et al.2020:13)

The amount of the assessment results of students and teachers will be calculated as a percentage so that the level of practicality of the animated video can be known using the following formula:

$$X = \frac{x}{xi} x\ 100\%$$

Information:
X = Percentage of student or teacher responses in (%)
x = Total score of the respondents
xi = Total ideal score

The next stage calculates the average number of percentages of all respondents using the formula:

$$N = \frac{\sum x}{n}$$

Information:
N = Percentage index criteria
$\sum x$ = Percentage of student or teacher responses in (%)
n = Number of responses.

The terms of conversion of the scoring criteria score are shown in the following table:

Table 4. Category Criteria for Percentage of Student and Teacher Response Questionnaires

No	Skor	Category
1	$N > 90\%$	Very Practical
2	$75\% < N \leq 90\%$	Practical
3	$65\% < N \leq 75\%$	Quite Practical
4	$50\% < N \leq 65\%$	Less Practical
5	$N \leq 50\%$	Very less Practical

Modified from Riyana, et al. (2020:258), Apriansyab, et al (2019:13)

Based on table 4, it can be concluded that animated videos are said to be practical if the achievement target reaches a practical value of >75%.

Effectiveness Analysis

The effectiveness of the animated video developed is analyzed through data measuring the learning outcomes of students. The achievement of learning outcomes is directed towards individual achievement. Students are said to be successful (complete) if they get a score greater than or equal to the KKM score of 65. The determination of KKM is determined by each school itself which is known as the minimum completeness ktiteria, guided by 3 considerations, namely the ability of each student; facilities; and the carrying capacity of each school. The classical completion percentage is calculated using the formula:

$$P = \frac{f}{n} X100\%$$

Information
P = Percentage of classical completeness
f = Many students are complete
n = Many students

The percentage category of classical completeness can be seen in the following table:

Table 5. Product Effectiveness Criteria Based on Classical Completeness

Interfal (%)	Category
$P > 80$	Excellent
$70 < P \leq 80$	Good
$60 < P \leq 70$	Enough
$50 < P \leq 60$	Not Good Enough
$P \leq 50$	Very Less

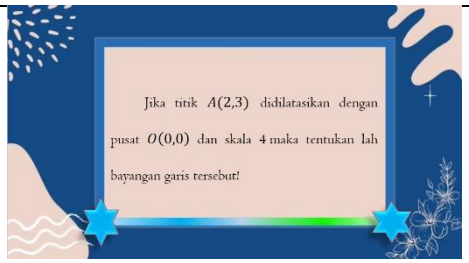
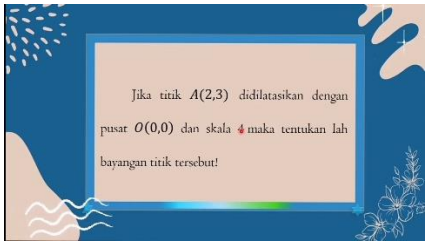
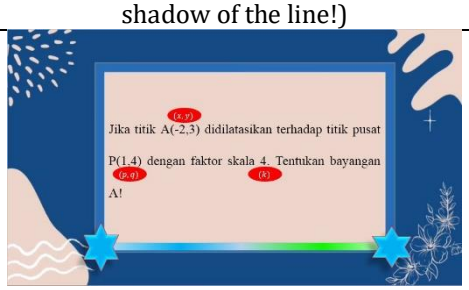
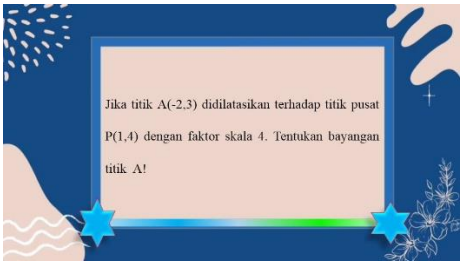
Based on the table above, animated videos are said to be feasible in terms of effectiveness, if the percentage of classical completeness reaches a value of >70%

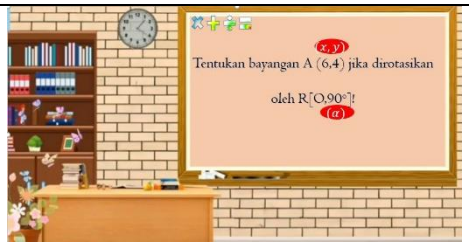
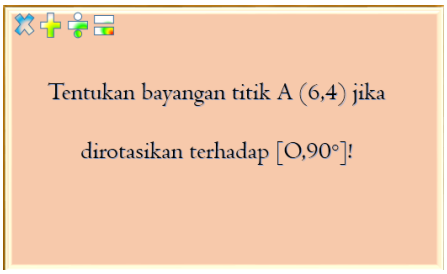
RESULTS OF RESEARCH AND DISCUSSION

After the researcher has designed the animated video as a medium for learning mathematics, the next stage can be carried out according to the level of evalution of tassmer which can be described below:

Self Evaluation

Table 6. Self-Evaluation Results

Before Revision	After Revision
 In meeting video 1, the line word error (If point A(2,3) is latlated with the center O(0,0) and scale 4 then determine the shadow of the line!)	 (If point A(2,3) is latlated with center O(0,0) and scale 4 then determine the shadow of that point!)
 On meeting video 1, the word shortage period.	 It's fixed.

 In the video of meeting 2, the incompleteness of the word on the question.	 It has been fixed

Expert Review

Table 7. List of Validator Names

No.	Validator Name	Information
1.	Sozatulo Zebua, S.Pd (material expert validator)	Mapel Mathematics Teacher of SMA Negeri 2 Gomo
2.	Imansudi Zega, M.Pd (linguist validator)	Lecturer of Indonesian Language and Literature Education FKIP UNIAS
3.	Serious June Harta Jaya Telaumbanua, S.Kom (media expert validator)	Mapel ICT Teacher of SMA Negeri 2 Gomo

Based on the validation results from the experts above, it can be described below:

1. Material Expert Validation

Table 8. Material Expert Validation Results

No.	Validators	Revision I	Revision II
1.	Material Expert	62,66%	97,33%

Based on the table above, it can be seen that validators revise the product twice. The validator results in the first revision with an average percentage result of 62.66% with the category are quite valid and the product needs to be improved. After the product is improved based on suggestions and comments from the validator, the product is again validated by the researcher to the validator in the second revision with an average percentage result of 97.33% with the category very valid and does not need to be revised. Based on the validator's final results, the animated video is declared suitable for use.

2. Validate the linguist

Table 9. Linguist Validation Results

No.	Validators	Revision I	Revision II
1.	Ahli Bahasa	77,5%	100%

Based on the table above, it can be seen that validators revise the product twice. The validator results in the first revision with an average percentage result of 77.5% with the category are quite valid and the product needs to be improved. After the product is improved based on suggestions and comments from the validator, the product is again validated by the researcher to the validator in the second revision with an average percentage result of 100% with the category very valid and does not need to be revised. Based on the validator's final results, the animated video is declared feasible to use.

3. Expert media validator

Table 10. Media Expert Validation Results

No.	Validators	Revision I	Revision II
1.	Ahli Media	66,95%	93,04%

Based on the table above, it can be seen that validators revise the product twice. The validator results in the first revision with an average percentage result of 66.95% with the category are quite valid and the product needs to be improved. After the product is improved based on suggestions and comments from the validator, the product is again validated by the researcher to the validator in the second revision with an average percentage result of 93.04% with the category very valid and does not need to be revised. Based on the validator's final results, the animated video is declared feasible to use. Based on the validation results from expert validators of material, language and media with very valid categories, the next step is to see user responses, animated videos as mathematics learning media are tested on students.

4. One-to-one evaluation

Table 11. Individual Evaluation Results

No.	Student	Number of Scores	%	Criterion
1.	Student 1	87	96,66	Very Practical
2.	Student 2	83	92,22	Very Practical
3.	Student 3	86	95,55	Very Practical
Number of Scores		**256**		
Average percentage		**94,81%**		
Criterion		**Very Practical**		

Based on the table above, it shows an average percentage result of 94.81%, so animated videos are included in the criteria of being very practical and feasible to use.

5. Small Group Evaluation

Table 12. Small Group Evaluation Results

No.	Student	Number of Scores	%	Criterion
1.	Student 1	89	98,88	Very Practical
2.	Student 2	86	95,55	Very Practical
3.	Student 3	85	94,44	Very Practical
4.	Student 4	89	98,88	Very Practical
5.	Student 5	82	91,11	Very Practical
6.	Student 6	83	92,22	Very Practical
Number of Scores		**514**		
Average percentage		**95,18%**		
Criterion		**Very Practical**		

Based on the table above, it shows that animated videos are included in the criteria of being very practical and feasible to use with an average percentage result of 95.18%. And some responses from students based on the results of interviews said animated videos as a medium for learning mathematics help understand and speed up the learning process. With these results, the researcher carries out the next step, namely field trials in the assessment phase. Assessment Phase.

Table 13. The Results of the Teacher's Response

No.	Teacher	Number of Scores	%	Criterion
1.	Teacher 1	84	93,33	Very Practical
2.	Teacher 2	86	95,55	Very Practical
Number of Scores		**170**		
Average percentage		**94,44%**		
Criterion		**Very Practical**		

Through the data in the table above, it can be seen that the average teacher's response to the use of animated video media in the category is very practical with a percentage of 94.44% so that animated videos are worth using. Meanwhile, the percentage of completion obtained from the learning outcomes test given to students is 95.23%. These results show that animated video as a medium for learning mathematics on transformation materials (dilatation, rotation) is in the excellent category. based on the results of the trial in this phase animated video as a medium of learning mathematics effectively used, without continuing at the remission stage listed in stage 3 of the plomp model development procedure.

CONCLUSION

Product development in this study produced animated video products as a medium for learning mathematics in class XI high school transformation material developed with the Plomp model with the acquisition of values from the validity of animated videos obtained by material validators with a percentage of 97.33%, linguists with a percentage of 100%, and media experts with a percentage of 93.04%, with very valid categories. Practicality Animated videos obtained a level of practicality with an average percentage of 94.81% with a very practical category. And the effectiveness of animated video as a medium for learning mathematics class XI obtained an effectiveness level with a percentage of 95.23% with the category of very effective and feasible to use according to classical completeness.

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