

Interactive Learning Video of Two-Variable Linear Equation System Based on Gambyong Dance Ethnomathematics

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Abstract

The learning process applied so far is considered boring for students due to the lack of use of interactive learning media. As a result, learning activities become less effective so that it has an impact on reducing student learning outcomes. Based on the existing problems, it is necessary to design learning media that is in line with the era of technological development, namely the use of interactive learning videos. Therefore, the purpose of this research is to design a valid interactive learning video based on Gambyong Dance Ethnomathematics. This study adopted the research and development (R&D) method using the ADDIE development model which focused only on the analysis, design, and development stages. The data analysis techniques applied were needs analysis, as well as validation analysis from media experts and material experts. This research produced an interactive learning video design that had been validated by media experts with an average percentage of 94%, which was classified as very valid, and by material experts with an average percentage of 94%, which was also classified as very valid. Based on this assessment, it can be seen that the combined average percentage of 94% is classified as very valid. This indicates that the interactive learning video designed is feasible to be tested on students during the math learning process.

Keywords: Learning Media, Interactive Learning Video, Ethnomathematics, Gambyong Dance.

INTRODUCTION

Technological developments have had a significant impact on the world of education (Dewi *et al.*, 2023). Technological developments have brought many changes to all aspects of education, one of which is the teaching and learning process (Sahid *et al.*, 2024). As stated by Wati & Trihantoyo (2020), an effective teaching and learning process along with technological developments is achieved when teachers can manage the class well, because teachers play a major role in improving the cognitive development of students in schools. However, in its implementation there are still many teachers who are unable to manage the class maximally, which results in a decrease in learning outcomes, especially in mathematics subjects (Manafe *et al.*, 2022). Several factors that cause a decline in students' mathematics learning outcomes in Indonesia include: (1) Anxiety about mathematics, (2) Students' boredom during learning, and (3) Lack of use of interactive learning media (Ayu *et al.*, 2021). The learning implemented so far is considered boring by students so that it has an impact on reducing student learning outcomes (Halidah *et al.*, 2024). Moreover, mathematics is considered a subject that is not easy to understand at every level of

education (Sa'id, 2021). Therefore, teachers are expected to be able to provide enjoyable learning to increase students' learning motivation and help them obtain maximum learning results (Mukarromah & Andriana, 2022). The use of appropriate learning media has been proven to have a big influence on student learning outcomes (Adimsyah *et al.*, 2023). Learning media that is used effectively can not only meet students' learning needs, but can also create a more enjoyable learning atmosphere (Hafiyya & Hadi, 2023).

Learning videos are an innovative learning media that is useful in supporting learning to make it more interesting (Tama & Sumargiyani, 2022). One form of learning video that is appropriate to use in the current era of technological development is interactive learning videos. Interactive learning videos are a form of learning media designed with two-way communication or dialogue interaction so that they can support the learning process to be more effective. This media, in the form of animated videos, functions as a channel to convey messages or news in the form of moving images, which can be seen and heard (Tama & Sumargiyani, 2022). With use It is hoped that

interactive learning videos in learning activities can stimulate students' interest in learning and help them learn independently (Mawarsari *et al.*, 2023). Apart from that, so that students understand the material better relate culture with mathematics or what is called Ethnomathematics is an alternative way that can be done.

Ethnomathematics is likened to a bridge that connects mathematics with culture, namely by linking mathematics to culture (Kamilah *et al.*, 2024). Rahmawati & Hidayah (2023) argued that integrating culture into mathematics learning can make it easier for students to understand mathematical concepts that are relevant to their daily lives, and can broaden students' insight into the culture around them. In line with research results from Novera *et al.* (2022) that the use of learning videos with an Ethnomathematics approach produces fun learning and can improve student learning outcomes. This proves that cultural links in mathematics are effective in attracting students' interest in learning so that mathematics learning is no longer boring for students. One of the cultures that is often found in the school environment studied is the Gambyong Dance, a traditional dance that is often performed at various important school events. Gambyong dance has a varied combination of floor patterns, attributes and movements. These elements can be connected to mathematical concepts, especially in the material Systems of Linear Equations in Two Variables (SPLDV). SPLDV teaches how to solve problems in everyday life which are formed into story problems, which require students to change everyday language into mathematical language and analyze the results of calculations to find the right solution (Amalo *et al.*, 2022).

There is a need for students to learn using interactive videos and the connection between SPLDV in everyday life, so by linking the Ethnomathematics approach to Gambyong Dance, it is hoped that it will make it easier for students to understand SPLDV material as well as introduce students to their culture. However, until now no one has implemented mathematics learning in schools that has implemented interactive learning videos on SPLDV material based on Gambyong Dance Ethnomathematics. Due to the importance of this, researchers are

interested in designing interactive learning videos for valid SPLDV materials based on Gambyong Dance Ethnomathematics.

RESEARCH METHOD

The research method applied in this research is method research and development (R&D) with the aim of producing a product, as well as testing the feasibility of the product being developed (Okpatrioka, 2023). By using the ADDIE development model which consists of the Analysis, Design, Development and Implementation stages. The ADDIE model was chosen because it can create a systematic approach when developing learning media and guarantee the validity of the products produced. But deep study the stages of the ADDIE model are limited to the Analysis, Design and Development stages.

The analysis stage is the first step taken to identify problems that occur in the learning process. At this stage, to analyze initial needs, problem analysis, needs analysis and analysis of student characteristics are needed.

The second stage is designing the product to be developed, starting with analyzing needs based on the problems obtained in the analysis stage, then setting development goals, and developing a testing strategy (Mawarsari *et al.*, 2023). This stage aims to provide an overview of the solution for the product being developed. At this stage the researcher determines elements including: media selection, preparation of teaching materials, product design, and preparing evaluation tools.

The third stage is the product development stage to produce an initial product which will then be assessed and validated by three media experts and three material experts. The results of this validation are in the form of assessments, comments, suggestions and input from media experts, which will later be used to correct deficiencies in the media being developed. Assessment by media experts includes aspects of appearance, sound, images, text and Ethnomathematics elements, which are in accordance with the indicators listed in Table 1. Meanwhile, assessment by material experts consists from the aspect of material suitability, suitability language, Ethnomathematical

elements, and indicator ability communication mathematically presented in Table 2.

Table 1. Media Expert Validation Grid

Assessment Aspects	Indicator	No. Item Statement
Sound Display	The sound presentation in the video is clear.	1
	Accurate setting of video background volume with learning video sound.	12
Image Display	The accuracy of the image presentation in the video can be seen clearly.	2
	The presentation of image illustrations is appropriate to the problem discussed.	3
	The background color matches the text color in the video.	9
	Suitability of the background to the storyline in the video.	10
	The video background display can be seen clearly.	11
Text View	The information text displayed on the video can be read clearly.	5
	The presentation of the text goes according to the words conveyed and is not too late.	6
	The running text display can be read clearly.	7
	The choice of text color on the video can be read clearly.	8
Ethnomathematics View	The suitability of the dance footage in the video with the	13

Ethnomathematics theme.
 The suitability of the animation to the topic being discussed. 4

Total Statement Details 13
 Source: Adaptation of (Widiastuti & Priantini, 2022)

Table 2. Material Expert Validation Grid

Assessment Aspects	Indicator	No. Item Statement
Material Feasibility	Compliance of the material in the video with CP and ATP.	1
	Suitability of SPLDV material in the video.	2
	Suitability of the example questions presented in the video with SPLDV material.	3
	The image display presented in the video is in accordance with the learning material.	4
	Clarity of presentation of material in learning videos.	5
Language Compatibility	The language used in the video is easy to understand.	6
	The language used in the video is in accordance with good and correct Indonesian language rules.	7
Ethnomathematics	Suitability of Ethnomathematics elements of Gambyong Dance in learning videos.	8
	The suitability of the	9

interesting presentation of the ethnomathematics elements of the Gambyong Dance in the video. Suitability of the example questions in the video with the theme Gambyong Dance Ethnomathematics. 10

Mathematical Communication Skills Suitability example questions in the video with indicators of mathematical communication skills. 13

Total Statement Details 11

Source: Adapted from (Widiastuti & Priantini, 2022)

This research uses quantitative data analysis methods by obtaining validation results from media experts and material experts in the form of a scale liked, after that data analysis is carried out including:

1. Calculate the total score obtained from the results of the media and material validation questionnaire using a Linkert Scale which are listed in Table 3 below.

Table 3. Linkert Scale

Assessment	Scale Value
Very Worth It	4
Worth it	3
Decent Enough	2
Not feasible	1

Source: (Fitri & Putri, 2020)

2. Next, data analysis was carried out on the validation questionnaire which had been filled in by the validators using the formula (Miftah and Setyaningsih, 2022):

$$\bar{x} = \frac{\sum x}{N} \quad (1)$$

Information:

\bar{x} = Average score

$\sum x$ = Total Score
 N = Number of Questionnaire Items

3. Calculate the percentage of data analysis results obtained using the following formula (Aprianka *et al.*, 2021):

$$Results = \frac{Total\ average\ score\ obtained}{Maximum\ Score} \times 100\%$$

4. Then the results of data analysis calculations in percentage form are classified into Table 4 as follows:

Table 4. Validity Assessment Criteria

Percentage Score Achievement	Validity Criteria
81% – 100%	Very Valid
61% – 80%	Valid
41% – 60%	Fairly Valid
21% – 40%	Invalid
< 21%	Very Invalid

Source: Adaptation from (Mawarsari *et al.*, 2024)

5. Analyzing the validity of learning videos based on assessment categories. This aims to assess whether the learning videos developed are suitable for use or whether there are still improvements. The quality of the learning video is declared valid if the minimum percentage score calculation results are within the score range 61% – 80% (Aprianka *et al.*, 2021).

RESULTS AND DISCUSSION

The aim of this research is to create an interactive learning video design based on Gambyong Dance Ethnomathematics on System of Two Variable Linear Equations (SPLDV) material that is valid and can be implemented in the learning process. The learning video design process in this research uses the ADDIE model which is limited to the development stage only. The stages that must be implemented are:

1. Level of Analysis


At the analysis stage, observations and interviews were carried out with mathematics teachers to identify the students' conditions. The results show that the majority of students are still having problems solving problems related to everyday life into mathematical concepts.

Apart from that, students are also not able to explain the solution to what they get. One of the materials of concern is the System of Linear Equations in Two Variables (SPLDV). This happens due to various reasons, including the teacher's side not facilitating students with questions related to daily life, limited learning media that supports students' learning interests, and not keeping up with technological developments. Apart from that, the curriculum used in schools has followed the latest curriculum developments from the government, namely the independent curriculum. However, in practice it has not been implemented well. Teachers still apply conventional teaching methods so that the indicators of an independent curriculum have not been implemented, including that students are expected to be able to analyze, present and solve problems that exist in everyday life. This also results in reducing students' interest in learning so that they often feel bored and even fall asleep in class while studying. Therefore, learning media is needed to increase students' interest in learning. and has followed technological developments so that students become more enthusiastic and do not fall asleep in class.

2. Planning Level

At this stage the researcher collaborates ideas for designing media that are developed as a form of solution to problems that occur in schools, such as choosing suitable learning media that can solve problems found, compiling teaching materials, designing products, and preparing evaluation tools needed in the process of measuring the validity of learning media. developed. The media developed in this research is an interactive learning video on Systems of Linear Equations in Two Variables (SPLDV). Then the researcher compiled the teaching materials used in the learning video, in the form of adjusting the video content to the learning outcomes, learning objectives and indicators used. After that, the product design was developed by collecting the elements that would be included in the learning video, carrying out an analysis of the Gambyong Dance to find out the elements that could be related to the System of Two Variable Linear Equations (SPLDV) material, making recordings and duplicating them, making animation, as well as making a learning video script first before recording. The learning video script is attached in Table 5 below.

Table 5. Learning Video Script

Scene	Visual	Audio/Captions	Duration
1		<i>Back sound</i> : Intro Instrumental Music	5 seconds
2	Prolog: Displays animations that convey the material studied in the video.	<i>Back sound:</i> Instrumental Music Displays an animation that conveys greetings and introductions before starting to discuss the material, as	1 minute

well as conveying the purpose and content of the material being studied.

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|---|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 3 | Case study:
Shows an explanatory animation relatedness Gambyong dance with SPLDV material. | <i>Back sound:</i> Instrumental Music
Displays animations that explain information about the Gambyong Dance such as the history of the Gambyong dance, accompanying music, clothing, movements and floor patterns used. Then students are required to solve problems based on the information that has been explained. | 2
minutes |
| 4 | Determining the solution:
Displays an animation that explains the solution to the problem. | <i>Back sound:</i> Instrumental Music
Shows animated activities discussing, solving problems given, and providing explanations regarding the solutions obtained. | 2
minutes |
| 5 | Conclusion:
Displays an animation that concludes the SPLDV concept, solving SPLDV with methods elimination, substitution method, and mixed method. | <i>Back sound:</i> Instrumental Music
Displays an animation that conveys the conclusion of solving the given problem. | 30
seconds |
| 6 | Closing:
Displays an animation that concludes the lesson in the video. | <i>Back sound:</i> Instrumental Music
Showing farewell and closing greetings in the video. | 5
seconds |
| 7 | Video Extro:
Acknowledgments | <i>Back sound:</i> Extra Instrumental Music | 5
seconds |



The video script that has been formed is then used as a basic framework for making learning videos. After that, the researcher took a video according to a predetermined flow. The results of the learning video design are as follows:





Picture 1. Intro and Introduction to the Learning Video

Figure 1 shows the intro display of the learning video which contains the title of the material being studied. Also, the introductory display contains an opening greeting, an introduction to the animation used in the video, and an explanation regarding the objectives and learning materials.



Figure 2. Case Studies in Learning Videos

Figure 2 shows the case study display containing narrative information about the Gambyong Dance, including the history of the Gambyong Dance, dance clothing, dance music, dance movements, and Gambyong Dance floor patterns. This aims to enrich students' insight into Gambyong Dance culture. Apart from that, in this case study students are given examples of problems related to the relationship between Gambyong Dance and SPLDV material. So that students know the connection between Gambyong Dance culture and mathematics.

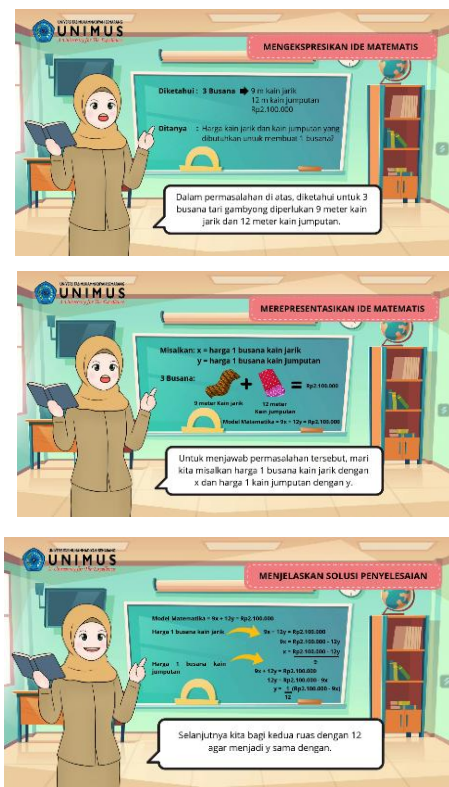


Figure 3. Solution Solution in the Learning Video

Figure 3 shows the solution display which contains the steps used to solve the problem from the given case study. In this scene, students are trained to answer with indicators of mathematical communication skills consisting of indicators of representing mathematical ideas, expressing mathematical ideas, and explaining solutions.



Figure 4. Solution Conclusion, Closing and Extras in Learning Videos

Figure 4 shows the display of the conclusion of the solution obtained. And the closing display contains greetings farewell and a closing greeting to end the learning video. Then, on scene There is an extra thank you to students who have watched this learning video.

3. Development Stage

This stage begins with the creation of the initial product, namely learning media in the form of videos that have been previously designed. Next, a validation test was carried out by three media experts and three material experts to assess the validity of the product being developed and to obtain useful input and suggestions in improving the product, so that it can be used appropriately in the learning process. The results of validation tests on learning videos in this research are used as a benchmark in assessing the suitability of the media being developed. Then the validation test results are presented in Table 6 for media validation and Table 7 for material validation.

Table 6. Analysis of Media Validation Results

Assessment Aspects	Shoes Validator			Rate-rate
	1	2	3	
Sound Display	3,7	3,8	3,7	3,73
Image Display	3,8	4	3,8	3,86
Text View	3,8	3,8	3,8	3,8
Ethnomathematics View	3,8	3,8	3,8	3,8
Validation Percentage Results				94%
Criteria				Very Valid

Table 7. Analysis of Material Validation Results

Assessment Aspects	Shoes Validator			Rate-rate
	1	2	3	
Material Feasibility	3,8	3,8	3,8	3,8
Language Compatibility	3,8	3,6	3,8	3,73
Ethnomathematics	3,8	4	4	3,93
Mathematical Communication Skills	3,7	3,6	3,7	3,6
Validation Percentage Results				94%
Criteria				Very Valid

Based on Table 6, the highest assessment from media experts on the image display aspect was obtained from validator II with a score of 4, which has a percentage of 100% and is in the very valid category. Displaying attractive images in learning videos can attract students' interest in learning material (Tama & Sumargiyani, 2022). Meanwhile, the assessment carried out by validators I and III obtained a score of 3.8 with a percentage of 95% in the very valid category. This matter is supported by Fitri & Putri (2020) who stated that through the visualization of attractive images in learning videos, abstract mathematical material becomes easy to understand. In the text display aspect, the score obtained from the 3 validators was 3.8 percentage 95% category very valid. A clear text display will make the visualization of the learning video more interesting to learn (Humaidi *et al.*, 2021). In the sound display aspect, the lowest score was obtained from validators I and III, namely 3.7 with a percentage of 92%. The display of clear sound in learning videos has

a significant influence in making it easier for students to understand the learning material (Qurrotaini *et al.*, 2020). However, based on the results of validator II obtained a score of 3.8 with percentage 95% are categorized as very valid. Meanwhile, in the Ethnomathematics aspect, a score of 3.8 was obtained from 3 validators with a percentage of 95% being in the category very valid. Thus, the average percentage of media validation results obtained was 94% which was in the interval 81% – 100%, this shows that the learning videos developed are categorized as very valid.

Table 7 shows the highest material validation results in the Ethnomathematics aspect with a score of 4 obtained from validators II and III, with a percentage assessment of 100% in the very valid category. This shows that the Gambyong Dance Ethnomathematics-based learning video is interesting to study because the material and example questions are linked to the Gambyong Dance culture. Learning videos represented through a cultural approach can make the learning process more interesting (Lisgianto & Suhendri, 2021). Apart from that, this can also broaden students' insight into the culture around them (Valda *et al.*, 2022). In the aspect of material feasibility, a score of 3.8 was obtained with a percentage of 95%, which is included in the very valid category based on assessments from 3 validators. This shows that the learning objectives prepared are in accordance with the expected learning outcomes, the material presented is considered effective in training students to solve contextual problems. Wijayanti *et al.* (2021) stated that good learning videos can make it easier for students to solve problems related to everyday life. In the language suitability aspect, the average score obtained was 3.73 with a percentage of 93.2% in the very valid category. In this way, the phrases or sentences used in providing voice over explanations of the material are clear and easy for students to understand. Learning videos are said to be good if the explanation of the material in the video can make it easier

for students to understand the material (Siwi & Puspaningtyas, 2020). In the aspect of mathematical communication skills, an average score of 3.6 was obtained by assessment percentage 90% of categories are very valid. This matter indicated the learning videos developed focus on indicators of students' mathematical communication abilities, so that they can optimize students' mathematical abilities (Yulastuti & Sholihah, 2021). The average percentage of material validation results obtained was 94% in the interval 81% – 100%, meaning the learning video developed has a very valid category.

Based on the assessment of media and material experts, the Gambyong Dance Ethnomathematics-based learning video SPLDV material obtained a validation percentage of 94% which ranged from 81% – 100% with a very valid category. This proves that the designed learning video is suitable for testing with students during the mathematics learning process.

CONCLUSION

Based on the results of research that has been conducted, it can be concluded that interactive learning media plays a very important role in increasing students' interest in learning, so that they become more enthusiastic and no longer feel bored or sleepy in class. The solution obtained from this research is the development of an interactive learning video for the material System of Linear Equations in Two Variables (SPLDV) based on Gambyong Dance Ethnomathematics which was designed using the Canva application. Based on the results of the validity analysis, it is known that the interactive learning video based on Gambyong Dance Ethnomathematics SPLDV material has received validation from media experts with the learning video developed being categorized as very valid. This assessment includes image visualization, choice of text type, sound display, and Ethnomathematics aspects, each of which is categorized as very valid. Apart from that, it is known from material experts that the learning videos developed are categorized as very valid. This assessment includes the ethnomathematics

aspects of the Gambyong Dance, material suitability aspects, language suitability aspects, mathematical communication ability aspects, each of which has been categorized as very valid. Thus, based on the assessment of media experts and material experts, an average validation percentage of 94% was obtained, making it in the very valid category. This means that the designed learning video is suitable for testing on students during the mathematics learning process. This interactive learning video display, which has been declared valid, is a cultural representation of the Gambyong Dance in the material System of Linear Equations in Two Variables (SPLDV) which is packaged interactively so that students can more easily understand the learning material.

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