Development of Animation Learning Videos Based On Ethnomathematics using Plotagon On SPLDV Material

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ABSTRACT

The learning media used at SMP Negeri 6 Metro are school textbooks which only contain writings and are not connected to real life. So students are less interested and enthusiastic about mathematics lessons. Based on the results of previous research, it show that students need media presentations that are attractive, contain images, can be accessed via the Internet, and are based on Lampung culture. This research aims to develop an ethnomathematics-based animated video using plotagons on SPLDV material based on its feasibility and attractiveness as a learning medium. The method used in this research is Research and Development (R&D) with a 4D development model. Data collection techniques were carried out through interviews, observation, and distribution questionnaires. This research data comes from two material experts, two media experts, and two cultural experts. The subjects in this research were 25 students in class VIII of SMP Negeri 6 Metro. The research results show that animated videos are suitable for use as learning media with material expert validation of 92.71%, media 84.62%, and culture of 90.63% with very feasible criteria, student responses received a percentage of 91.32% with very interesting criteria. Based on the research results, it can be concluded that Animated videos can be used to help with mathematics learning at school.

Keywords: Animated Videos, Ethnomathematics, Spldv, Plotagon, Lampung Culture.

INTRODUCTION

Education plays a vital role in preparing quality human resources capable of being competent in developing science and technology (Nursyeli and Puspitasari 2021). Education can also be seen as a measure of a nation's progress, so various countries have tried to improve the quality of their education. This happens despite the role of education as a means of building thinking skills. Mathematics is a subject in the educational process that can improve thinking abilities (Asmaranti and Andayani 2018).

Learning mathematics is a science that can solve problems in everyday life. Students can improve their thinking skills, become more independent, and develop problem-solving abilities by studying mathematics. However, learning mathematics at school often feels far from real life. Therefore, there is a need for content that links mathematics to everyday life, one of which is applying mathematics and culture (Abi 2016).

Mathematics education aims to improve students' reasoning power, intelligence, and positive attitudes. Students are expected to improve their critical, logical, systematic, careful, effective, and efficient thinking skills in solving mathematical problems through learning mathematics. Mathematics is a scientific discipline that can improve thinking and argumentation skills, help solve daily problems in the world of work, and support the development of science and technology (Jana 2018). Mathematics is considered difficult and tedious by many students. However, with a creative approach and exciting learning methods, mathematics can be a fun subject and connected to the real world (Nurfitriyanti 2016).

Many students need help with mathematics. However, with innovative and exciting learning methods, mathematics can become an interesting lesson and connect to the real world. D'Ambrosio (2016) states that the learning process applies local cultural knowledge. Culture-based mathematics learning is a practical approach to help students understand and relate mathematical concepts to everyday life. Incorporating cultural values into mathematics material can also help students feel closer to the material being taught (Abdullah 2016). According to (Rewatus et al. 2020), Culturally based mathematics learning experiences can significantly benefit students' understanding and learning strategies.

Culture-based learning in mathematics learning is one of the innovations in eliminating the assumption that mathematics tends to be rigid and connecting it with something interesting, such as culture, so people's perception of mathematics will be flexible (Pratiwi and Pujiastuti 2020). Ethnomathematics is a practical approach to combining culture and education. Students can better understand mathematics and their cultural values by applying culture in mathematics learning. This is important to ensure that the cultural values that are part of the nation's character are embedded from an early age (Wahyuni et al. 2013).

The results of observations carried out at SMP Negeri 6 Metro in November 2023 show that the learning model at the school uses a conventional model and is still centered on textbooks provided by the school and the government, as well as students' low enthusiasm for learning mathematics. Therefore, exciting learning media is needed so students are more interested and enthusiastic. According to Wiratmojo & Sasonohardjo (Apriliyani and Mulyatna 2021), the use of learning

media in the teaching and learning process can increase students' interest and desires, increase motivation, and stimulate to participate in learning activities and even have a psychological influence on students. By using appropriate learning media, both teachers and students can achieve success. Apart from the critical role of teachers in the learning process, teachers are also required to develop and utilize learning media, one of which is animated videos produced from the Plotagon application (Yuanta 2019).

Learning with animated video media effectively increases student understanding and can make students enthusiastic so that student creativity increases (Safitri et al. 2019). Animation consists of moving images in the form of objects with particular effects to make them realistic and exciting. The right color combination, supporting writing, and sound and audio support make the animation attractive (Mashuri and Budiyono 2020). Animated videos are essential as a learning medium because they allow students to see and understand material they cannot see or imagine. By using this media, teachers can more easily convey material.

Plotagon is an innovative application that creates 3D animated videos with many characters that can be created according to your wishes. In mathematics learning, plotagons can be used to create exciting and interactive animated videos so students can be more involved in learning. There are several steps in making videos using Plotagon: creating characters and arranging scenes in animated videos. Next, set up the movement and add appropriate dialogue.

Engaging learning media is needed to make students more interested and enthusiastic. According to Wiratmojo & Sasonohardjo (Apriliyani and Mulyatna 2021), the application of learning media in the learning process can psychologically affect students, such as fostering new interests and desires encouraging and encouraging learning activities. Both teachers and students can succeed if used correctly in the teaching and learning process in the classroom. Apart from the critical role of teachers in the learning process, teachers must create and use learning media such as videos (Yuanta 2019).

Learning with animated videos will be more effective if it is linked to the culture around students to provide attraction, and students will feel energized by learning mathematics. They can provide information and preserve culture (Aisyah, Alim, and Alpusari 2022). By developing learning media such as ethnomathematics-based animated videos, students become more enthusiastic about the learning process being carried out. According to (Lestari et al., 2024) Through the application of ethnomathematics-based animated videos, mathematics learning can become more relevant, meaningful andexperienced an increase in learning. Plotagon is an innovative tool to improve education, and there is still a lot of potential that has not been explored. By using this tool, you can create interactive stories, visual presentations, and animations that are interesting and attention-grabbing. It can help students develop their critical thinking and creativity skills, while also providing a fun and engaging way to learn.

The results of the pre-survey at SMP Negeri 6 Metro showed that the school had never linked mathematics learning to the surrounding culture, namely Lampung culture, especially Lampung's typical cakes and tapis cloth.

Many students are not familiar with traditional cakes and tapis cloth in their environment. By linking culture to learningcan help students feel closer to the material being taught.Therefore, ethnomathematics-based animated video learning media is needed. One of the class VIII mathematics materials that can be linked to Lampung culture is SPLDV material. To prove this, research was carried out on the development of ethnomathematics-based animated video learning media using plotagons which made students not feel bored and enthusiastic about understanding SPLDV based on feasibility and attractiveness.This happens because student textbooks only contain writing and very few supporting pictures. This agrees with (Maharani, 2017) who states that media presentations that are interesting, contain pictures, and are close to real life can generate a better response when compared to books that only contain writing.

What differentiates this research from similar previous research is the animated video that was developed telling the story of everyday life based on ethnomathematics andBased on the devices used in developing animated videos, this research uses Plotagon and Capcut with the hope that they can be easily adapted by teachers because Plotagon and Capcut can be installed and operated on each teacher's smartphone.

METHOD

The research method used is Research and Development (R&D), which aims to produce specific products. The product produced in this research is teaching material in the form of ethnomathematics-based animated videos on SPLDV material. This type of research is carried out in the form of development research (R&D) with the 4 D development model:

1. The first stage is define, where at this stage the researcher collects information through observation, observing the learning process, interviewing students and teachers about learning methods and problems in the field.
2. Design stage, at this stage the researcher started trying to design an animated video using the Plotagon and Capcut applications. Activities at this stage include creating an animated video flow script and selecting the format.
3. This development stage produces a final product in the form of an animated video after going through revisions based on comments, suggestions and assessments from material experts, media experts, cultural experts and student responses.
4. The disseminate stage is to promote products that have been developed so that they are accepted by users.

The subjects in this research were material experts who were very competent in the field of mathematics consisting of one IAIN Metro mathematics lecturer and a Mathematics teacher at SMP Negeri 6 Metro, the Media experts chosen were two IAIN Metro lecturers who were experts in this field, the cultural expert chosen was one teachers of SMP Negeri 6 Metro and teachers of SMP Negeri 2 Metro and students of SMP Negeri 6 Metro class VIII as many as 25 students.

Data collection instruments use material expert validation questionnaires to test the suitability of the material, the correctness and systematicity of material preparation,

media expert validation questionnaires to test the presentation of learning media in the form of animated videos, cultural expert validation questionnaires to test cultural suitability and correctness, and student response questionnaires.

Data analysis from the results of the feasibility test questionnaire for material experts, media experts and cultural experts is used to determine the feasibility of the media being developed. Meanwhile, the student response questionnaire is to obtain the interest of the media being developed.

Qualitative data validated by experts is converted into quantitative data on a Likert scale, where each statement is scored. After the points are collected, the average expert assessment is calculated using the formula:

$$Vah = \frac{Tse}{Tsh} \times 100\%$$

Information:
Vah =Expert validation
Tse =Total empirical score
Tsh =Total expected score

After obtaining expert validation values, then the category levels of percentage results can be converted in **Table 1** (Fitriani et al., 2021).

Table 1. Eligibility Category

Validity Criteria	Interpretation
$80\% < V \leq 100\%$	Very Worthy
$60\% < V \leq 80\%$	Worthy
$40\% < V \leq 60\%$	Decent Enough
$20\% < V \leq 40\%$	Not worth it
$0\% < V \leq 20\%$	Very unworthy

Meanwhile, student response data can be obtained by giving scores on the questionnaire that has been presented. The average score for each indicator is calculated and then converted into a percentage using the following method:

$$P = \frac{\Sigma f}{n} \times 100\%$$

Information:
P =Final score
Σf =Total score
N =Maximum score

After obtaining the average attractiveness, the category levels of percentage results can be converted in **Table 2** (Bilqis, 2021).

Table 2. Product Attractiveness Criteria

Validity Criteria	Interpretation
$80\% < P \leq 100\%$	Very interesting
$60\% < P \leq 80\%$	Interesting
$40\% < P \leq 60\%$	Quite interesting
$20\% < P \leq 40\%$	Less attractive
$0\% < P \leq 20\%$	Very uninteresting

RESULTS AND DISCUSSION

This research and development produced ethnomathematics-based animated mathematics learning videos for class VIII junior high school students as appropriate and interesting media. The development procedure used is a 4D model which consists of 4 stages, namely:

Define Stage

The results of interviews conducted with mathematics teachers at SMP Negeri 6 Metro in November 2023 showed that the learning model at the school used a conventional model, still centered on textbooks provided by the school and the government, and students' low enthusiasm for learning mathematics was seen from test scores and educators had never linking mathematics learning with Lampung culture. Therefore, learning media is needed that can link mathematics learning material with culture, namely ethnomathematics-based animated videos. The material explained in this animated video is SPLDV material, understanding various SPLDV solutions in real life. After students watch this ethnomathematics-based animated video, it is hoped that students will be able to understand the SPLDV solution and gain insight into traditional Lampung cakes, Lampung siger, and Lampung tapis cloth.

Design Stage

This stage begins with designing teaching materials by compiling materials and tests that refer to Learning Achievements (CP) and Learning Objectives (TP) in the curriculum. After that, design and prepare learning tools and selecting appropriate learning media. In addition, learning media are designed to achieve learning goals and are helpful during the learning process. The material is designed to make it easier for students to understand. As a result, the delivery of the material is designed to be simple and utilize student perspectives to make the material more interesting.

Researchers used the Plotagon Studio and Capcut applications to create animated videos. Getting to know plotagon and capcut are popular animation creation tools allowing researchers to create more interactive, interesting and informative animated videos easily. During the initial design of an animated video, characters, backgrounds, and expression selection are created in Plotagon Studio. The animated video was made twice and discusses various topics in this research. This learning video was created using plotagon and capcut, has a resolution of 1440p, and is based on the ethnomathematics of traditional Lampung cakes, Lampung siger, and Lampung siger cloth. To make learning media more interesting, researchers used video animation and created stories from everyday life by linking Lampung culture such as traditional cakes, tapis cloth, and siger. In addition, the researcher created a validation sheet in this arrangement to evaluate the suitability of the media that had been created. Cultural experts, media experts and material experts will validate this animated video. Apart from that, response questionnaires were also distributed to students to see the responses and level of interest given by students after using media with animated videos. **Picture 1** shows the design of animated video learning media using Plotagon Studio.

Picture 1. Animation Video Learning Media Design

Development Stage

This development stage aims to develop an ethnomathematics-based animated video using plotagons on SPLDV material. This stage includes product validation activities and giving student questionnaires which aims to determine the feasibility and attractiveness of the animated video being developed. The validation results from material experts, media experts and cultural experts show that the animated video developed is feasible and can be used with revisions

The first stage is to create an animated video validation assessment questionnaire sheet. Material expert validation evaluates the content of the material contained in the product with aspects assessed, namely the appropriateness of the content of the teaching material, the presentation of the teaching material and the suitability of the examples in the teaching material. Media experts evaluate the results of product designs created using the plotagon and capcut applications with aspects of the appearance, sound and content of learning media devices. And for cultural experts evaluating cultural information, language spelling, suitability of cultural images.

Validation of material experts, media experts and cultural experts is carried out by experts who are competent and relevant to the media developed by the researcher. Based on the average calculation of material expert validation results with aspects of appropriateness of the content of teaching materials, presentation of teaching materials and suitability of examples in teaching materials, it is 92.71% which is in the very appropriate category. Meanwhile, the average media expert validation results with aspects of assessing the suitability of the appearance, sound and content of the device was 84.62% which was in the very feasible category. And the average result of cultural validation with aspects of cultural information, language spelling, cultural images is 90.63% which is in the very appropriate category. The overall validation average result was 89.32% which was in the very feasible category. This animated video was declared worthy because it has an attractive and enjoyable appearance consisting of images, animation and sound. This is in accordance with the results of the analysis carried out by Sri Hariati et al., (2020) stated that learning using animated video media could help students understand the material.

The second stage is product revision. After product validation has been completed by material expert validators, media experts, and cultural experts, suggestions and input are obtained from the validators regarding the ethnomathematics-based animation video so that researchers can find the shortcomings of the animation video. Then, the suggestions given are used as input to revise the initial product to make the animated video even better. The suggestions from validation material experts, media, and culture experts can be seen in Table 3 below.

Table 3. Suggestions and Improvements

No	Suggestion	Repair
1	Add explanatory captions to videos	Add explanatory captions to the video
2	Added questions at the end of the video	Add questions at the end of the video
3	Delete the name of the fourth slide	The name of the fourth slide is deleted
4	Added bibliography and validator names at the end	At the end, the bibliography and name of the validator are added
5	Changing the final text, that is all	That is all the post has been replaced

The next stage, namely testing and providing response questionnaires to students, is carried out when the product has been validated by material experts, media experts and cultural experts and has been revised. Then, after carrying out the lesson using an animated video that the researcher developed and which the validator said was appropriate, the researcher gave a response questionnaire sheet to the students. This aims to determine the attractive response to the learning media that researchers developed at SMP Negeri 6 Metro. Where this trial involved 25 students. Based on the calculation of the average percentage results of the student response questionnaire, namely 91.32%, it is in the "very interesting" category, so it can be said that the animated video had a positive response from students. This is caused by interesting and fun learning media, which makes students more motivated. Animation as a learning medium is expected to improve student learning outcomes (Annisa et al., 2021). Research conducted by Swandari & Jemani (2023) shows that the design of learning media used by teachers influences learning success. **Picture 2** show ethnomathematics-based animated video products to students.

Picture 2. documentation of Trial Activities

Dissemination stage

The final stage of the product development process aims to disseminate and introduce the animated video that has been developed so that it can be well received by users. The dissemination stage is carried out after the learning video product developed is declared feasible by validators, in this case material experts, media experts and cultural experts. At the dissseminate stage, the researcher directly introduced the ethnomathematics-based animated video that the researcher developed to 25 students at SMP Negeri 6 Metro so that teachers and students could later use it in learning. Apart from that, this animated video is also distributed online via the YouTube application so that it is practical and can be easily accessed by the wider community. In many studies, the use of YouTube is often discussed, but there are still not many types of animated videos as a learning source. By distributing animated videos via the YouTube application, it is hoped that a teacher can use these animated videos without having to edit them. An ethnomathematics-based animated video product distributed via the YouTube application with the following link.

Part 1
https://youtu.be/2FA75d8VDfM?si=I-WcVUU8Sw9pFqSP

Part 2
https://youtu.be/PdgdWAVdEWo?si=NXeJxDNI2QTwHCyj

CONCLUSION

The process of developing ethnomathematics-based animated video learning media with SPLDV material is carried out through 4 stages, namely define, design, development and disseminate. The results of the development of animated video learning media using Plotagon Studio show a high level of validity and feasibility based on assessments from validators through revisions, as well as receiving a very positive response from students in terms of the attractiveness of its use. Based on the research and development results described previously, to answer the problem formulation the following conclusions can be drawn.

1. From the results of material expert validation, a total average of 92.71% was obtained in the "very feasible" category, media expert validation obtained a total average of 84.62% in the "very feasible" category, and Lampung culture expert validation was obtained on average the total average was 90.63% in the "very feasible" category. Based on these results, the animated video was declared feasible and could be used to test the product with students.

2. Students looked enthusiastic in ongoing learning activities using ethnomathematics-based animated videos on SPLDV material as proven by the average total student response of 91.32% in the "very interesting" category.

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