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DEVELOPMENT OF ANIMATED VIDEO BASED ON CONTEXTUAL TEACHING AND LEARNING USING *ANIMAKER* ON THE MATERIAL OF EQUAL AND INVERSE VALUE COMPARISON

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Abstrak

Hasil analisis kebutuhan siswa menunjukkan sebesar 51% siswa lebih menyukai pembelajaran berbasis video. Hasil wawancara guru menunjukkan bahwa siswa mengalami kesulitan dalam membedakan materi perbandingan senilai dan berbalik nilai. Studi ini bertujuan untuk mendeskripsikan kevalidan, kepraktisan, dan keefektifan video animasi berbasis CTL menggunakan perangkat lunak *Animaker* pada materi perbandingan senilai dan berbalik nilai untuk siswa kelas VII di SMP Negeri 6 Jember. Metode yang digunakan yakni metode *R&D* dengan model DDD-E. Melalui teknik *purposive sampling*, subjek yang terlibat sejumlah enam siswa pada skala kecil dan 32 siswa pada skala besar. Hasil penelitian menunjukkan kevalidan video animasi yang dikembangkan meliputi kevalidan materi memperoleh skor sebesar 98% (sangat valid), kevalidan media memperoleh skor sebesar 86% (sangat valid). Kepraktisan diperoleh dari respon siswa skala kecil, respon siswa skala besar, dan respon guru dengan nilai skor secara berurutan yaitu 81,4% (sangat praktis); 89,8% (sangat praktis); dan 86% (sangat praktis). Keefektifan dari uji *Wilcoxon* dengan nilai *Sig.* 0,001 dimana kurang dari 0,05 dapat dikatakan terdapat perbedaan hasil tes siswa antara sebelum dan sesudah menggunakan video animasi. Sedangkan uji *N-Gain* diperoleh skor 0,72 dikategorikan tinggi sehingga dapat dikatakan efektif. Dapat disimpulkan video animasi yang dikembangkan dapat dikatakan layak digunakan dalam pembelajaran Matematika.

Kata kunci: *Animaker software; CTL*; perbandingan senilai dan berbalik nilai; video animasi

Abstract

The results of needs analysis show that 51% of students prefer video-based learning. The results of mathematics teacher interview show that students have difficulty in differentiating the equal and inverse value comparison materials. This study aims to describe the validity, practicality, and effectiveness of animated videos based on CTL using Animaker on equal and inverse value comparison for students grade VII at SMP Negeri 6 Jember. This study employs the R&D method with the DDD-E model approach. Six participants were recruited on a small scale and 32 participants on a large scale. The results showed that the validity of the animated video developed included the validity of the material reached the score of 98% (very valid category), and the validity of the media reached the score of 86% (very valid category). Practicality is obtained from small-scale student responses, large-scale student responses, and teacher responses, with their respective scores reaching the score of 81.4% (very practical), 89.8% (very practical), and 86% (very practical). The effectiveness is obtained from the Wilcoxon test with Sig. 0.001 where <0.05, it can be stated that there is a difference between before and after using animated video media. While the N-Gain test reached a score of 0.72 (high category), so it can be stated to be effective. It can be concluded that the animated video developed can be said to be suitable for use in learning Mathematics.

***Keywords**: Animaker software; animated videos; CTL; equal and inverse value comparison*

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INTRODUCTION

Technological advances are developing very rapidly and affect various fields, including education. Therefore, the education process should align with current technological developments, as its use is embedded in everyday life. Technology is able to assist humans in gathering various information and applying knowledge to improve learning activities. When viewed from its role, it becomes a necessity to involve technology in the learning process (Benny, 2017; Sriyanah & ES, 2023).

The utilization of technology in schools can be seen from its implementation as a learning media that helps teachers deliver material. Learning media is one of the essential components in making the learning process effective and efficient. As an intermediary tool, learning media functions to support activities, to improve problem solving ability, to acquire skills and knowledge (Darmawan & Suparman, 2019; Farihah, 2020; Saputri & Qohar, 2020).

Firdaus et al. (2023) said that learning videos are one of the media that can support more exciting and innovative learning. Several ways can be done to create engaging learning media, one of which is by using animated videos. According to Hamidi et al. (2023), animated videos can increase students' enthusiasm for learning, making it easier to absorb learning material.

The results of a questionnaire of seventh-grade students at SMP Negeri 6 Jember, East Java, Indonesia, regarding Mathematics learning show that 46% of students feel bored with daily learning, 50% of students have difficulty understanding comparison material, and 53.1% prefer learning with videos compared to reading books. This data is corroborated by the results of the Mathematics teacher interview, which show that students have trouble distinguishing the material of equal and inverse value comparison. There is only a student worksheet as the only learning resource. Of course, if you only rely on one learning source, students' knowledge will also be limited.

Because of these problems, an alternative solution is proposed by developing learning media in the form of animated videos. Animated video using *Animaker* was chosen because it has several advantages, including features such as characters, audio, background, handwriting animation, text, effects, transitions, and can be accessed for free online (Paino & Hutagalung, 2022). Animated videos using *Animaker* can also display teacher animations, practice questions, process illustrations, case studies, and simulation examples (Azizah et al., 2024).

In addition, the animated video in this study is combined with the Contextual Teaching and Learning (CTL) approach to create a real learning experience so that students will better understand the material presented. This has been explained by several studies that Contextual Teaching and Learning (CTL) can encourage students to apply knowledge while improving learning outcomes and activeness (Afni & Hartono, 2020; Rambe et al., 2024; Trimurtini et al., 2020). Contextual Teaching and Learning (CTL) has seven major components: learning community, modeling, questioning, inquiry, constructivism, reflection, and authentic assessment (Al-Siyam & Sundayana, 2014; Indriani et al., 2019; Sadiyono & Sri, 2014).

Regarding the solution offered, several previous studies, including, Nabila et al. (2023) reported the development of a learning video using

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Animaker using the ADDIE model for junior high school students, only limited to statistical material. Therefore, this study tries to implement it on another material, namely equal and inverse value comparison material. The DDD-E model was used in this study. Another study also reported the development of animated videos in math learning for junior high school students. Sofnidar et al. (2023) explained that video animation using *Animaker* 88.33% is critical in improving students' concept understanding of flat-sided space-building material with a blended learning approach with a discovery model. This shows that this study will be very important in answering problems with different materials and approach, therefore the CTL approach and equal and inverse value comparison materials are used. Similar to Sofnidar et al. (2023) study, Puspaningtyas & Marchamah Ulfa (2020) also used blended learning in implementing video animation. However, in their study, the animated video used for Universitas Teknokrat Indonesia students on the derivative function of algebra material did not use *Animaker* software. Of course, the different uses of media, models, approaches, and different levels of study in this study will provide different views and results.

So, this study aims to describe the validity, practicality, and effectiveness of the development of CTL-based animated videos using *Animaker Software* on the material of equal and inverse value comparisons for grade VII students at SMP Negeri 6 Jember. It is hoped that the results of this study can solve the problem of students who feel bored during Mathematics learning and increase students' understanding in distinguishing the material of equal and inverse value comparison.

METHODS

The type of research used is Research and Development (R&D), which uses the DDD-E model (Decide, Design, Develop, Evaluate). The design of the operational research in this study: 1) At the decision stage, several processes occur, including setting learning objectives; determining media and approaches based on Mathematical material that is difficult for students to understand, namely material of equal and inverse value comparison; ensuring prerequisite abilities; and assessing student abilities, 2) The design stage, the process of creating a flowchart; designing a display; and creating a storyboard is carried out, 3) The development stage, video media development is carried out by developing and collaborating three elements, namely animation; images; and audio, and 4) Conduct formative evaluations to assess the feasibility of animated videos with small-scale and large-scale trials.

The study was conducted in class VII of SMP Negeri 6 Jember, East Java, Indonesia, from August 2022 to January 2023. The timing of the research is explained in more detail in the Table 1. There were 42 research subjects involved in this study, including: 1) Three Mathematics lecturers of UIN Kiai Haji Achmad Siddiq Jember namely Afifah Nur Aini, M.Pd as material expert validator; Masrurotullaily, M.Sc, as media expert validator; and Athar Zairozie, M.Pd as Mathematics question evaluation expert validator, 2) One teacher of SMP Negeri 6, Iqbal Ariwijaya S.Pd. to know the response to the developed media, and 3) 38 students of SMP Negeri 6 Jember with details of 6 students involved in small-scale trials and 32 students involved in large-scale product trials.

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Table 1. Reserach timeline

Time	Activities
August 30, 2022	Observation
October 10, 2022	Mathematics teacher interview and student interviews
December 19, 2022	Material expert validation
December 21, 2022	Media expert validation
December 28, 2022	Validation of pre-test and post-test questions
January 7, 2023	Submission of a research permit letter
January 18, 2023	Small-scale trial
January 19, 2023	Large-scale trial

The sample selection was carried out using a purposive sampling technique. Based on the acquisition of the average value of the school final exam, two classes in class VII were selected, namely, class VII F and VII G. The research subjects involved were six students of class VII F who were used in the small-scale trial and 32 students of class VII G who were used in the large-scale trial.

This research and development use various instruments, including student needs analysis questionnaire, teacher interview guidelines, media expert validation questionnaire, material expert validation questionnaire, question pre-test and post-test evaluation expert validation questionnaire, teacher response questionnaire, student response questionnaire, and pre-test and post-test question sheets.

The student needs analysis questionnaire instrument and the Mathematics teacher interview guideline were adopted from Ady Prasetya et al. (2021) research instrument. The student needs analysis questionnaire consists of 10 questions to explore information related to mathematics material that is considered difficult, student knowledge, learning methods used by teachers when teaching, learning media used, and student understanding of the material taught. While, the interview guideline for mathematics teachers consisted of 10 questions containing questions about the curriculum, minimum student completeness criteria, teacher difficulties in delivering the equal and inverse value comparison material, and learning media used.

The material validation questionnaire instrument adopted the instrument of Sidarta & Yunianta (2022) consists of 10 indicators, namely: 1) The suitability of the material with basic competencies and core competencies, 2) The material is in line with the indicators, 3) The material is in line with the learning objectives, 4) The completeness of the material, 5) The orderliness of the material, 6) The completeness of the material images, 7) The accuracy of the questions is easy for students to understand, 8) Clarity of language use, 9) The language used is by the level of development of students' thinking, and 10) Use of informative and communicative language.

The media validation instrument adopted the instrument of Sidarta & Yunianta (2022) consists of 10 indicators including: 1) Text clarity, 2) Proportionality of text size, 3) The font type is easy to read, 4) The attractiveness of the learning video display, 5) Clarity of narration, 6) Language use is easy to understand, 7) Learning video display is

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easy to understand, 8) Attractiveness of background, 9) Accuracy of text color selection with background, and 10) Appropriateness of layout and image.

Afterward, the validation instrument for the question of pre-test and post-test questions adopts the research instrument of Sumarni et al. (2020) which consists of seven indicators, including: 1) Suitability of the question to the learning objectives, 2) Clarity of the instructions for working on the question, 3) Clarity of the intention of the question, 4) Possibility of the question being solved, 5) Language by Indonesian rules, 6) Question sentences do not contain double meanings, and 7) The formulation of the sentence using simple and easy-to-understand language.

Meanwhile, the teacher and student response questionnaire was adopted from Rachmavita (2020). Indicators in the teacher response questionnaire include: 1) The animated video developed is very helpful in the learning process, 2) The ease of the teacher in delivering the material, 3) The attractiveness of the animated video, 4) Improves students' abilities, 5) Encourage students to be active during learning, 6) The language used is easy to understand, 7) Animated video display creates meaningful learning, 8) The use of animated videos can create meaningful learning, 9) Images are in accordance with the material, and 10) Accuracy of duration. A total of nine indicators of student response questionnaires to animated videos including: 1) Encouraging students to learn, 2) Ease of understanding the content of the material, 3) Ease of remembering the material, 4) Attractiveness of animated videos, 5) Motivated to learn, 6) Benefits in learning, 7) Clarity of material, 8) Background video animation is interesting, 9) Students feel helped by animated videos.

Data collection techniques are observation, interview, questionnaire, pre-test, and post-test in multiple choice of 10 questions. The procedures for making pre-test and post-test questions include: 1) Analyzing possible basic competencies, 2) Designing grids, 3) Determining contextual stimulus, 4) Compiling question items according to the guidelines of the grids that have been made, and 5) Designing scoring procedures. The questions (pre-test and post-test) were first validated by Mathematics question experts, shown in Table 2.

Table 2. Question validation results

Criteria	Score
Appropriateness to learning objectives	5
Clarity of question instructions	5
Clarity of purpose of the question	5
Probability of the problem being solved	5
Writing questions according to Indonesian language rules	5
Question sentences do not contain multiple meanings	5
Formulating question sentences is simple, easy to understand, and familiar for students	5

The question validation results obtained a score of 5 on each indicator. After calculating using the validation formula described by Akbar (2016) in equation 1, the validation results obtained a percentage of 100% very valid criteria. After validation, the next step is to test the reliability and distinguishing power. The test reliability results are shown in Table 3.

Table 3. Test instrument reliability test results

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	Cronbach's Alpha	**The Number of Item**	**The Number of Respondents**	**Description**
Test instrument (pre-test and post-test)	0.712	10	32	Fixed/good

An instrument can be reliable if the reliability coefficient is > 0.6 (Surya et al., 2020). Obviously, on Table 3 that the *Cronbach Alpha* value is 0.712 > 0.6, which means that the test instruments are reliable. The next important step is to test the Differentiating Power (DP) of the questions.

The results of Differentiating Power (DP) are shown in Table 4. This test aims to determine the ability of the question to distinguish students who are classified as high achievers from students who are classified as weak achievers. According to Quaigrain & Arhin (2017), the higher the DP of the question means the better the question used distinguishes students who understand and do not understand the material.

Table 4. Test the distinguishing power (DP) of the test instrument

Question Number	**DP**	**Interpretation**
1	0.602	Very good
2	0.407	Very good
3	0.344	Good enough
4	0.402	Very good
5	0.600	Very good
6	0.417	Very good
7	0.543	Very good
8	0.468	Very good
9	0.372	Good enough
10	0.676	Very good

The results of the differentiating power test in Table 4 show that there are eight questions in the very good category with *Cronbach Alpha* values of 0.417 to 0.676. While two questions are included in the good enough criteria. Therefore, the questions made can be concluded to be very good for students to use.

Before being tested on students, the animated video was first validated by media and material experts using a questionnaire with Likert scale calculations, according to Akbar (2016) in Table 5.

Table 5. Rating scale criteria

Criteria	**Score**
Very good	5
Good	4
Good enough	3
Not so Good	2
Very poor	1

There are three data analysis techniques used in this study, namely: 1) Validity data analysis techniques, 2) Practicality data analysis techniques, and 3) Effectiveness data analysis techniques. After filling out the questionnaire by the material, media, and evaluation of pre-test and post-test questions validators, the validity data was analyzed using the formulation proposed by Akbar (2016) in equation 1. Meanwhile, the criteria for validity based on Abdullah & Yunianta (2018) are presented in Table 6.

$$V - ah = \frac{Tse}{Tsh} \times 100\% \quad \ldots (1)$$

Description:
V : Expert validation
Tse : Empirical total score
Tsh : Expected total score

Table 6. Criteria for validity

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Score Interval (%)	Description
84 ≤ V – ah ≤ 100	Very valid
68 ≤ V – ah < 84	Valid
52 ≤ V – ah < 68	Moderately valid
36 ≤ V – ah < 52	Not valid enough
20 ≤ V – ah < 36	Not very valid

Furthermore, the results of the validator questionnaire were analyzed. The animated video was said to be suitable for use if the score obtained from the validators' questionnaire results reaches 68% ≤ V - ah < 84% with the valid category. Practicality data analysis was obtained based on the results of small-scale test and large-scale test student responses and the acquisition of teacher response results to animated videos. According to Paino & Hutagalung (2022) practicality criteria are retrieved in Table 7.

Table 7. Practicality criteria

Score Interval (%)	Description
80 ≤ V – ah ≤ 100	Very practical
60 ≤ V – ah < 80	Practical
40 ≤ V – ah < 60	Practical enough
20 ≤ V – ah < 40	Less practical
0 ≤ V – ah < 20	Very less practical

Furthermore, the data analysis stage is based on the results of the acquisition of small-scale and large-scale student response questionnaires, as well as teacher responses. Animated videos can be said to be feasible to use if the score obtained reaches 60% ≤ V - ah < 80% of the practical category.

Analysis of effectiveness data is obtained based on the calculation of learning outcomes. The effectiveness test in this study used *Pre-Experimental Design*. In a *Pre-Experimental Design*, there are no control variables, and the selection of samples is done non-randomly. *One Group Test-Post Design* was used as the design in this study, namely by taking one class as an experimental class, then giving a pre-test, then giving treatment using a learning video using *Animaker*, and then giving a post-test.

After obtaining the pre-test and post-test data, a *t-test* using the *Paired Sample T-test* and the *N-Gain* test using *IBM SPSS Statistics 26 Software* was conducted to determine whether there was an increase between before and after using animated videos. *N-Gain* Score formulation, according to Wahab et al. (2021) can be seen in equation 2, After finding the average *N-Gain*, the next step is to determine the effectiveness category based on Basyarewan et al. (2022), which is shown in Table 8.

$$N - Gain = \frac{Post\ Test - \ Pre\ Test\ Score}{Ideal\ Score - \ Pre\ Test\ Score} \quad \ldots (2)$$

Table 8. Effectiveness categories

Score	Qualification

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$g > 0.7$	High
$0.3 \leq g \leq 0.7$	Medium
$g < 0.3$	Low

If the score of the *N-Gain* is $0.3 \leq g \leq 0.7$ with moderate qualifications, The animation video developed can be concluded to be effective.

RESULT AND DISCUSSION

There are four stages of development using the DDD-E model, namely deciding, designing, developing, and evaluating Yusuf (2022).

Deciding Stage

There are four aspects in the determination stage. The first aspect of learning objectives is analyzed through basic competencies. The curriculum used in SMP Negeri 6 Jember is the 2013 curriculum. Learning objectives are analyzed according to the results of the student needs questionnaire and compiled based on the analysis of learning media selection. Second, determining the theme used, namely CTL-based animated videos. The animated video presented daily life events related to the material of equal and inverse value comparison. Third, developing prerequisite skills. Based on the observation, it shows that (1) Students are familiar with animated videos and have good hearing and vision, (2) SMP Negeri 6 Jember has Information and Technology facilities in the form of *Liquid Crystal Display* projectors, and (3) Teachers can run projectors. Fourth, assessing resources as research subjects where students have met the prerequisite abilities. That way, students can understand the equal and inverse value comparison material easily without any obstacles.

Designing Stage

There are three visual stages, in the design stage. First, creating a flowchart in the form of a learning scenario flow made to help design the video display as in Figure 1.

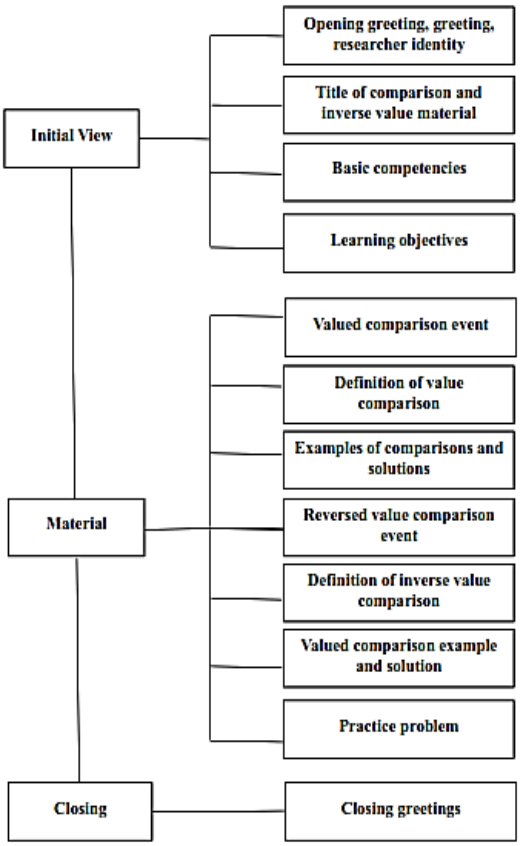

Figure 1. Animated video development flowchart

From Figure 1, it can be seen that there are three main parts in the learning video design, namely the initial appearance of the animated video, material and practice questions of equal and inverse value comparison material, and the closing of the animated video.

Second, designing an interface consisting of three main views, namely (1) The initial display consists of an opening greeting, researcher identity, basic competencies, and learning objectives, (2) The material display consists of material and sample questions, (3) The closing display consists of a closing

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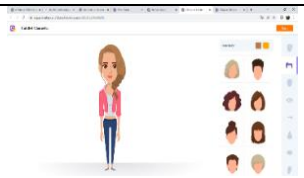
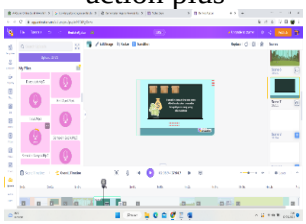
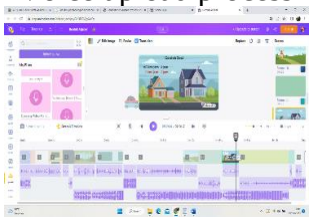
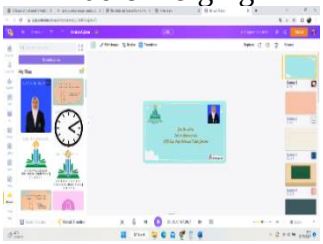
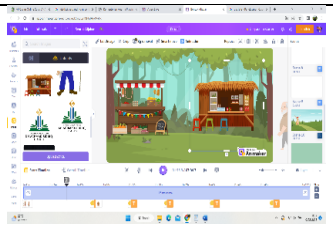
greeting. Third, create a storyboard by designing animated images displayed in 13 scenes.

Developing Stage

This stage combines animation, images, and audio, as shown in Table 9.

Table 9. Component merging

Component	View
Animation	 Editing teacher character
	 Addition of buyer character action plus
Audio	 Voice upload process
	 Audio merging
Image	 Image upload process
	 The process of combining images in each scene

Incorporating the animated video component is adapted to the seven syntaxes of Contextual Teaching and Learning (CTL) (Selvianiresa & Prabawanto, 2017). First, the constructivism syntax is shown in Figure 2. The Basic competence and learning objectives are displayed to focus students' attention.

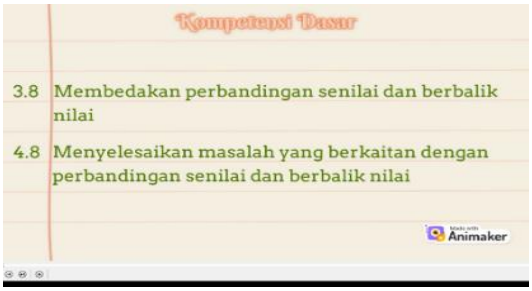


Figure 2. Syntax of constructivism

Based on Figure 2, it can be seen that two basic competencies must be mastered by students, namely basic competency 3.8 to equal and inverse value comparison material, and basic competency 4.8 to solving equal and inverse value comparison material problems. Secondly, in the inquiry syntax, the events of value comparison and inverse value in daily life are displayed with animations, as in Figure 3.

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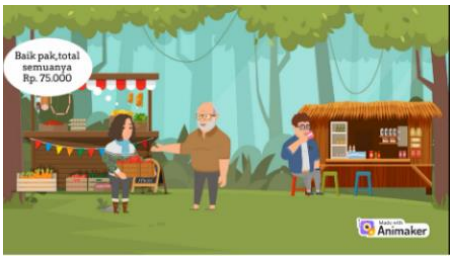

Figure 3. Inquiry syntax

To provide real understanding for students, Figure 3 shows animated videos of real events in the community related to the equal and inverse value comparison material. Third, the syntax questioning. Students are asked questions to determine if they already know the material, as presented in Figure 4.

Figure 4. Questioning syntax

Figure 4, shows how the animated video was designed to determine the extent of student understanding of the material that has been taught. Fourth, the learning community emphasizes that students learn to understand the material together by watching animated videos, as featured in Figure 5.

Figure 5. Learning community syntax

Furthermore, Figure 5 shows an explanation of the basic concepts of the equal and inverse value comparison material. Fifth the modeling syntax. Students are presented with examples of problems and their solutions contained in the modeling, as in Figure 6.

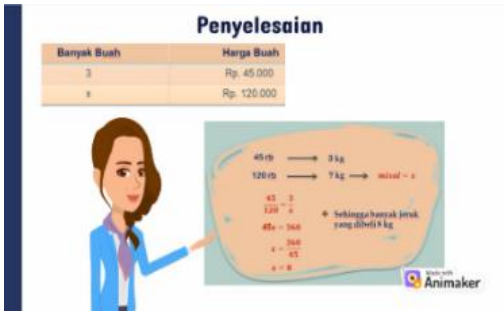

Figure 6. Modeling syntax

In Figure 6 students are given example problems according to the material displayed. This exercise is useful for training students in solving similar problems. The sixth syntax of reflection is presented in an animated video in the form of practice questions to be done by all students. The animated video display is shown in Figure 7.

Figure 7. Reflection syntax

The final section in Figure 7 is an important point for researchers to find out whether the materials that have been developed can help students understand the material. This syntax is also needed by students to measure their understanding. The seventh syntax is authentic assessment. The assessment process is carried out based on the results of the exercise questions that have been

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displayed so that the animated video is not displayed.

The following process is the validation stage by experts, namely two lecturers of Mathematics Education UIN Kiai Haji Achmad Siddiq Jember as validators of material and media experts. The validation results are shown in Table 10.

Table 10. Expert validation results

Validator	Average	Criteria
Material expert	98%	Very Valid
Validator	**Average**	**Criteria**
Media expert	86%	Very Valid

Based on the material experts' validation results, the animation video developed was declared very valid. Almost all aspects of the animated video have met the indicators, namely indicators 1 to 8, and indicator 10 scored 5 (very good). There is only one indicator that scored 4 (good), namely indicator 9.

Table 10 also shows that the results of media validation by experts are very valid. This is based on the scores on each indicator. In media validation, indicator 1, indicator 2, and indicator 3 received a score of 5 (very good), while indicator 4 to 10 received a score of 4 (good). There were suggestions and comments from the validators that became a reference for revision, as presented in Table 11.

Table 11. Revision of the developed animation video

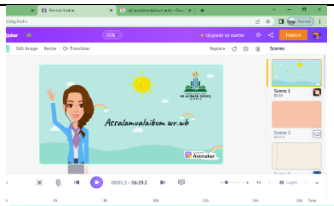
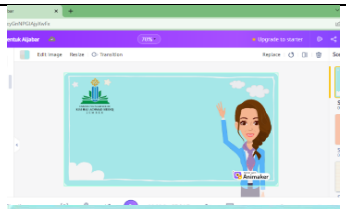
Validator	Before Revision	After Revision	Description
Material Expert			Revise the correct writing of the college name on the logo.
Media Expert			Adding the word *Assalamualaikum* in Arabic writing and writing *wr.wb.* not abbreviated.
			In modeling the example problem, the word "used" is replaced with an arrow.

Table 11 shows the appearance of the animated video before and after revision. In general, the only improvements are in the writing and logo. After the revision process is complete, it can continue to the evaluation stage.

Evaluating Stage

There are two types of evaluation: summative evaluation and formative evaluation. Summative evaluation occurs at an earlier stage in the form of revision. As Rachmavita (2020) said, the evaluation process can be integrated into

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each stage. Rijal & Azimi (2021) added that the summative evaluation process at each stage can minimize the shortcomings of the developed animation video. Meanwhile, the formative evaluation comes from the practicality and effectiveness of the animation video developed.

1. Practicality of Animated Video

The practicality of the animated video can be seen from the results of students' responses on a small scale and large scale and Mathematics teacher responses in Table 12.

Table 12. Practicality results of animated video

Practicality	Average	Criteria
Small scale	81.4%	Very practical
Large scale	89.8%	Very practical
Teacher response	86%	Very practical

Table 12 shows the average results of students' responses on a small scale to the development of Contextual Teaching and Learning (CTL)-based animated videos using *Animaker* on the material of equal and inverse value comparisons developed at 81.4% very practical category. While on a large scale, the percentage was 89.8% in the very practical category. The results of the percentage show that the animated video developed has met all nine indicators of student response in the small and large scale trials so that the average student gives an excellent response.

Mathematics teacher responses of 86% very practical category. Of the 10 indicators, seven indicators received a score of 4 (good), namely in indicator 1, indicator 2, indicator 4, indicator 5, indicator 7, indicator 8, and indicator 9. While the other indicators received a score of 5 (very good). This means that the animation video developed has met all the indicators so that it is easy to use, efficient, interesting, and very practical to use in learning mathematics on equal and inverse value comparison material.

2. Effectiveness of Animated Video

The Pre-Test results of students before using CTL-based animated videos using *Animaker* on comparable and inverse value materials and the post-test results of students after using CTL-based animated videos using Animaker on equivalent and inverse value materials are shown in Table 13.

Table 13. Pre-test and post-test result

Learning Outcomes	Average Value
Pre-test	34.7
Learning Outcomes	**Average Value**
Post-test	81.7

The mean post-test score is higher than the mean pre-test score shown in Table 13. To determine whether there is a significant difference between the pre-test and post-test, the *Paired Sample T-test* was conducted. before doing the test, it must fulfill the prerequisites through the *Normality* test.

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2.1 Normality Test

The results of the *Normality* test calculation using *Shapiro-Wilk* with the help of *IBM SPSS Statistics 26 Software* are shown in Table 14. If the *Sig.* Value > 0.05, then the data can be said to be normally distributed.

Table 14. *Normality* test result

	Kolmogorov-Smirnov[a]			***Shapiro-Wilk***		
	Statistic	*df*	*Sig.*	*Statistic*	*df*	*Sig.*
Pre-Test	0.190	32	0.005	0.896	32	0.005
Post-Test	0.252	32	0.001	0.872	32	0.001

a. Lilliefors Significance Correction

Based on Table 14 shows *the Sig value.* The pre-test on *Shapiro-Wilk* is 0.005, while the *Sig* value post-test is 0.001. From the results of *Sig.* Pre-test and post-test results do not meet the requirements of normal distribution because both obtained *a Sig. value* < 0.05, so the *Wilcoxon* test is necessary.

2.2 *Wilcoxon* Test

To determine whether there is a difference between the test scores before (pre-test) and the test scores after (post-test) given treatment to students, the *Wilcoxon Test* is needed (Divine et al., 2018). The statistical hypothesis is as follows:

H_0: There is no significant difference between students' pre-test and post-test scores.
H_a: There is a significant difference between students' pre-test and post-test scores.

Decision making: If the value of *Asymp. Sig* < 0.05, then H_a is accepted. *Wilcoxon* test results are retrieved in Table 15.

Table 15. *Wilcoxon* test results

		N	**Mean Rank**	***Sum of Ranks***
Pre-Test – Post-Test	*Negative Ranks*	0[a]	0.00	0.00
	Positive Ranks	32[b]	16.50	528.00
	Ties	0[c]		
	Total	32		

a. *Post-Test < Pre-Test*
b. *Post-Test > Pre-Test*
c. *Post-Test = Pre-Test*

Based on the data in Table 15, it is found that (1) *Negative Rank* results show as many as 0 or no students who experienced a decrease in scores from the pre-test to the post-test. For the *Mean Rank* and *Sum of Rank* values of 0.00, it can be said that there is no decrease in value in the pre-test and post-test results. (2) Data on *Positive Ranks* shows that 32 students experienced an increase in pre-test to post-test scores. On the Mean Rank, the increase is 16.50. Meanwhile, the Sum of Rank is 528.00, and (3) It can be seen that the Ties value is 0. This indicates that 0 or no students get the same score on the pre-test and post-test. the summary of the *Wilcoxon* test can be seen in Table 16.

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Table 16. *Wilcoxon* test summary

	Pre-test – Post-test
Z	-4.967b
Asymp. Sig. (2-tailed)	< 0.001

a. Wilcoxon Signed Ranks Test
b. Based on Negative Ranks

Table 16 shows *Asymp Sig. (2-tailed)* of 0.001 < 0.05, which means that H_a is accepted. It can be said that there are differences in student test scores before being treated (pre-test) and after being treated (post-test) in the form of CTL-based animated videos using *Animaker* on the material of equal and inverse value comparison. After the *Wilcoxon* test, the next step is the *N-Gain* test, shown in Table 17.

Table 17. *N-Gain* test

	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
N-Gain	32	0.38	1.00	0.7200	0.14066
Valid N (listwise)	32				

Based on Table 17, the *N-Gain* value is 0.72 > 0.70 with a high category. It can be interpreted that the CTL-based animated video using *Animaker* on comparable and inverse value material for grade VII students at SMP Negeri 6 Jember can be declared effective so that it is feasible to use in the learning process. In terms of methods, this study also has advantages compared to previous research, namely Nabila's research. In Nabila et al. (2023) research, the animation video development process only reached product validity, while in this study the development has reached the effectiveness test stage.

The results of this study are in line with Sofnidar et al. (2023) study, despite the differences in approaches and materials used. The effectiveness results show that the animated video developed with the discovery model is effectively used to improve the ability to understand the concept of building space material. According to the results of Kleftodimos (2024) investigative study, *Animaker* is a very popular and effective software used in learning. However, in their study, the application in learning Mathematics has not been reported. Therefore, the findings of this research are a novel strategy that can add to the scientific treasure in overcoming the phenomenon of problems in learning Mathematics. In particular, in this case, overcoming students' difficulties in understanding and distinguishing the material of equal and inverse value comparison.

Although the animated video developed has weaknesses such as high production costs, taking a long time to make, and requiring regular maintenance. However, this animation video also has many advantages, making it effective in Mathematics learning. These advantages include: 1) It has been very well designed to meet the needs of students, 2) The verbal and visual collaboration presented in the animated video adds to the attractiveness of students, 3) Many practice questions can encourage student activeness, 4) Apart from being in the form of animated videos, this media also allows it to be accessed in print, and 5) The material presented can be accessed repeatedly. After the students were taught the equal and inverse value comparison material using CTL-based animated video using *Animaker* and then given a post-test, there was an increase in value, compared to the pre-test value where students had not been taught the equal and inverse

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value comparison material using CTL-based animated video using *Animaker*.

The success of this study aligns with the research results of Mawarsari et al. (2023), which revealed that *Animaker*-based learning videos effectively increase interest and learning effectiveness, can create a pleasant learning experience, and strengthen concept understanding. The collaboration of animated videos using *Animaker* based on the CTL approach in this study is considered very appropriate. The advantages of the CTL approach, according to previous study this approach can make students become more active and interested in learning mathematics, create enthusiasm for learning both independently and in groups, self-regulated learning, and encourage students' ability to conclude and find their own concepts during the learning process (Afni & Hartono, 2020; Merawan et al., 2021; Susanti, 2018).

In addition to being feasible to use in Mathematics learning, the use of contextual-based animated videos in Mathematics learning is also proven to have good implications because it can make students more active and independent in learning, a great impact on mathematics learning outcomes, make it easier to understand the material because it is connected to everyday life and create a more pleasant learning (Astika et al., 2019).

The success of this study will directly impact students in improving their understanding of contextualized equal and inverse value comparison materials, assist teachers in implementing enjoyable learning, contribute to schools in providing alternative strategies for improving the quality and outcomes of mathematics learning, and contribute broadly by providing reference solutions to educators and researchers who wish to conduct further research.

CONCLUSION AND SUGGESTION

Based on the results of the research that has been presented, it can be concluded that the animation video based on Contextual Teaching and Learning (CTL) using *Animaker* on the material of equal and inverse value comparison for VII grade students at SMP Negeri 6 Jember can be said to be very valid, very practical, and effective so that it can be concluded that it is suitable for use in the Mathematics learning process. For future researchers who find the same problem but in different materials and situations, it is recommended to develop Contextual Teaching and Learning (CTL)-based animation videos using similar *software* such as *Powtoon* and *Wideo.*

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