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THE DEVELOPMENT OF ANIMATED VIDEO LEARNING MEDIA USING ANIMAKER TO IMPROVE STUDENTS' CRITICAL THINKING SKILLS

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ABSTRACT

Along with the development of Information and Communication Technology, learning media is now increasingly diverse. Teachers must be smart in choosing the right media so that it can facilitate students in understanding the material presented. The purpose of this research is to develop animated video learning media using animaker that is feasible and practical to use in learning mathematics in the classroom. The research method used is the Research and Development (R&D) method. The research model uses the ADDIE model which consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation. The research subjects in the small-scale trial were 8 students of class XI MAN Kota Cimahi and in the large-scale trial were 24 students of class XII MA Misbahunnur. The data collection technique was carried out by distributing response questionnaires to students to see the average using Microsoft Excel. From the results of product research, the feasibility of the products developed in the small-scale trial was 75%. While in the large-scale trial of 93% so that it is included in the criteria is very feasible. The practicality results of the small and large trials obtained 87% which showed very practical criteria. For a significance value of 0.0005 <0.05, the critical thinking ability whose learning uses animated video learning media using animaker with a scientific approach is better than ordinary learning. Thus, animated video learning media using animaker on statistics material is feasible and practical to use as a medium for learning mathematics.

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INTRODUCTION

Mahmuzah (2015) asserted that critical thinking skills constitute a vital component that students must possess, particularly in the context of learning mathematics. This skill set enables students to formulate, identify, interpret, and strategize effective solutions to problems.. In line with the opinion of Syafitri et al. (2021) students' critical thinking skills are able to build the quality of thinking so as to produce good learning. The cultivation of critical thinking skills is of paramount importance, as it significantly influences various aspects of daily life.

According to Liberna (2015) in performing critical thinking skills, the brain is forced to think seriously to solve problems faced by individuals or think about actions that will be taken later. Given that individuals encounter challenges that are unavoidable and necessitate resolution, it is imperative that everyone possess critical thinking skills. Such skills enable individuals to devise appropriate strategies for addressing the significant issues they confront.

It can be concluded that the ability to think critically is of paramount importance for individuals as they navigate life's challenges. This skill involves engaging in serious, active, and thorough analysis of all information received, accompanied by rational reasoning. Such an approach ensures that all decisions undertaken are sound and well-founded.

Indeed, critical thinking skills hold significant importance; however, the current situation in the field does not align with expectations. It has been observed that students' critical thinking skills in Indonesia remain relatively underdeveloped. Syafitri et al. (2021) in their research based on the four-year International Trends in International Mathematics and Science Study (TIMSS) study conducted on students with the characteristics of high cognitive level questions that can measure students' critical thinking skills show that Indonesian students consistently fall in the lower ranks. In addition, in the research of Syafitri et al. (2021) obtained the results of the 2018 Programme for International Student Assessment (PISA) survey published in March 2019 in the mathematics category, Indonesia is ranked 7th from the bottom (73) with an average score of 379. In 2015, Indonesia's ranking in the science performance category was 62nd; however, it has declined to 71st, positioning the country 9th from the bottom. The average score attained in this category was 396.

Mahmuzah (2015) revealed that the low mathematical critical thinking skills of students in learning mathematics need serious attention from all circles, especially mathematics teachers. Numerous factors contribute to the diminished cognitive abilities of students during the learning process. One significant factor is the prevalence of teacher-centered learning, often referred to as conventional teaching methods, which are frequently employed in educational institutions. In this approach, the teacher assumes a predominately dominant role, leading to a tendency among students to adopt a passive stance. Traditional learning activities typically commence with the educator providing an informative explanation of concepts, followed by illustrative examples and concluding with the assignment of practice problems. Consequently, this methodology promotes an emphasis on memorization rather than a deep understanding of concepts, thereby hindering the development of essential thinking skills, such as critical thinking, among students.

The utilization of learning media in the delivery of instructional material in the classroom will enhance students' interest in the learning process. According to Supriyono (2018) didactically psychological learning media greatly help the psychological development of children in terms of learning. It is asserted that the efficacy of teaching aids, particularly learning media, can be attributed to their psychological impact, as they facilitate an easier learning process for students by rendering abstract concepts more concrete and comprehensible. Furthermore, the incorporation of learning media is of paramount importance, as it contributes to time

efficiency in education. This implies that the utilization of media serves to simplify complex issues, particularly in the communication of new and unfamiliar content to students. Additionally, the application of media within the learning process can also foster meaningful experiences for learners.

The learning process is fundamentally a communication process and occurs within a systematic framework. Consequently, learning media holds a significant position as a key component of the learning system. Ekayani (2017) states that without media, communication will not occur and the learning process as a communication process will also not be able to take place optimally. In the educational process, it is essential to enhance learning effectiveness and to ensure that it becomes a more significant and meaningful experience for students.

Susilo (2015) pointed out that along with the development of Information and Communication Technology (ICT), learning media is now increasingly diverse. Teachers are required to exercise judiciousness in selecting appropriate media to facilitate students' comprehension of the material being presented. The effective utilization of instructional media can enhance students' ability to assimilate the subject matter. Consequently, it is imperative for teachers to demonstrate creativity and selectivity in the development of learning media.

An alternative innovation that can be used as a learning tool is Animaker. Animaker applications can be created and applied by teachers, which can be found on the internet web. Animaker is a web tool that can create full motion with audio and transition added to provide results that look like more interesting learning material (Munawar & Ahmad 2020). According to Fajrianti & Meilana (2022) learning media using animation has advantages for each user when animated videos are made because in making them using webtools so that computer storage space remains safe, as well as other supporting features that are free but can also use premium features. In addition, animators have the advantage of creating customisable characters as a substitute for the teacher explaining in the video.

The objective of this research is to develop educational media utilizing Animaker to enhance students' critical thinking skills. It is anticipated that the implementation of this learning media will facilitate improved cognitive abilities among the students.

METHOD

The research undertaken is categorized as developmental research, with the objective of creating learning media that is both feasible and practical. The product resulting from this research is an animated video developed using Animaker. The research used is a model implemented by Robert Maribe Branch, namely the ADDIE model. According to Gafur (in Razad & Rahman, 2022). The ADDIE model is composed of five distinct stages: analysis, design, development, implementation, and evaluation. The instrument uses a student response questionnaire. For data processing techniques using Microsoft excel to see the average validation from experts for feasibility and the average student response questionnaire for practicality (Sasongko & Suswanto, 2017).

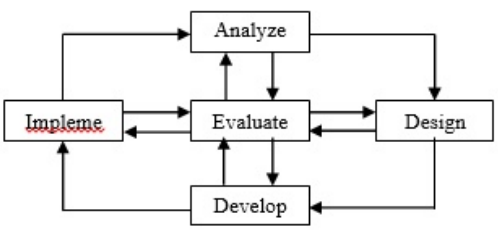

Figure 1. ADDIE Development Model

The analysis stage represents the preliminary phase preceding the determination of the concept for animated video learning media. This stage encompasses several analytical dimensions. Firstly, performance analysis aims to identify fundamental issues encountered during the learning process. Secondly, student analysis assesses the characteristics of students in relation to their knowledge and skill development. Additionally, the analysis of facts, concepts, principles, and procedures serves to identify relevant material that aligns with the advancement of learning media. Finally, there is a learning objective analysis, which is a step that needs to be owned by students to determine their abilities or competencies.

In this design step, researchers will set learning objectives and develop learning media designs using animators and relevant materials. In this stage, the researcher will also start designing the media interface, menu, materials, sample questions, and evaluation. The whole design will then become the basis for the development process. Currently, all designs that have been made are still conceptual in nature.

The development stage entails the process of creating learning media that has been established during the design stage. Upon the completion of the design stage, the learning media undergoes refinement. During the design stage, a conceptual framework for the learning media is formulated, which is subsequently transformed into a product that is prepared for implementation, revised, and validated by subject matter experts. The validation of the learning media, which incorporates animated videos created using Animaker, involves both media experts and content specialists, thereby ensuring a thorough evaluation of the media's suitability and effectiveness.

The implementation stage of this research involves the application of the learning media design within an actual classroom setting. During implementation, the learning media design that has been made is put into practice in real circumstances. The learning materials that have been prepared are delivered according to what is in the curriculum. However, previously it is necessary to prepare several matters, namely schedules, classrooms, learning equipment, media, and students who must be mentally and physically ready. After everything is ready, the product will be tested by giving response questionnaires to students to see its practicality.

In conclusion, the evaluation stage serves as a critical source of feedback from users of the learning media, facilitating improvements aimed at addressing any identified deficiencies in the developed materials. The proposed modifications must align with the assessment outcomes and address any unmet expectations related to the learning media. The results of the evaluation are utilized to inform the development process of the learning media. Subsequently, revisions will be conducted in accordance with the evaluation findings and the previously unmet objectives pertaining to the enhancement of the learning materials.

The research was carried out at MAN Kota Cimahi and MA Misbahunnur during the odd semester of the 2024/2025 academic year. The research subjects for the small-scale trial were 8 students of class XI MAN Kota Cimahi while for the large-scale trial were 24 students of class XII MA Misbahunnur. Researchers have previously conducted product validation with material experts and media specialists. While the product test was class X students at MAN Kota Cimahi totalling 36 students and MA Misbahunnur with 21 students.

Qualitative data that has been validated by experts is converted into quantitative data through the utilization of a Likert scale, where each statement is given a score. After the score is obtained, the average score of the expert validation assessment will be calculated which is the formula:

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

After obtaining the expert validation value, then look at the validity criteria in table 1 below (Hodiyanto et al., 2020).

Table 1. Product Validity Criteria

Value	Validity Level
$80\% < Vah \leq 100\%$	Highly valid, usable
$60\% < Vah \leq 80\%$	Valid, can be used
$40\% < Vah \leq 60\%$	Moderately valid, can be used with improvements
$20\% < Vah \leq 40\%$	Not valid, recommended not to use
$Vah \leq 20\%$	Not valid, cannot be used

Meanwhile, we can get data on student responses from giving scores on the questionnaire that has been provided by calculating the average score on each indicator, after which it is converted into a percentage by using the method:

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

After obtaining the average practicality, then see the criteria in table 2 below (Hodiyanto et al., 2020).

Table 2. Product Practicality Criteria

Value	Practical Level
$80\% < P \leq 100\%$	Very Practical
$60\% < P \leq 80\%$	Practical
$40\% < P \leq 60\%$	Moderately Practical
$20\% < P \leq 40\%$	Less Practical
$P \leq 20\%$	Not Practical

The data processing steps are as follows:

1. **Normality Test**

The normality test is performed to assess whether the data originates from a population that follows a normal distribution. Specifically, the Shapiro-Wilk test is employed for this purpose, utilizing a significance level of 0. 05.

The criteria for testing, based on their significance, are outlined as follows:

a. If the value of $sig \geq 0{,}05$ is observed, it can be concluded that the sample data follows a normal distribution.

b. If the value of $sig < 0{,}05$ is observed, it can be concluded that the sample data follows a normal distribution.

If the sample follows a normal distribution, one should proceed with the homogeneity test. Conversely, if the sample does not exhibit a normal distribution, a non-parametric test, specifically the Mann-Whitney test, should be conducted.

2. **Homogeneity Test**

The homogeneity test is conducted under the condition that the data follows a normal distribution, specifically by utilizing the T-test for assessment. The test is to determine whether the variances of the two groups are the same or different (Mariana & Zubaidah, 2015). The homogeneity test was conducted utilizing the IBM SPSS Statistics Software, Version 27.

The test criteria based on significance are as follows:

a. If the value of $sig \geq 0{,}05$, Thus, the variance of the two sample groups is homogeneous.

b. If the value of $sig < 0{,}05$, Consequently, the variances of the two sample groups are not homogeneous.

If the variance is homogeneous, one may proceed with the parametric test known as the Independent Sample T-Test. Conversely, if the variance is not homogeneous, one should also proceed with the parametric test, specifically the T-Test.

3. Significance Test of Difference between Two Averages

If the data follows a normal distribution and exhibits homogeneous variance, the appropriate statistical test to employ is the t-test. If the data is normally distributed but the variance is not homogeneous, then the test performed is the 't-test' (Sukestiyarno & Agoestanto, 2017). In the event that the data does not exhibit a normal distribution, it is advised to proceed with the Mann-Whitney U test. One possible formulation of the hypothesis is as follows:

$H_o: \mu_1 = \mu_2$ (there is no difference in critical thinking skills whose learning uses animated video learning media using animaker with a scientific approach with ordinary learning)

$H_a: \mu_1 \neq \mu_2$ (there is a difference in critical thinking skills whose learning uses animated video learning media using animaker with a scientific approach with ordinary learning)

Testing criteria if $sig \geq 0{,}05$, then H_o accepted, while if $sig < 0{,}05$ then H_o rejected.

RESULTS AND DISCUSSION

Results

The objective of this research is to develop learning media utilizing Animaker specifically for the teaching of row and sequence material. In addition to the creation of this educational media, the study aims to assess both the feasibility and practicality of the learning resources for use in mathematics instruction. The development process of the animated video learning media with Animaker is conducted through the five stages of the ADDIE model, which include: analysis, design, development, implementation, and evaluation. The subsequent steps outline the process involved in the research and development of educational media.

The initial step undertaken in this research and development process involves the assessment of needs and curriculum. In this step, researchers first collected data about the learning media being used at MAN Kota Cimahi and MA Misbahunur schools. The findings of the conducted analysis indicate that teachers did not utilize learning media during the instructional process.

The next step is to design the design. After obtaining information about learning media problems in schools, data was collected to help develop learning media. then made learning media design. Researchers compiled learning media according to the indicators and objectives in the syllabus. The purpose of the material is organized to facilitate students' understanding of the content. Therefore, the presentation of the material is arranged in such a way that it is not too convoluted and presents the students' point of view to make the material more

interesting. To make the learning media more interesting, researchers used video animation according to the material and the background was made not boring. In addition, in this stage, researchers developed a validation sheet to assess the feasibility of creating learning media. The validation sheet is made with aspects of learning media assessment. The validation sheet is intended for media specialists and material experts, during the administration of the questionnaire. for response is intended for students to assess the responses and practicality demonstrated by students following their learning experiences. give after learning media with animated videos are used.

Following the design of the learning media, the process transitions into the development stage. During this phase, the researchers initiate the implementation of the plans that were previously established in the design stage. Researchers started creating the learning media with animated videos using animaker. The design of the animated video learning media is presented in Figure 1 below:

Figure 1. Animation Video Learning Media Design

Upon the completion of the development of the learning media, and prior to the implementation of a small-scale trial, a feasibility assessment or validation conducted by material and media experts is essential. The evaluations provided by these validators regarding the learning media serve as a crucial reference for necessary improvements. This process proves to be highly beneficial before the product is introduced to students during the field-testing phase.

The assessment was carried out in collaboration with media experts to evaluate the feasibility of using Animaker for animated video learning media. The evaluation encompassed several aspects, including appearance, audio/sound quality, content material, and overall benefits. The findings from the media experts' assessment are presented in Table 3 below:

Table 3. Validity Results of the Media Expert Small Scale Trial

No	Aspects	Score		Total	Presentase	Description
		Expert 1	Expert 2			
1	View	24	22	46	82,14%	Very Valid
2	Audio/Sound Effects	14	12	26	81,25%	Very Valid
3	Material Content	6	6	12	75%	Valid
4	Benefits	13	12	25	78,13%	Valid
Total		**57**	**52**	**109**	**79%**	**Valid**

The percentage value provided by media experts in the 'Valid' category is 79%., with different percentages for each aspect, namely 82.14% for appearance, 81.25% for audio/sound effects, 75% for material content, and 78.13% for benefits.

Furthermore, the materials expert conducts an evaluation to ascertain the feasibility. of the material in learning video animation using animaker. The aspects of assessment include competence, presentation of material, benefits and completeness. The findings of the media expert assessment are delineated in Table 4, specifically:

Table 4. Validity Results of the Small Scale Trial Conducted by Material Experts

No	Aspects	Score		Total	Presentase	Description
		Expert 1	Expert 2			
1	Competence	6	6	12	75%	Valid
2	Presentation of Material	16	17	33	68,75%	Valid
3	Benefits	7	9	16	66,66%	Valid
4	Completeness	5	6	11	68,75%	Valid
Total		**34**	**38**	**72**	**70%**	**Valid**

The percentage value determined by the material expert is 70%, which includes the designation of 'Valid ', the percentage value of each aspect is 75% in the aspect of competence, 68.75% in the aspect of material presentation, 66.66% in the aspect of benefits and 68.75% in the aspect of completeness.

Based on the evaluations conducted by media specialists and material experts also provide comments on this learning media, namely at the beginning of the video should convey the objectives, Indicators in learning not in the video. Furthermore, the graph as an illustration, should continue to appear when the question is given, so that what is asked can be illustrated. Finally, when asking for a response or answer, it should provide a pause for students to think.

After the validation process is complete, a small-scale trial will be conducted to evaluate the efficacy of the developed learning media was evaluated through the distribution of feedback forms questionnaires to several students to obtain their responses. In this study, the learning media was implemented at MA Misbahunnur involving 8 grade XI students. The results of student responses to the small-scale trial are presented in Table 5 as follows:

Table 5. Outcomes of Student Responses in the Small-Scale Trial

No	Aspects	Score	Presentase	Description
1	View	165	73,66%	Practical
2	Presentation of Material	192	85,71%	Very Practical
3	Benefits	118	73,75%	Practical
Total		**475**	**78%**	**Practical**

According to the findings presented in Table 5, it is observed that the developed learning media falls within the 'Practical' category, achieving a percentage of 78%. The detailed scores for each individual aspect are as follows: the overall appearance received a score of 73,66%, the presentation of the material attained a score of 85,71%, and the perceived benefits were rated at 73,75%.

From the responses that students have given using the questionnaire, there is input given, namely the sound in the video is not too big and the video backsound is too big so that what is conveyed is not very clear. Consequently, validation will be conducted once more prior to the administration of the subsequent test.

After the learning media has been revised and before the learning media is carried out on a large scale trial, validation is subsequently conducted by media experts, followed by an evaluation by material experts.. The assessment obtained from media experts and material experts on learning media becomes a guide for making improvements. This stage is very important before students are tested on a large scale.

Media experts conduct an evaluation to assess the feasibility of using animated video learning media through Animaker. The evaluated aspects encompass visual presentation, audio/sound aspects, material content and benefits. The expert assessment of the media is contained in the following table 6 below:

Table 6. Results of the Validity Assessment of the Large-Scale Trial Involving Media Experts

No	Aspects	Score		Total	Presentase	Description
		Expert 1	Expert 2			
1	View	27	24	51	91,07%	Very Valid
2	Audio/Sound Effects	15	14	29	90,63%	Very Valid
3	Material Content	8	7	15	93,75%	Very Valid
4	Benefits	15	15	30	93,75%	Very Valid
Total		**65**	**60**	**125**	**92%**	**Very Valid**

According to Table 6, the percentage value attributed to the media expert falls within the 'Very Valid' category, registering at 92%. This figure reflects the percentage score for each individual aspect, namely 91.07% in the display aspect, 90.63% in the audio/sound effects aspect, 93.75% for the material content aspect and 93.75% for the benefits aspect.

The next step is to conduct an evaluation with material experts to find out whether the material presented in the animated video learning media created with Animaker is deemed suitable for instructional use. The evaluation encompasses several aspects, including competence, material presentation, benefits, and completeness. The results of the assessment conducted by media experts are presented in Table 7.

Table 7. Presents the Findings Regarding the Validity of the Large-Scale Trial Conducted by Material Experts.

No	Aspects	Score		Total	Presentase	Description
		Expert 1	Expert 2			
1	Competence	6	8	14	87,5%	Very Valid
2	Presentation of Material	21	24	45	93,75%	Very Valid
3	Benefits	11	12	23	95,83%	Very Valid
4	Completeness	7	8	15	93,75%	Very Valid
Total		**45**	**52**	**97**	**93%**	**Very Valid**

According to Table 7, the percentage value ascertained by the material expert is 93%. including 'Very Valid', the percentage value attributed to each aspect is 87. 5%. in the competency aspect, 93.75% in the material presentation aspect, 95.83% in the benefits aspect and 93.75% in the completeness aspect.

Based on evaluations conducted by media experts and material specialists, it was concluded that this educational media is highly suitable for use without the need for revisions so that the product can be used during a large-scale trial to assess the feasibility of the developed learning media,, by giving a response questionnaire to students. In the context of extensive trial research, the learning media was implemented at MA Misbahunnur involving 36 class IX students. The following are the results of student responses to the large-scale trial in Table 8:

Table 8. Outcomes of Learner Responses in the Large-Scale Trial

No	Aspects	Score	Presentase	Description
1	View	495	85,94%	Very Practical
2	Presentation of Material	591	87,95%	Very Practical
3	Benefits	402	83,75%	Very Practical
Total		**1488**	**86%**	**Very Practical**

Based on the findings from the student questionnaire presented in Table 8, the developed learning media received an overall rating of 86%, categorizing it as 'Very Practical. ' The individual values of the assessed aspects are as follows: 85. 94% for the aspect of appearance, 87. 95% for the aspect of material presentation, and 83. 75% for the aspect of benefits.

After validating the media experts and material experts, it can be seen the feasibility of animated video learning media using animaker in small and large scale trials. The following is a recapitulation in table 9:

Table 9. Summary of the Validity of Small-Scale and Large-Scale Trials

Validator	Small Scale Trial		Large Scale Trial	
	Presentase	**Description**	**Presentase**	**Description**
Media Expert	79%	Valid	92%	Very Valid
Material Expert	70%	Valid	93%	Very Valid
Average	**75%**	**Valid**	**93%**	**Very Valid**

According to Table 9, the average performance of the validator in the small-scale trial was 75%, categorized as 'Valid. ' In contrast, the average performance of the validator in the large-scale trial was 93%, classified as 'Very Valid. ' This indicates an 18% improvement in validity from the small-scale trial to the large-scale trial.

After giving the response questionnaire to students, the practicality of animated video learning media is evident using animaker during small or large scale trials. Here is the recapitulation in table 10 below:

Table 10. Summary of the Practicality of Small-Scale Trials and Large-Scale Trials

No	Aspects	Small Scale Trial		Large Scale Trial	
		Presentase	**Description**	**Presentase**	**Description**
1	View	73,66%	Practical	85,94%	Very Practical
2	Presentation of Material	85,71%	Very Practical	87,95%	Very Practical
3	Benefits	73,75%	Practical	83,75%	Very Practical
Average		**78%**	**Practical**	**86%**	**Very Practical**

According to Table 10, the average response rate in the small-scale trial was 78%, which included the category designated as ‘Practical’. In contrast, the average response rate in the large-scale trial was 86%, encompassing the category ‘Very Practical’. This indicates that the learning media was deemed practical for use.

Critical Thinking Ability of Students Using Animated Video Learning Media Using Animaker with a Scientific Approach

Based on the processing of pretest and post-test data, the averages, percentages of critical thinking abilities, and standard deviations for both the experimental and control groups have been calculated. Below, Table 11 presents a detailed description of the data for the experimental and control classes.

Table 11. Data Description of Experimental Class and Control Class

Statistics	Experiment Class		Control Class	
	Pretes	Postes	Pretes	Postes
N	36	36	21	21
$\bar{x}$	10,32	37,15	10,05	34,19
(%)	23,72	80,37	21,95	74.33
S	0,99	1,22	0,98	1,69

Ideal Maximum Score for pretest and posttest = 46

According to Table 11, the average pretest score for the experimental class is 10,32, while the control class has an average of 10,05. This indicates that there is no significant difference between the two classes' averages. Therefore, we can conclude that the initial abilities of both classes are comparable. In the experimental class, the average student obtained a pretest score of critical thinking ability above the completeness criteria as much as 23,72% and increased in the post-test to 80,37% of the average ideal score. In the control class, The average student in the experimental group achieved a pretest score of critical thinking ability that exceeded the completeness criteria by 23,72%. This score increased to 80,37% of the average ideal score in the post-test. In contrast, the average student in the control group attained a pretest score of critical thinking skills that surpassed the completeness criteria by 21,95%, which subsequently rose to 74,33% of the average ideal score in the post-test. Based on these data, it can be concluded that the experimental group experienced a greater percentage increase compared to the control group.

The experimental group exhibits a standard deviation of 1,22, whereas the control group displays a standard deviation of 1,69. This indicates that the final abilities within the experimental group are more widely dispersed than those in the control group.

To test the truth, inferential statistical calculations will be carried out for pretest and posttest, namely by conducting normality tests, homogeneity tests and significance tests of mean differences.

The hypothesis to be tested is: 'Critical thinking skills whose learning uses animated video learning media using animaker with a scientific approach is better than ordinary learning'.

a. Analysis of Student Critical Thinking Ability Pretest Data

In order to ascertain that the average abilities of the two classes are not significantly different, a significance test of the difference in means (two-tailed) was conducted on the pretest results. Prior to executing the significance test for the difference in means, normality and homogeneity tests were performed.

1) Normality Test of Student Critical Thinking Ability Pretest

To test the normality of pretest data, The analysis was conducted utilizing SPSS version 27, employing the Shapiro-Wilk test with a significance level set at 0,05. The criteria for decision-making in this test stipulate that if the significance level is greater $sig \geq 0{,}05$, the sample can be considered normally distributed. The results of the normality test for the pretest scores are presented in Table 12 below:

Table 12. Presents the Results of the Normality Test Conducted on the Pretest of Critical Thinking Ability.

Tests of Normality

		Shapiro-Wilk		
	Kelas	Statistic	df	Sig.
Nilai	Kelas Eksperimen	.096	36	.200*
	Kelas Kontrol	.160	21	.170

According to Table 12, the significance value for the experimental group is 0,200, while that of the control group is 0,170. Since both significance values $sig \geq 0{,}05$, it can be concluded that both the experimental and control groups are normally distributed. Consequently, given the normal distribution of the data, the next step is to conduct the homogeneity test.

2) Homogeneity Test of Student Critical Thinking Ability Pretest Data

The homogeneity test is employed to ascertain whether the variances of two groups are equal or differ. To evaluate the homogeneity of the pretest data, the Levene statistic test was applied, utilizing a significance level of 0,05. The criterion for establishing homogeneity is that if the value $sig \geq 0{,}05$ exceeds a specified threshold, the variances of the two sample groups are considered homogeneous. The results of the homogeneity test for the pretest scores are summarized in Table 13 below:

Table 13. Critical Thinking Ability Pretest Homogeneity Test Results

Independent Samples Test

		Levene's Test for Equality of Variances	
		F	Sig.
Nilai	Equal variances assumed	.719	.400

Based on the data presented in Table 13, it is evident that the significance value for the homogeneity test is 0,400. Given this value, it can be concluded that the variances of the two sample groups are homogeneous. Because the variance is homogeneous, subsequently one should proceed to the parametric analysis, specifically the Independent Samples T-Test.

3) Significance Test of Average Differences in Student Critical Thinking Ability Pretest Data

The mean difference test is designed to ascertain whether there exists a significant difference between the averages of two classes. This test was conducted utilizing SPSS version 27, with a significance level set at 0. 05. Based on the results of prior calculations, it was determined that both the experimental and control groups exhibited a normal distribution. Consequently, hypothesis testing was executed using a parametric approach, specifically the Independent Sample T-Test. The hypothesis for this test is formulated as follows.

$H_o: \mu_1 = \mu_2$ (there is no significant difference in the initial critical thinking skills of students who engage in learning through animated video media created with Animaker utilizing a scientific approach, when compared to those who participate in conventional learning methods.)

$H_1: \mu_1 \neq \mu_2$ (There exists a discernible difference in the initial levels of critical thinking skills among learners who engage with animated video learning media created with Animaker, utilizing a scientific approach, in comparison to those who participate in conventional learning methods)

The criterion for decision-making in this test is subsequently accepted. The data obtained from the two mean difference test results are presented in Table 14 as follows:

Table 14. Mean Difference Analysis of Critical Thinking Ability Pretest Scores

Independent Samples Test

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Nilai	Equal variances assumed	.745	55	.459	.544	.729	-.918	2.005

According to Table 14, the significance (2-tailed) value is 0. 459. This indicates that the significance level exceeds $sig \geq 0{,}05$, thus leading to the acceptance of the null hypothesis. In other words, there is no statistically significant difference in the initial critical thinking skills of students taught using animated video learning media designed with Animaker, as compared to those taught through traditional instructional methods.

b. Analysis of Posttest Data on Students' Critical Thinking Ability

Post-test data was collected by administering an examination to assess the critical thinking skills of students following the application of the treatment. The objective of conducting the post-test is to determine whether the critical thinking skills of the experimental group outperform those of the control group.

1) Normality Test of Posttest Data on Students' Critical Thinking Abilities

To assess the normality of the post-test data, an analysis was conducted utilizing SPSS Version 27, employing the Shapiro-Wilk statistical test with a significance level set at 0,05. The decision-making criteria for this test dictate that if the $sig \geq 0{,}05$ exceeds the significance level, then the sample can be considered normally distributed. The results of the normality test for the pretest scores are presented in Table 15 below:

Table 15. Results of the Normality Test for the Posttest Scores of Critical Thinking Ability

Tests of Normality

		Shapiro-Wilk		
	Kelas	Statistic	df	Sig.
Nilai	Kelas Eksperimen	.179	36	.110
	Kelas Kontrol	.147	21	.200*

According to Table 15, the significance values for the experimental class and the control class are 0,110 and 0,200, respectively. This indicates that both classes exhibit a normal distribution. Given the normality of the data, a homogeneity test will subsequently be conducted.

2) Homogeneity Test of Student Critical Thinking Ability Posttest Data

The homogeneity test is employed to ascertain whether the variances of two groups are equal or differ. For the evaluation of the homogeneity of post-test data, the Levene statistic test was utilized, with a significance level set at 0,05. The testing criterion stipulates that if the

computed value meets a specified threshold, then the variances of the two group samples may be regarded as homogeneous.

The results of the homogeneity test for the post-test scores are presented in Table 16 below.

Table 16. Results of the Homogeneity Test for Critical Thinking Ability Post-Intervention

Independent Samples Test

		Levene's Test for Equality of Variances	
		F	Sig.
Nilai	Equal variances assumed	32.632	.482

According to Table 16, the significance value for the homogeneity test is 0,482. Given this value $sig \geq 0{,}05$, it can be concluded that the variances of the two sample groups are homogeneous. Consequently, due to the homogeneity of variance, the next step is to conduct a parametric test, specifically the Independent Samples T-Test.

3) Significance Test of Average Differences in Students' Critical Thinking Ability Posttest Data

The Mean Difference Test is designed to assess whether there exists a statistically significant difference in the averages of two distinct classes. This analysis was conducted utilizing SPSS version 27, employing a significance level of 0. 05. The results of prior calculations indicated that both the experimental and control groups exhibited normal distribution; consequently, hypothesis testing proceeded using a parametric method, specifically the Independent Samples T Test (T-Test). The hypothesis for this test is articulated as follows.

$H_o: \mu_1 = \mu_2$ (There is no discernible difference in the initial critical thinking skills among individuals whose learning is facilitated by animated video learning media created using Animaker, in comparison to those who engage in conventional learning methods.)

$H_1: \mu_1 > \mu_2$ (The ability to engage in critical thinking, when developed through the use of animated video learning media created with Animaker and employing a scientific approach, proves to be superior to traditional learning methods.)

The criteria for testing are outlined as follows:

a. If the sig value. (1-tailed) = sig value. (2-tailed)/2 <0.05 then rejected
b. If sig. (1-tailed) = sig value. (2-tailed)/2 0.05 then it is accepted

The results of the differential analysis conducted between the two means of the post-test scores are presented in Table 17 below.

Table 17. Assessment of the Mean Difference in Posttest Scores of Critical Thinking Ability

Independent Samples Test

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Nilai	Equal variances assumed	3.444	55	.001	2.702	.785	1.130	4.275

According to the data presented in Table 4. 17, the significance value (two-tailed) is identified as 0,001. However, because hypothesis testing uses a one-sided statistical test (1-tailed), 0.001 is divided by 2 to 0.0005. Because the significance value of 0.0005 < 0.05, this study investigates the comparative effectiveness of animated video learning media developed with Animaker, alongside a scientific approach, in fostering critical thinking skills. The findings indicate that the use of this innovative instructional method is superior to traditional learning methods.

The subsequent phase is the evaluation stage, during which a comprehensive review of the assessments provided by experts, as well as the feedback from students, is conducted. Following this evaluation, decisions will be made based on the findings. conducted on animated video learning media using animaker, It demonstrates that the media produced has achieved the requisite standards for educational utilization, although there are still shortcomings in the media such as audio but overall it is good. For students, the media that has been made has been practical, this facilitates a more conducive learning environment for students., and students can accept learning using learning media in the classroom.

Discussions

The developed product is presented as an animated video learning medium that employs a scientific approach. This product has passed several stages of revision such as in the Forum Group Discussion (FGD) from the results that the video must be more interactive and the steps of the scientific approach are important to be raised again so that students can later be more active in learning and understanding the contents of the animated video because according to Sulistyowati et al. (2012) learning through a scientific approach is very important to be taught to students, so that students are accustomed to 'discovering' concepts or knowledge systematically.

After the product was improved, a limited test was conducted, having been previously validated by subject matter experts in materials and media. In Figure 4.2, what is fixed at the beginning of the video should convey the objectives, KD, Indicators in learning not in the video. Furthermore, the graph as an illustration, should continue to appear when the question is given, so that what is asked can be illustrated. Finally, when asking for a response or answer, it should provide a pause for students to think. In addition, the sound in the video is not too big and the video backsound is too big so that what is conveyed is not so clear. In addition, the background display is a little less colourful so that the background of the video is made more colourful to make it more interesting. This video improvement is very important so that when used the animated video can be understood by students because according to Romadoni & Susilo (2019) videos can make students active and focused in classroom learning because the appearance of images combined with sound can make students easily understand the material.

The subsequent stage constitutes the final phase in the process of developing this animated video learning media, which involves a comprehensive testing procedure. Initially, validation was conducted during this broad testing phase, from the validator there were no more revisions that needed to be made, just a few revisions from student input such as Figure 4.4 for the background to be made even more colourful. After the revision is made, this product can be tested at the product test stage.

Feasibility testing or validation is very important because according to Widiastika Asti et al. (2021) the criteria for preparing material in media development, namely that it must be valid or valid and of interest. Valid or valid means that the material presented must really be in accordance with the sources used so that it helps students' understanding. The feasibility test

was conducted by validators, specifically material experts and media experts. The results of the limited test indicated that the validation outcomes met the criteria for feasibility, but there were from the validator, namely at the beginning of the video it should convey the objectives, KD, Indicators in learning not in the video. Furthermore, the graph as an illustration, should continue to appear when the question is given, so that what is asked can be illustrated. Finally, when asking for a response or answer, it should provide a pause for students to think.

In the limited test, the product was tested on students who had already studied because the product would be used by students and students' responses would be seen by distributing response questionnaires. Because the product uses class X material so that the practicality test is given to class XI. For the limited test of student responses taken as many as 8 students from MAN Kota Cimahi. The results obtained are already on very practical criteria but there is little input from students that the sound in the video is not too big and the video backsound is too big so that what is conveyed is not so clear. In addition, the background display is a little less colourful so that the background of the video is made more colourful to attract students' attention because according to Sari (2022) the educational media used must be made as interesting as possible, so that children feel curious and interested in increasing understanding, thus creating a meaningful experience. From this input, product revisions were made.

In the broad test of student responses taken as many as 24 students from MA Misbahunnur who were different from the previous test, besides that testing was also carried out at different times so that they could see the changes that occurred and the results were in very practical criteria with a slight revision for the background to be made more colourful again. So that the product is ready to be tested in the next test, This finding is consistent with the research conducted by Eka et al. (2022) which involved minor revisions even though the product has been tested.

This study seeks to investigate the attainment of critical thinking skills among students. who use animated video learning media using animaker with scientific approach compared to ordinary learning and the enhancement of critical thinking skills among students who engage in animated video learning. media using animaker with scientific approach compared to ordinary learning.

Before different treatments were given to the experimental and control groups in the study, the author conducted pretests for both groups. A descriptive statistical analysis revealed that there was no significant difference in the average scores of the pretests for both classes. Furthermore, inferential statistical calculations indicated that there was no discernible difference in the critical thinking skills of students between the experimental and control groups..

After different treatments, both classes were administered a post-test to assess the differential impact of animated video learning media, utilizing Animaker within a scientific framework, on the critical thinking skills of students in comparison to traditional learning methodologies. The results of the descriptive statistical analysis indicated that the mean score of the experimental class's post-test was higher than that of the control class. Likewise, with inferential statistical calculations, it was concluded that students' critical thinking skills using animated video learning media using animaker with a scientific approach were better than ordinary learning.

The critical thinking skills of students in the experimental class surpassed those in the control class. This is attributed to the effective incorporation of animated video learning media, specifically utilizing Animaker within a scientific approach. Consequently, students

in the experimental class demonstrated heightened levels of engagement during the learning process and with this approach students developed more critical thinking skills.

Critical thinking skills have a relationship with the scientific approach using animakers, because the scientific approach requires students to do activities as a science expert (Umar, 2016). Thus, learning with a scientific approach using animakers makes students able to understand what they learn well.

Based on observations during the research, it appears that students‘ critical thinking skills can emerge when students are faced with a problem and students' critical thinking skills will be enhanced if they independently explore and discover the concepts related to the material.. This is in line with research conducted by Ucisaputri et al. (2020) that critical thinking skills with learning using a scientific approach are better than ordinary learning and it appears that the scientific approach has a significant effect on students' mathematical critical thinking skills.

CONCLUSION

The process of developing animated video learning media utilizing Animaker is conducted through five distinct phases: Analysis, Design, Development, Implementation, and Evaluation. The development of animated video learning media utilizing Animaker has demonstrated highly valid and feasible criteria, as indicated by expert evaluations, and has received favorable feedback from students. This suggests that the animated learning media is exceptionally effective for use in the mathematics classroom. Consequently, the animated video learning media created with Animaker is suitable for mathematics instruction. Furthermore, students who engage with the animated video learning media through a scientific approach exhibit superior critical thinking skills compared to those participating in traditional learning methods.

Suggestions from researchers that can be given to future researchers to be able to further develop this animaker the role of media in the learning process is significant. Furthermore, it is anticipated that the media developed subsequently will demonstrate effectiveness, thereby providing a clearer assessment of students' abilities throughout their educational experiences.

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