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The Effect of Problem-Based Learning Assisted by Video Animation on Students' Self-Efficacy and Creative Thinking Ability

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Abstract

Students' creative thinking skills and different self-efficacy cause weaknesses for students in solving problems presented in learning mathematics. This study aimed to determine how implementing video-assisted problem-based learning affects students' self-efficacy and creative thinking abilities. This research method uses quantitative with a quasi-experimental research design. The study sample population of class XII IPA 2 students consisted of 34 students in the experimental class and 30 students in the class XII IPA 1 and control classes. Statistical analysis of N-Gain score of self-efficacy sig 0,014 < 0,05 and creative thinking skills sig = 0,003 < 0,05. The study results show significant differences in self-efficacy and creative thinking skills of students in the experimental class compared to the control class. This indicates the enormous difference in gains between experimental and control classes. Thus, the influence of problem-based learning assisted by video animation on students' self-efficacy and creative thinking abilities is very large. Problem-based learning model with animated videos can organize students in informing learning objectives so that students have the motivation to be actively involved in problem-solving activities.

Keywords: *Ability Creative Thinking; Animation Videos; Self-Efficacy*

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Abstrak

Kemampuan berpikir kreatif siswa dan self eficacy yang berbeda menyebabkan kelemahan bagi siswa untuk memecahkan masalah yang disajikan dalam pembelajaran Matematika. Tujuan dari penelitian ini adalah untuk mengetahui pengaruh penerapan pembelajaran berbasis masalah berbantuan video animasi terhadap kemampuan efikasi diri dan berpikir kreatif siswa. Metode penelitian ini menggunakan kuantitatif dengan desain penelitian quasi experiment. Sampel penelitian ini adalah siswa kelas XII IPA 2 terdiri dari 34 siswa sebagai kelas eksperimen dan siswa kelas XII IPA 1 terdiri 30 siswa sebagai kelas pembanding. Analisis statistik tes berpikir kreatif memperoleh nilai signifikasi = 0,003 < 0,05 and efikasi diri sebesar 0,014 < 0,05. Hasil penelitian menunjukkan perbedaan yang signifikan antara berpikir kreatif dan efikasi diri siswa pada kelas eksperimen dan kelas kontrol. Dengan demikian bahwa pengaruh penerapan pembelajaran berbasis masalah berbantuan video animasi terhadap efikasi diri dan kemampuan berpikir kreatif siswa sangat besar. Model pembelajaran berbasis masalah dengan video animasi dapat mengorganisasikan siswa dalam menginformasikan tujuan pembelajaran sehingga siswa memiliki motivasi untuk terlibat aktif dalam kegiatan pemecahan masalah.

INTRODUCTION

21st-century education can integrate knowledge (Blaique et al., 2022; Kim et al., 2019), skills (Laar et al., 2017), attitudes (Ghani et al., 2020; Hussin et al., 2019), and mastery of Information and Communication Technology (ICT) to prepare quality Human Resources (HR) in facing global challenges (Peters-burton & Stehle, 2019). Improving the quality of human resources, both hard skills and soft skills, must be balanced with improving the quality of education (Yuniendel, 2018). Improving the quality of education can be realized through learning directed at helping students master specific abilities to achieve the expected goals. 21st-century students are required to be able to master science (Aslamiah et al., 2021), have metacognitive skills (Karatas & Arpaci, 2021), be able to think critically and creatively (Darmayanti et al., 2022), and be able to communicate and collaborate well.

The cap potential to suppose creatively, also called the ability to think at a higher level is one of the goals of the 2013 syllabus and must be achieved by students, including in Mathematics (Mercier & Lubart, 2021). Students must have creative thinking skills to express ideas and solve problems (Durmuşoğlu et al., 2021). The ability to think creatively is a thought process to express new ideas, see things from new perspectives, and form new combinations of two or more previously learned concepts to solve a problem from a different perspective.

The problem of the low ability of children's creative thinking is due to the learning model, which is still teacher-centered, using the lecture method (Masfingatin et al., 2020; Novianto et al., 2020), so students tend to be passive in learning. This causes a lack of trust and confidence in students. Students tend not to be confident in giving opinions and lack confidence in answers to questions given by the teacher.

MAN 2 Malang City is one of the madrasas continuing to innovate in teaching and learning activities as a response to educational developments. Learning media has been used in almost all teaching and learning activities in each subject. However, problems still arise, namely the ability to think creatively and students' self-efficacy. Based on the pretest results in students' mathematics learning, it was found that the problem was that students' creativity in working on math problems was still lacking, as in Figure 1.

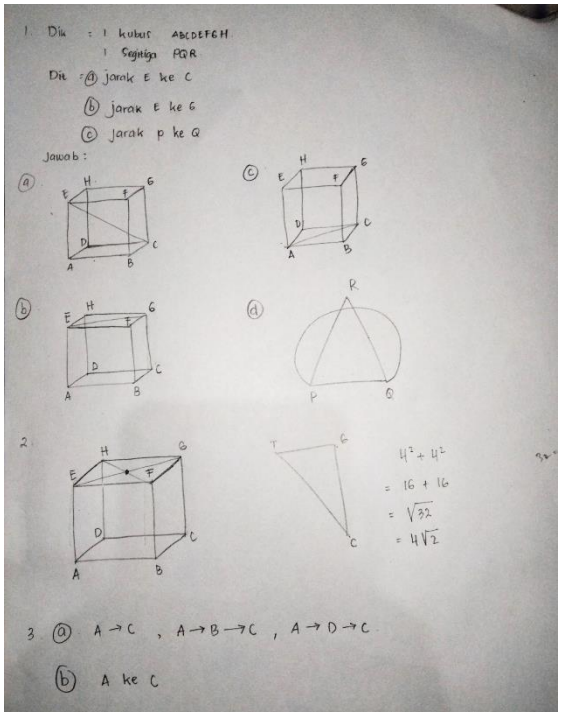


Figure 1. Students' Pre-test Results

In addition to self-efficacy, most students are still less active and less confident in expressing their opinions in mathematics. When interviewed, the teacher gave a quiz. Some students stated that they had done it but did not want to voluntarily present the results of their work because they were unsure of the answers and sometimes even saw their friends' work.

The students' activity problem in learning and confidence in solving math problems and conveying ideas is a problem in the cognitive domain. The attitude domain must also be considered to support student success in learning mathematics. Self-efficacy must be considered (Alqurashi, 2016). (Bandura, 1997) self-efficacy affects how a person thinks, feels, motivates, and acts. Students with high self-efficacy tend to make more significant efforts to achieve learning achievement. Students who are not confident in their abilities will hinder their learning process. When given an assignment, they will experience problems when completing it and when given the opportunity to express their opinion, they hesitate to express their opinion. Students who have high self-confidence can think creatively and believe that they are able to solve the problems they face.

Efforts to increase the self-efficacy and creative thinking abilities of students who master skills in mathematics can be made by improving the learning process. Interactive, learning mathematics with fun helps improve students' creative thinking and mathematical self-efficacy. One applicable learning model is problem-based learning, but the use of learning models alone is insufficient and not optimal, so learning media needed that help students and can support the implementation of Problem-Based Learning (PBL).

The benefits of PBL in developing mathematical creative thinking skills are supported by previous research (Dewi & Harjono, 2021), showing that the PBL model is more effective in increasing mathematical creative thinking skills than the Problem Solving (PS) model. Research has shown that applying problem-based learning methods can improve students' creative and creative thinking skills; consistent with the research (Maskur et al., 2020), the PBL model can influence mathematical creative thinking abilities using an open-ended approach.

The importance of self-efficacy in learning is supported by previous research (Farochmah & Leonard, 2021), showing a positive effect of self-efficacy on mathematics learning in intermediate-level students. Research conducted by (Rangkuti et al., 2021) shows a significant positive effect of self-efficacy on mathematics learning outcomes. Meanwhile, research (Adha & Rahaju, 2020) states that self-efficacy influences students' learning outcomes in mathematics.

Research on the impact of prob-

lem-based learning with video animation on students' creative thinking abilities and self-efficacy has not been found. Research (Dewi & Harjono, 2021; Maskur et al., 2020) examines the application of PBL to mathematical creative thinking skills, while (Kardoyo et al., 2020) examines the application of PBL to creative and creative thinking abilities. As for research on the application of PBL associated with student self-efficacy, it has been carried out by (Ernawati, 2020; Sariningsih & Purwasih, 2017; Sujarwo, 2020; Wiratmaja et al., 2014) stated that problem-based learning can increase student self-efficacy. At the same time, research on the application of PBL assisted by learning media (question cards) has been carried out by (Ratnawati et al., 2020). This states that problem-based learning is more effective when supported by instructional media designed to help students understand the material. Research conducted by (Aminy et al., 2021) revealed that students' mathematical creative thinking increased with a problem-based learning model based on Geogebra. However, in research (Aminy et al., 2021), GeoGebra can only be applied to certain materials. Therefore, the research chosen chooses animated videos that can be applied to all mathematics material by combining variables in previous research, namely Problem-Based learning, creative thinking skills, and student self-efficacy as a differentiator from previous research. So research on the Effect of Problem-Based Learning assisted by animated videos on students' self-efficacy and creative thinking abilities is essential to research.

Therefore, two formulation problems will be analyzed: students' self-efficacy and creative thinking abilities in applying video-assisted problem-based learning outperform students taught by traditional methods.

METHODS

Quantitative research is used in this study with the Quasi Experiment *method* (Pseudo-Experiment). The population in this study were students of class XII MAN 2 Malang City. The population selection was based on the reason that the students' mathematics year-end assessment (PAT) scores at school were still low. This can be seen from the 2021/2022 school year results. A non-equivalent control group design was used in this study. Therefore, two classes were sampled. Class XII IPA 2 with a total of 34 students as an experimental class taught by video-assisted PBL, and class XII IPA 1 with 30 students in the character of control class taught by conventional and typical methods. The researcher selected two classes randomly using a targeted random sampling technique. In this study, the independent variable was video-assisted PBL, while self-efficacy and creative thinking ability were the dependent variables. The learning process lasted for three meetings. Data was collected from the pre-test and post-test results of students' self-efficacy and creative thinking abilities.

Self-efficacy data was collected from a questionnaire consisting of 20 questions adopted from Rangkuti et al., (2021). There are three dimensions, namely (a) level dimension, (b) *strength*, and (c) *generality*—a questionnaire with 20 questions consisting of 12 positive questions and 8 negative questions. Tests for students' creative thinking abilities related to three-dimensional material in compulsory mathematics for class XII SMA/MA consist of 3 essay questions adapted from (Qomariyah & Darmayanti, 2023), which has a valid value with high criteria for all questions and a reliability value of 0.743. The preparation of these questions is adjusted to indicators of cre-

ative thinking skills adapted. Indicators of the ability to think creatively are (a) fluency, (b) Elaboration, (c) Flexibility, and (d) Originality.

Descriptive statistics and inferential statistics are data analysis techniques used in this study. Descriptive analysis of the pre-test and post-test data begins with the relative frequency distribution and then uses descriptive statistical tables. The relative frequency distribution of the creative thinking data is used to find the difference between the post-test and pre-test percentage scores. Thus, the significant improvement percentage of the progress can be noticed. The self-efficacy data is used to check the effect of self-efficacy when learning mathematics. The phase of inference statistical analysis of pre-test data begins with tests for normality, uniformity, and average similarity. The following inferential statistical analysis for confirming increases using N-gain data begins with N-gain difference tests analysis, N-gain value criterion tests, and effect size tests.

An analysis of the N-gain effect size test was used to see how significant the differences in the effects of self-efficacy and creative thinking skills were between the two classes. The formula that can be applied for the effect size of test criteria and the effect size is shown below:

$$d = \frac{< g >_{sbl} - < g >_r}{< SD >}$$

To calculate using the formula above, the author provides some information related to the terms and symbols in question. This information is like the symbol d (to indicate the effect size), then for $<g>_{sbl}$ is the average value of N-gain in the experimental class. Furthermore, $<g>_r$ is used for the average N-gain value in the control class, and the last symbol $<SD>$ is the average value of the standard deviation.

Table 1. Criteria for the effect size tests

Effect Size	size	Interpretation
d ~0.80	Large	dominant
d ~0.50	Medium	Less dominant
d ~0.20	Small	Not dominant

Note. d = effect size value, adapted from "Plain and Simple Statistics" by Sherri L. Jackson, 2014.

An analysis of the criteria for the N-gain score was conducted to determine how effective PBL assisted by video animation is used for self-efficacy and creative thinking skills. The table below shows the formulas for determining the N-Reinforcement value and N-Reinforcement score criteria:

$$N - gain = \frac{posttest\ score - pretest\ score}{ideal\ score - pretest\ score}$$

Table 2. Normalized Gain value criteria

N-gain Score	Size	Interpretation
$g \geq 0.7$	High Point	Very Efficient
$0.3 \leq g < 0.7$	Moderate	Efficient
$g < 0.3$	Low Point	Less Efficient

Note: g = normalized gain-value, adapted from "Analyzing Change/Gain Score" by Richard R. Hake, 1997.-

Researchers have tried to adjust the experimental and control classes, but although the two groups have relatively similar mean pre-test scores, there are still weaknesses. Researchers cannot form classes by taking random samples from parallel classes because it interferes with the class.

Table 3. Relative Frequency Distribution of Creative Thinking

Indicator Creative Thinking	Control				Experiment			
	Pre-test		Postest		Pre-test		Postest	
	Less Op-timal	good	Less Op-timal	good	Less Op timalll	good	Less Op-timal	good
Fluency	80%	20%	60%	40%	70%	30%	60%	40%
Elaboration	75%	25%	65%	35%	70%	30%	62%	38%
Flexibility	78%	22%	70%	30%	72%	28%	70%	30%
Originality	86%	14%	80%	20%	82%	18%	76%	34%

Researchers also do not allow control over student circumstances outside of research. For example, students may not attend math classes outside their scheduled classes. Interaction with other teachers, groups of mathematics classes outside of school hours, tutoring, etc., may affect the learning outcomes they achieve. In terms of analysis, quantitative methods are analyzed with inferential statistics, i.e., average or overall analysis, making it challenging to observe deeper states and signs. The researcher intends to explain the actual situation and condition through descriptive statistics. However, the researcher still could not explain the situation representing the sample individually and as a whole.

RESULTS AND DISCUSSION

Results

Creative Thinking Ability

Table 3 shows the relative frequency percentage of each class and metric data collection. The control class increased the fluency index of teaching by 20%, the sophistication index by 10%, and the flexibility index by 8%. The uniqueness index increased by 4%. The experimental class increased the fluency index of teaching by 10%, the elaboration index by 8%, and the flexibility index by 2%. 16% increase in originality index. It can be seen that the percentage of improvement in creative thinking ability in the experimental class taught with *Problem-Based Learning* assisted by animated videos is greater than that of the control class. It shows that the creative thinking ability of students taught with Problem-Based Learning assisted by animated videos is better than those taught conventionally.

Data on pre-test scores for creative thinking abilities analyzed using descriptive statistics showed that the two classes had almost the same or not many different averages and variances. In contrast, in the post-test data, after being taught with Problem-Based Learning assisted by animated videos, the experimental class experienced an average increase. The average ability to think creatively is higher than the control class. The results are shown in Table 4.

Table 4. Descriptive Statistical Analysis

	Pre-test		
	N	Means	SD
Control	30	63,21	1,533
Experiment	34	63.95	1,419
	Post-test		
	N	Means	SD
Control	30	70,84	1,947
Experiment	34	78,37	1,844

The gains in creative thinking skills obtained based on the descriptive statistics described above should be analyzed further by performing statistical tests to determine differences in significant improvements. Normality testing of pretest data was performed using the Shapiro-Wilk statistical test. The control class statistic was sig 0.993 > 0.05, and the experimental class statistic was 0.941, so H_0 is accepted. From this, we can conclude

Table 5. Relative Frequency Distribution of *Self-Efficacy*

Self-efficacy Indicator	Control				Experiment			
	Pre-test		Postest		Pre-test		Postest	
	Less Optimal	good	Less Optimal	good	Less Optimal	good	Less Optimal	good
Levels	73%	27%	61%	39%	68%	32%	61%	39%
strength	76%	24%	65%	35%	70%	30%	61%	39%
generality	77%	23%	72%	28%	71%	29%	68%	32%

that the pre-test data are normally distributed. The Levene Statistic test is the statistical test used to test the homogeneity of the pre-test data. The significance *Levene* Statistic value for the pre-test is 0.377 > 0.05, and for the post-test, 0.740 > 0.05; the value of the two variants of the data are homogeneous.

Mean similarity tests were analyzed using statistical t-tests for pre-test sig = 0.988 and post-test sig = 0.002 for identical variants. There is no significant difference in creative thinking ability before receiving treatment and increasing after teaching Problem-Based Learning assisted by animated videos between students in the experimental and control classes.

The analyzed N-gain (normalized gain) mathematical creative thinking skills data was sig = 0.003 < 0.005, which rejects Ho. This demonstrates that the creative thinking skills taught by students using a problem-based learning model supported by video animation have improved significantly and outperformed traditional students.

Self-Efficacy in Mathematics Learning

Post-test data shown in table 5, mathematics learning self-efficacy trends in the control class did not outperform the experimental class taught with problem-based learning using video animation. The percentage difference in learned self-efficacy before and after the mathematics test. The control class is smaller than that in the experimental class, and there is a percentage increase in the self-efficacy frequency after the test. Learning in mathematics learning is after application to two different classes.

This indicates that students in practical classes taught problem-based learning are more likely to learn mathematics self-efficacy than traditional methods.

Pre-test data from descriptive analyzes of learning self-efficacy in mathematics questionnaires for both grades had similar or little difference in mean and variance, whereas post-test data showed average student self-efficacy. Mathematics learning differs between the two classes, as shown in Table 6.

Table 6. Descriptive Statistical Analysis

	Pre-test		
	N	Means	SD
Control	30	53,21	1,955
Experiment	34	56.95	1,957
	Post-test		
	N	Means	SD
Control	30	60,84	1,857
Experiment	34	68.97	1,486

Additionally, an inference statistical data analysis is performed, and the self-efficacy learning mathematics pretest data are analyzed with nonparametric statistics as they are on an ordinal scale beginning from the mean similarity of the pre-test data.

The gains in self-efficacy obtained based on the descriptive statistics described above should be analyzed further by performing statistical tests to determine differences in significant improvements. Normality testing of pre-test data was performed using the Shapiro-Wilk statistical test. The control class statistic

was significance = 0.106 > 0.05, and the experimental class statistic was 0.160 with significance = 0.095 > 0. 05, so H_0 is accepted. From this, we can conclude that the pre-test data are normally distributed. The Levene Statistic test is the statistical test used to test the homogeneity of the pre-test data. The significance Levene Statistic value for the pre-test is 0,509 > 0.05, and for post-tes, 0.085 > 0.05, which means the value of two variants of the data are homogeneous.

Mean similarity tests were analyzed using statistical t-tests for pre-test sig = 0.795 and post-test sig = 0.001 for identical variants. There is no significant difference in self-efficacy before receiving treatment and increasing after teaching Problem-Based Learning assisted by animated videos between students in the experimental and control classes.

The N-gain (normalized gain) self-efficacy data analyzed was sig = 0.014 < 0.005, which rejects Ho. This demonstrates that the students' self-efficacy using the problem-based learning model supported by video animation has improved significantly and outperformed traditional students.

Discussion

Findings Statistically Analyzed Show Influence Students' Creative Thinking Skills and Self-Efficacy Conferred by Video-Assisted Animation Problem-Based Learning Models. These two variables have a significant influence. The effectiveness of the problem-based learning model assisted by video animation is moderate for each variable.

In the group of students who applied problem-based learning assisted by video animation, there was a significant increase in creative thinking skills, which was better than in the group of students who applied conventional learning. So, there is a significant difference in the increase in the ability to think creatively between the experimental and control classes due to the application of the learning model. Problem-based learning assisted by animated videos is more effective and influences creative thinking skills than conventional learning models. Similarly, for the self-efficacy learning variable, students taught with a problem-based learning method using video animation showed increased self-efficacy learning compared to those taught with a conventional method. A significant difference is seen in, obtained, a significant difference in influence between the two classes. The problem-based learning model assisted by video animation is more influential in self-efficacy learning than conventional learning models.

Increase self-efficacy and creative thinking with an anime video assisted-problem-based learning model. At each stage of an animated video-assisted problem-based learning model, students must complete complex tasks, possess strong beliefs, and be able to perform a variety of tasks simultaneously. Applying this model allows students to think fluently, sophisticatedly, flexibly, and originally.

In the first stage, organizing students on problems, teachers inform learning goals, explain necessary logistical requirements, and motivate students to participate in problem-solving activities (Almulla, 2020; Arnidha & Fatahillah, 2021; Maxwell, 2020; Prayogi & Asy'ari, 2013; Zhao et al., 2020). In this case, the teacher's importance of self-motivated self-efficacy can increase students' confidence in completing complex tasks (Semilarski et al., 2021). Also, describing logistical needs requires thinking creatively about the elaboration indicator in detail and the information provided

(Kardoyo et al., 2020; Rudibyani, 2019; Rusijono et al., 2020; Wicahyono et al., 2018). Not only that, in organizing problems, students are expected to be able to formulate ideas, answers, or statements from different perspectives. Figure 2 is a form of the problem presented in the animated video, where the problem is designed to be able to organize students so they can have the ability to provide different ideas.

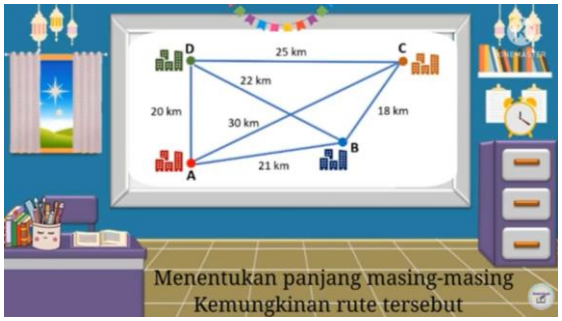


Figure 2. Organizing problem students to different ideas

In the second stage, Organizing what students learn in this activity is learning with animated videos that can increase students' interest in learning, and students can survive in learning situations that they consider difficult because the context in the video is different from what they experienced before or can also be called new knowledge. With this new thing, creative abilities on the elaboration indicator increase because it stimulates broad thinking to solve existing problems. Figure 3 is a form of questions or problems presented in the animated video, where these problems are designed by presenting contextual problems. Contextual problems can help stimulate students' creative thinking skills to solve problems when faced with problems in the real world.

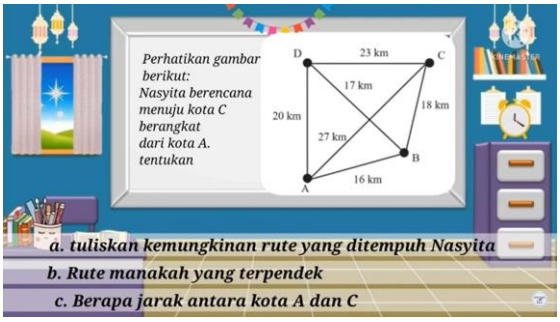


Figure 3. Presentation of Contextual Problems in Stimulating Creative Thinking Skills

Furthermore, the problems presented in the video also have another purpose. Presentation of contextual problems in stimulating creative thinking skills can also provide different ideas with *fluency and originality* (Bulu & Tanggur, 2021; Oktavia & Ridlo, 2020; Sanders, 2016).

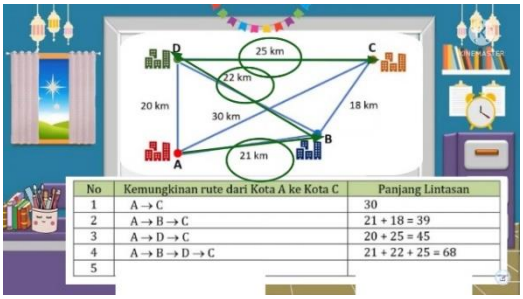
In the third stage, independent and group investigations in this learning activity, students are encouraged to collaborate with their group mates (Semilarski et al., 2021). In this activity, it is essential to share several tasks according to the ability of its members (level) (Alfares, 2021; Rustan & Bahru, 2018; Zorlu & Zorlu, 2021). Gather information from the material and discuss it with the group (Farochmah & Leonard, 2021).

Figure 4. Group Discussion Activities

Discussion activities with groups as presented in Figure 5, where these activities are contained in the video. The teacher gives instructions in the video for all students to discuss with their respective groups. Discussion activities can be in the form of activities when the teacher

gives a problem. A selected member from each group presented the group discussion results in front of the class and then responded to the other groups. This discussion activity can produce different ideas (flexibility) (Hasanah et al., 2023; Priangga, 2021; Rizal et al., 2020). In addition, discussion activities in the video and those carried out by students directly when given problems can help students solve problems and find solutions. Therefore, it is expected that students will be able to complete the task (general) and provide their answers using the solutions obtained in the discussion activity (de Lima et al., 2019; Steinbauer et al., 2021; Vidyastuti et al., 2022). The fourth stage is developing and presenting student work (Silva et al., 2018). In these activities, students are expected to increase self-efficacy on self-confidence to present themselves in front of the class. The hard work completed is also important to be presented even though it is beyond his ability (Fathiah Umriani, 2020).

In the fifth stage, which is shown in Figure 5.



No	Kemungkinan rute dari Kota A ke Kota C	Panjang Lintasan
1	A → C	30
2	A → B → C	21 + 18 = 39
3	A → D → C	20 + 25 = 45
4	A → B → D → C	21 + 22 + 25 = 68
5		

Figure 5. Analysis and evaluation presentation of the contextual problem-solving process

Figure 5, presented in the animated video, a step-by-step format for analyzing and evaluating the problem-solving process, the student can give different thoughts from others due to the stimulation given to the learning (Ambarsari & Eliastuti, 2017; Masitoh & Fitriyani, 2018). The problem-solving stage can also develop different answers from different angles. The problems give students many ways, solutions, and answers (Arnidha & Fatahillah, 2021; Dewi & Harjono, 2021; Prayogi & Asy'ari, 2013).

Self-efficacy is very influential in problem-based learning assisted by video animation—the effect of this learning on self-efficacy when solving a given problem. Students with high self-efficacy can solve problems very well (Amalya et al., 2021). PBL can potentially increase self-efficacy because it is based on constructivism; effective learning occurs when students reconstruct their knowledge through learning experiences (Masitoh & Fitriyani, 2018). Using innovative learning resources can also affect self-efficacy. One of the innovative learning resources in question is animated videos, as in this study.

Constructivist learning can enhance creative thinking skills (Kardoyo et al., 2020). One problem-learning model is problem-based learning. This is consistent with research findings (Aminy et al., 2021) that the problem-based learning model supported by GeoGebra is highly effective in improving creative thinking skills. This research (Fathiah Umriani, 2020) is also reinforced by the presence of learning media used in problem-based learning models to improve students' creative thinking skills.

Limitation

The limitation of this study is that researchers in managing classes are not very flexible because the class being researched at this time is a class that already exists—limitations in selecting students' abilities randomly. Students who have low abilities or are less skilled at speaking in group discussions to solve problems, these students are also less active in working with their friends.

Implication

Using video-assisted PBL can help the teacher organize students with various characteristics in informing learning objectives and describing essential needs. So that students have a solid motivation to be actively involved in problem-solving activities in class to increase students' self-efficacy and creative thinking ability.

CONCLUSION

To conclude, by the findings, the impact of self-efficacy and creative thinking skills is significantly different for students who are better taught in problem-based learning with video animations than those who are not. N-Gain's values analysis in this study reveals that the increasing differences in pre-test and post-test scores for practical classes are more significant than for the control class. Analysis of the N-gain value criteria shows that animation of the video-assisted problem-based learning model is more efficient than typical learning models. Thus, the effect of problem-based learning models supported by animated videos on students' self-efficacy and creative thinking ability is superior to traditional learning models.

The recommendation from the researcher for the readers and researchers is to develop a more focused worksheet. So that all indicators of creative thinking ability can achieve the minimum criteria, It is necessary to conduct further research on using problem-based learning models assisted by video animation and whether they consistently increase the ability to think creatively, mathematically, and independently in mathematics learning.

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