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The Influence of Problem-Based Learning Model Assisted by Interactive Multimedia Google Sites on Critical and Creative Thinking Skills in Elementary School

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Abstract

This study aims to (1) assess the significant impact of the Problem-Based Learning (PBL) model, enhanced by Google Sites interactive multimedia, on the critical thinking abilities of fifth-grade elementary students, (2) evaluate the significant effect of the PBL model, supported by Google Sites interactive multimedia, on the creative thinking skills of these students, and (3) examine the combined influence of the PBL model, aided by Google Sites interactive multimedia, on both critical and creative thinking skills of fifth-grade students. This quasi-experimental research utilized a nonequivalent control group design, involving fifth-grade students divided into a control group and an experimental group, each consisting of 30 students. Data analysis was conducted using independent sample t-tests and MANOVA tests. The hypothesis testing results indicate that (1) the PBL model with Google Sites interactive multimedia significantly enhances critical thinking skills, (2) it significantly boosts creative thinking skills, and (3) it has a simultaneous positive effect on both critical and creative thinking skills of fifth-grade students. Future learning is encouraged to develop more diverse educational games to further motivate student learning.

Keywords: *problem-based learning, interactive multimedia, google sites, critical and creative thinking.*

Abstrak

Penelitian ini bertujuan untuk (1) mengkaji dampak signifikan model Problem-Based Learning (PBL) yang disempurnakan dengan multimedia interaktif Google Sites terhadap kemampuan berpikir kritis siswa sekolah dasar kelas lima, (2) mengevaluasi dampak signifikan model PBL yang didukung oleh multimedia interaktif Google Sites terhadap keterampilan berpikir kreatif siswa tersebut, dan (3) menguji pengaruh gabungan model PBL yang dibantu oleh multimedia interaktif Google Sites terhadap keterampilan berpikir kritis dan kreatif siswa kelas lima. Penelitian kuasi eksperimen ini menggunakan desain kelompok kontrol non-ekuivalen, yang melibatkan siswa kelas lima yang dibagi menjadi kelompok kontrol dan kelompok eksperimen, yang masing-masing terdiri dari 30 siswa. Analisis data dilakukan dengan menggunakan uji-t sampel independen dan uji MANOVA. Hasil pengujian hipotesis menunjukkan bahwa (1) model PBL dengan multimedia interaktif Google Sites secara signifikan meningkatkan keterampilan berpikir kritis, (2) secara signifikan meningkatkan keterampilan berpikir kreatif, dan (3) secara simultan memiliki efek positif terhadap keterampilan berpikir kritis dan kreatif siswa kelas lima. Pembelajaran di masa depan didorong untuk mengembangkan permainan edukatif yang lebih beragam untuk lebih memotivasi pembelajaran siswa.

Kata kunci: *pembelajaran berbasis masalah, multimedia interaktif, situs google, berpikir kritis dan kreatif.*

INTRODUCTION

21st-century learning skills of collaboration, character, critical thinking, citizenship, creativity, and communication are very important to apply in student learning activities. 21st-century skills are expected to equip students to improve their learning and innovation skills, use of information media and technology, and life and career skills (Care et al., 2018; Sepriyanti et al., 2022). However, 21st-century skills have not been fully mastered, especially the ability to think critically and creatively. TIMSS 2015 and PISA 2022 results put Indonesia at the bottom of the list (Teig et al., 2022). Based on this data, PISA concluded that Indonesian students' thinking abilities are classified as very low, especially in critical thinking abilities. This data is strengthened by Zebua et al., (2024) findings which state that students' critical thinking skills are relatively low on average with an average of 42.95. However, they still have the opportunity to improve their critical thinking abilities because their abilities and potential still need to be developed (Alsaleh, 2020; Pursitasari et al., 2020).

Critical thinking skills are the thinking skills needed to solve a problem or problem that arises. Critical thinking skills are essential because critical thinkers can think logically, answer questions well, and make rational decisions about what to do and believe (Sukmawati et al., 2023); Dakabesi & Luoise, 2019). Apart from critical thinking, thinking creatively is one of the abilities humans really need. Creative thinking skills and critical thinking are two interconnected things. The creative thinking process involves critical (logical and analytical) and intuitive thinking skills (Park & Song, 2020; Zhang et al., 2023). However, these two thinking abilities are still not well developed. This can be seen from several research results which show that students' critical thinking abilities are still relatively low (Putri et al., 2024; Zebua et al., 2024). Research related to creative thinking abilities also shows that the majority of students have medium and low creative thinking abilities (Arista & Mahmudi, 2020; Jamnais et al., 2024).

Based on the results of observations made by teachers in class V in one of the state elementary schools in Ponorogo Regency, Indonesia, students still need help analyzing a given problem. Students tend to need help with working on analytical questions. This is reinforced by the low student learning outcomes in Natural and Social Sciences (NSS) subjects when working on questions requiring higher-order thinking skills (HOTS). Learning using a variety of models and methods can support the development of critical and creative thinking abilities. Teachers can develop learning by using strategies and models based on constructivism, such as Problem-Based Learning (PBL), which allows the development of students' critical thinking and problem-solving skills in real-life contexts (Alsaleh, 2020; Santos-Meneses et al., 2023). The PBL learning model can help students solve various problems, emphasizing collaboration and communication to develop reasoning abilities (Chen, 2021; Zhao et al., 2020). Creative thinking abilities can be identified and improved through posing problems (Simanungkalit et al., 2019). This opinion is reinforced by Sukmawati et al., (2023),who emphasize that using the PBL model in class IV science subjects can improve students' problem-solving abilities.

Science learning, currently known as NSS, has complex scientific studies, such as the study of the natural universe and biological life, so there is a need for learning media stimulation to help students understand these concepts (Zhao et al., 2020). Implementing the PBL learning model is likely more effective and efficient if it is supported by digital-based interactive learning multimedia, especially by using the Google Sites platform (Erviana et al., 2024). By combining PBL and Google Sites interactive multimedia, learning becomes more meaningful, relevant and fun. Students not only gain knowledge, but also develop critical, creative, and collaborative thinking skills that are much needed in the 21st century. Apart from that, it encourages students to become independent learners. They learn to search for information, evaluate sources, and make their own decisions.

This research will develop interactive multimedia Google Sites by integrating several platforms, including YouTube, the educational game Quizziz, and Canva for Education. These platforms will be adapted to the needs of learning materials and the characteristics of elementary school students. The results of previous research conducted by (Saputri, 2020) showed that the application of the Problem-Based Learning model was proven to be able to improve the critical thinking skills of elementary school students. Other research shows that learning with the problem-based learning (PBL) model using audio-visual media can improve students' critical thinking abilities (Tawil & Dahlan, 2021).These findings were confirmed by (Pramestika et al., 2020) who stated that there was an influence of a scientific approach based on problem-based learning assisted by audio-visual media on critical thinking skills and learning outcomes.

The results of previous research conducted by Amin et al., (2020) showed that applying the Problem-Based Learning model was proven to improve elementary school students' critical thinking skills. Other research shows that learning with the problem-based learning (PBL) model using audio-visual media can improve students' critical thinking abilities (Amin et al., 2020). These findings were confirmed byParamitha et al., (2023), who stated that a scientific approach based on problem-based learning assisted by audio-visual media influenced critical thinking skills and learning outcomes. Similarly, research by Ahmad et al.,

(2022) and Kusuma et al (2024) indicates that the use of PBL with audio-visual media can enhance students' creative thinking abilities in science.

Much research has been related to applying the Problem-Based Learning model. However, interactive multimedia based on Google Sites has never been used to support problem-based learning activities to improve critical and creative thinking skills. Data analysis carried out on multimedia-assisted PBL research has previously never focused on analyzing the two variables of critical thinking and creative thinking. In this study we tried to examine both. Based on the description above, the researcher intends to conduct research activities using the PBL model assisted by digital-based interactive multimedia learning as a stimulating step for developing students' critical thinking and creative thinking abilities. The objectives of this research include, (1) determine the significant influence of the Problem-Based Learning model assisted by interactive multimedia Google Sites on the critical thinking skills of fifth-grade elementary school students, (2) determine the significant influence of the Problem-Based Learning model assisted by interactive multimedia Google Sites on the creative thinking skills of fifth-grade elementary school students, (3) determine the influence of the Problem-Based Learning model assisted by interactive multimedia on Google sites simultaneously on fifth-grade elementary school students' critical and creative thinking skills.

METHODS

The type of research we take is quantitative research. This is because in this research the data obtained is in the form of numbers. In line with this, Darmawan et al., (2021) explain that quantitative data is data in the form of numbers. These data are obtained from direct measurements or from figures obtained by converting qualitative data into quantitative data. This research aims at a quasi experimental design with a nonequivalent control group design model (Abraham & Supriyati, 2022). The nonequivalent control group design model has a design that is almost the same as the pre-test post-test control group but in this model the research subjects are not taken randomly (Siedlecki, 2020).

This research consisted of two groups, namely the experimental group and the control group. In both groups, both the experimental group and the control group were given the same learning units (learning objectives, materials, time, evaluation), only differing in the application of the model and learning media assistance. The first group as the experimental group was given teaching using the PBL learning model assisted by interactive multimedia on Google sites. Meanwhile, the second group as the control group was given instruction using expository learning. In its implementation, this research used class V-A and class V-B, which were then referred to as the experimental class and control class. In this design, researchers will give a pretest to determine the initial state of critical thinking and creative thinking in the control class and experimental class. In this way, it can be known more accurately, because it can be compared with the situation before treatment was given (Hayatun Nupus et al., 2023). The research subjects in this study were class V students at elementary school at Ponorogo Regency, Indonesia, totaling 82 students divided into classes V-A, V-B and class V-C. In determining the two classes as the experimental class and the control class, a homogeneity test was carried out on the two classes to see whether the two classes used as research samples had the same characteristics.

Research instruments are needed as data collection tools in carrying out research. (Sharma Test, 2022) states that "research instruments are tools needed or used to collect research data". The instruments used in this research were teaching modules, student activity sheets for treatment instruments, and evaluation sheets for data collection instruments for critical and creative thinking skills. The evaluation sheet was designed by adopting critical thinking and creative thinking indicators presented in Table 1 and 2.

Table 1. Critical Thinking Instrument Grid

Critical thinking skills	Critical thinking indicators	Question indicators	Question Number
Elementary Clarification	Focusing questions	Students are able to formulate several problems in the form of questions	1,2
Basic Support	Observe and considering the results observation	Students are able to provide appropriate reasons from observation activities on questions	3,4
Infference	Make deductions and consider the results of the deduction	Students are able to conclude the cause of a problem	5,6
Advance clarification	Defining terms and evaluating definitions (determining examples and non-examples)	Students are able to distinguish the classification of an example of an event, and then provide an appropriate explanation	7,8
Strategy and Tactics	Deciding on a course of action (formulating alternative solutions)	Students are able to provide appropriate solutions to the problems presented	9,10

(Source: Enis on Lestari et al., 2021)

Table 2. Creative Thinking Instrument Grid

Creative thinking skills	Creative thinking indicators	Question indicators	Question Number
Fluency	Students explore open problems, with multiple interpretations, solution methods, or answers	Students are able to formulate problems that arise from an event	11,14
Flexibility	Students solve (reveal or justify) in one way; then another way	Students are able to express the negative impacts of the problems found	12,15
Novelty	Students examine many methods of solution or answer (expression or justification); then make another one that is different	Students are able to formulate several solutions to problems	13,16

(Source: Silver on Simanjuntak et al., 2021)

The instruments that have been prepared are first tested for validity and reliability before being used for research activities. The validity test consists of expert validation tests and question trials. Instrument validation by experts is intended to determine whether the instrument that has been developed meets the criteria in terms of material, construct, and language aspects. Experts analyzed the validation results using Aiken V (Tobón et al., 2020). We use the validity criteria for the test items to determine whether an instrument is valid. The expert validity criteria are presented below in Table 3.

Table 3. Expert Validity Criteria

Validity Results	Validity Criteria
$0,80 < V \leq 1,00$	Very high
$0,60 < V \leq 0,80$	High
$0,40 < V \leq 0,60$	Enough
$0,20 < V \leq 0,40$	Low
$0,00 < V \leq 0,20$	Very low

(Source: (Pratiwi, 2014)

Based on the results of expert validity tests related to critical and creative thinking test instruments with the Aiken-V test, it was found that in general the results of the validity of the designed instruments are classified as high and very high, thus the instruments can be used for research. Question trials are carried out outside the research subjects, who have almost the same quality as the research subjects. Test questions using SPSS 25.0 for Windows with the Pearson Product Moment correlation statistical test at a significance level 0.05. If the probability value Sig. > 0.05, then it is declared valid. The results of the trial of critical and creative thinking skills test questions are classified as valid because R_{count} is greater than R_{table}. So critical thinking and creative thinking test questions can be used as research instruments

Reliability testing is used to determine the suitability of the instrument in measuring what is measured and related to trust. Reliability testing is used to see the extent to which measurement results using the same object will produce the same data (Ahmed & Ishtiaq, 2021). The reliability test in the research used SPSS 25.0 for Windows using Chronbach's Alpha. If the Chronbach's Alpha value is > 0.60, then the research instrument is said to be reliable, whereas if the Chronbach's Alpha value is < 0.60, then the research instrument is said to be unreliable (Barbera et al., 2021). Below is presented the data from the reliability test using Chronbach's Alpha in Table 4.

Table 4. Reliability Test Results of Critical and Creative Thinking Skills Test Questions

Variable	Chronbach's Alpha	Explanation
Critical thinking skills	0.827	Reliable
Creative thinking skills	0.639	Reliable

Based on Table 4, the instrument items regarding critical and creative thinking are classified as valid because Rcount is greater than Rtable. So, critical thinking and creative thinking test questions can be used as research instruments. Reliability testing is used to determine the instrument's suitability in measuring what is measured and related to trust. Reliability testing is used to see the extent to which measurement results using the same object will produce the same data (Ahmed & Ishtiaq, 2021).The reliability test in the research

used SPSS 25.0 for Windows using Chronbach's Alpha. If Cronbach's Alpha value is > 0.60, then the research instrument is said to be reliable. In contrast, if Cronbach's Alpha value is < 0.60, then the research instrument is said to be unreliable (Siedlecki, 2020). The data from the reliability test using Cronbach's Alpha is presented below in Table 4.

RESULTS AND DISCUSSION

Data on critical thinking skills was obtained from the experimental class's test results, which used the Problem-Based Learning (PBL) model with interactive multimedia assistance from Google Sites, and the control class, which was not given treatment. The pre-test and post-test questions given to students are in accordance with critical thinking indicators. Data on pre-test and post-test critical thinking skills in both groups (experimental and control) can be seen in Table 5.

Table 5. Mastery of Critical Thinking Skills Indicators

No.	Critical Thinking Indicators	Experimental Class		Control Class	
		Pretest	***Posttest***	***Pretest***	***Posttest***
1	Focusing questions	49.44%	83.89%	67.78%	75.56%
2	Observe and consider the results of observations	66.67%	81.67%	64.17%	64.17%
3	Make deductions and consider the results of the deduction	52.78%	71.11%	55.00%	62.22%
4	Defining terms and assessing definitions	75.83%	85.83%	75.00%	79.17%
5	Deciding on a course of action	52.78%	72.78%	53.89%	66.11%
	Mean	59.50%	79.06%	63.17%	69.44%

Based on Table 5, overall, there are differences in the results of critical thinking skills before and after learning in the experimental and control classes. The average percentage of the experimental group at the start of the test was 59.50%, increasing to 79.06%. Meanwhile, the control class group changed from 63.17% to 69.44%. There was a significant increase in the experimental class.

Data on creative thinking skills was obtained from the experimental class's test results, which used the Problem-Based Learning (PBL) model with the help of interactive multimedia on Google Sites, and the control class, which was not given treatment. The pre-test and post-test questions given to students are by creative thinking indicators. Data on pre-test and post-test creative thinking skills in both groups (experimental and control) can be seen in Table 6.

Table 6. Mastery of Creative Thinking Skills Indicators

No.	Creative Thinking Indicators	Experimental Class		Control Class	
		Pretest	***Posttest***	***Pretest***	***Posttest***
1	Fluency	55.00%	72.50%	47.50%	51.67%
2	Flexibility	63.33%	83.33%	70.00%	78.33%
3	Novelty	52.50%	68.33%	50.83%	64.17%
	Mean	56.94%	74.72%	56.11%	64.72%

Based on the data in Table 6, overall, there are differences in the results of creative thinking skills before and after learning in the experimental and control classes. The average percentage of the experimental group at the start of the test was 56.94%, increasing to

74.72%. Meanwhile, the control group changed from 56.11% to 64.72%. There was a significant increase in the experimental class.

Before testing the hypothesis using the Independent Sample T-test and Manova test, the prerequisite data analysis tests are first carried out, including normality and homogeneity tests. Normality tests and homogeneity tests were carried out on the results of critical thinking and creative thinking tests for experimental and control class students during the pre-test and post-test. A recapitulation of normality and homogeneity test results is presented in Table 7 and Table 8.

Table 7. Data Normality Test Critical Thinking and Creative Thinking

Variable	Group		Sig	Criteria	Conclusion
Critical thinking skills	Experiment	*Pretest*	0,200	sig > 0,05	Normal
		Posttest	0,200	sig > 0,05	Normal
	Control	*Pretest*	0,076	sig > 0,05	Normal
		Posttest	0,108	sig > 0,05	Normal
Creative thinking skills	Experiment	*Pretest*	0,186	*sig > 0,05*	Normal
		Posttest	0,062	*sig > 0,05*	Normal
	Control	*Pretest*	0,146	*sig > 0,05*	Normal
		Posttest	0,052	*sig > 0,05*	Normal

Table 8. Data Homogeneity Test Critical Thinking and Creative Thinking

Variable	Levene Statistic	df1	df2	Sig.
Critical thinking skills	.647	3	116	.586
Creative thinking skills	1.432	3	116	.237

Based on Table 7, it can be seen that the data on the results of critical thinking skills tests and creative thinking skills tests in the experimental class and control class are normally distributed. The homogeneity test results in Table 8 also show a significance level of > 0.05, so the data is homogeneous. The results of hypothesis testing with the critical thinking ability variable using the Independent Sample T-test are presented in Table 9.

Table 9. Hypothesis Test Results Critical Thinking Skills

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Critical Thinking Skills	Equal variances assumed	.379	.541	2.172	58	.034	9.23067	4.24935	.72466	17.73667
	Equal variances not assumed			2.172	56.583	.034	9.23067	4.24935	.72013	17.74121

The data contained in Table 9 above can be used to answer the first hypothesis and problem formulation. Based on the analysis results in Table 12, it is known that the

significance value (2-tailed) of the t-test is 0.034, which means <0.05. It can be concluded that H_o is rejected and H_1 is accepted, which means there is a significant difference in critical thinking skills between the experimental and control classes in the social science content for class V elementary school. The results of hypothesis testing with the creative thinking ability variable using the Independent Sample T-test are presented in Table 10.

Table 10. Hypothesis Test Results for Creative Thinking Skills

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Creative Thinking	Equal variances assumed	.395	.532	2.552	58	.013	9.99967	3.91830	2.15634	17.84299
	Equal variances not assumed			2.552	57.677	.013	9.99967	3.91830	2.15541	17.84393

The data in Table 10 above can be used to answer the second hypothesis and problem formulation. Based on the analysis results in Table 13, it is known that the significance value (2-tailed) of the t-test is 0.013, which means <0.05. It can be concluded that H_o is rejected and H_2 is accepted, which means there is a significant difference in creative thinking skills between the experimental and control classes in the social science content for class V elementary school.

Testing the third hypothesis using the Manova test aims to determine whether the PBL model, assisted by interactive multimedia on Google Sites, significantly influences fifth-grade elementary school students' critical and creative thinking skills. The results of the third hypothesis test to determine the simultaneous influence on critical and creative thinking skills are in Table 11.

Table 11. Hypothesis Testing Simultaneous Influence on Critical and Creative Thinking Skills

Multivariate Tests[a]

Effect		**Value**	**F**	**Hypothesis df**	**Error df**	**Sig.**	**Partial Eta Squared**
Intercept	Pillai's Trace	.963	745.680[b]	2.000	57.000	.000	.963
	Wilks' Lambda	.037	745.680[b]	2.000	57.000	.000	.963
	Hotelling's Trace	26.164	745.680[b]	2.000	57.000	.000	.963
	Roy's Largest Root	26.164	745.680[b]	2.000	57.000	.000	.963
Class	Pillai's Trace	.108	3.462[b]	2.000	57.000	.038	.108
	Wilks' Lambda	.892	3.462[b]	2.000	57.000	.038	.108

	Hotelling's Trace	.121	3.462[b]	2.000	57.000	.038	.108
	Roy's Largest Root	.121	3.462[b]	2.000	57.000	.038	.108

a. Design: Intercept + Class
b. Exact statistic

Based on the analysis results in Table 11, it is known that the significance value of Wilks' lambda from the MANOVA test is 0.038, which means <0.05. It can be concluded that Ho is rejected and H_3 is accepted, which means there are significant differences in students' critical and creative thinking skills in the experimental and control classes in the science and science content of class V elementary school.

The results of research on indicators of critical thinking skills show an increase in each indicator, especially in the experimental class. The difference in comparison of pretest and posttest scores in critical thinking skills from the experimental and control classes can be seen in Figure 1.

Figure 1. Comparison of critical thinking scores for experimental and control classes

Based on Figure 1, the achievement of indicators of critical thinking skills in the experimental class group has significantly increased between the pretest and posttest results. The research findings above align with the findings of (Dakabesi & Luoise, 2019) who explained a significant increase in all indicators of critical thinking through learning using the Problem-Based Learning model. This is reinforced by the opinion the PBL model provides learning that challenges students to work in groups to solve various problems to improve their critical and analytical skills (Brata & Mahatmaharti, 2020; Suradika et al., 2023).

Based on Figure 1, some indicators consistently get the highest scores, namely the indicators of defining terms and assessing definitions. This indicator has the highest value compared to other indicators. In both the experimental and control classes, the pretest and posttest scores on the indicators of defining terms and assessing definitions always got the

highest scores. These findings are similar to research conducted by Herunata & Widarti (2020), who explained that in their research, the indicator with the highest achievement was the indicator of defining terms and assessing definitions at 89.47%. The effectiveness of the learning model treatment in the experimental and control classes on critical thinking skills can be seen from the gain scores of both groups. A comparison of the difference in pretest and posttest scores from the two groups can be seen in Figure 2.

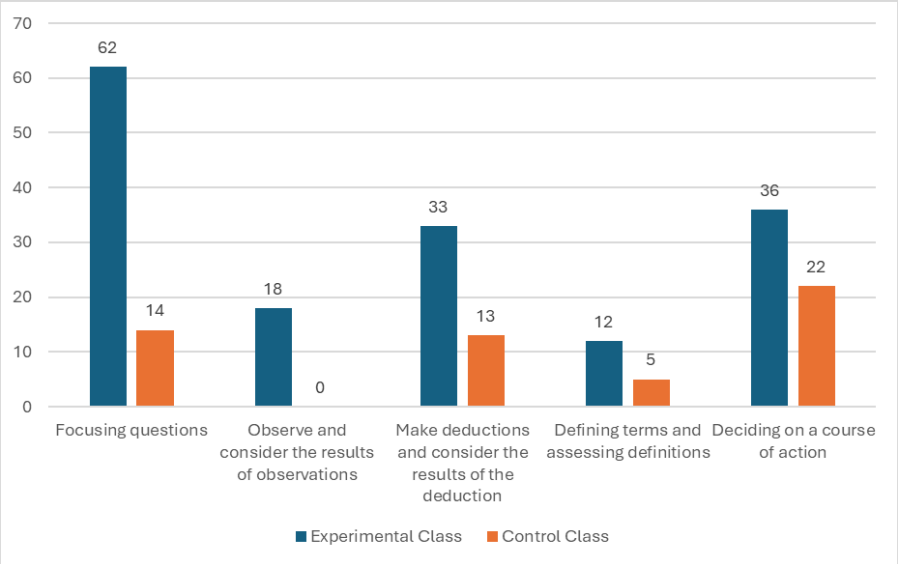

Figure 2. Comparison of Critical Thinking Skills Gain Score

Based on Figure 2, it can be seen that the experimental class and control class have varying Gain Scores. In the control class, there was also an increase in critical thinking skills, although it did not increase significantly. Of all the existing indicators, the experimental class has a higher Gain Score than the control class. This is in line with the findings of (Erviana et al., 2024), who explained that the Gain Score obtained by the experimental class was higher than the control class. These results were confirmed by Yulianti & Gunawan (2019) in their research, explaining that the Gain Score for critical thinking in the control class was 0.31, while in the experimental class, it was 0.58. This means the Gain Score in the experimental class is higher than in the control class.These results are in line with the findings of Putri et al (2024) which stated that there were differences in learning outcomes between the control class and the experimental class, the use of PBL in the experimental class was proven to be more effective than the control class. Additionally, the research conducted by Pertiwi et al (2024) found that critical thinking skills developed using Problem-Based Learning (PBL) with the aid of interactive media were higher than those developed using conventional media and were effective in enhancing students' critical thinking skills. In line with the research conducted by (Fajari, 2020), which shows that Problem-Based Learning (PBL) supported by information and communication technology enhances students' critical thinking skills.

The results of research on indicators of creative thinking skills show an increase in each indicator, especially in the experimental class. The difference in comparison of pretest and posttest scores in creative thinking skills from the experimental and control classes can be seen in Figure 3.

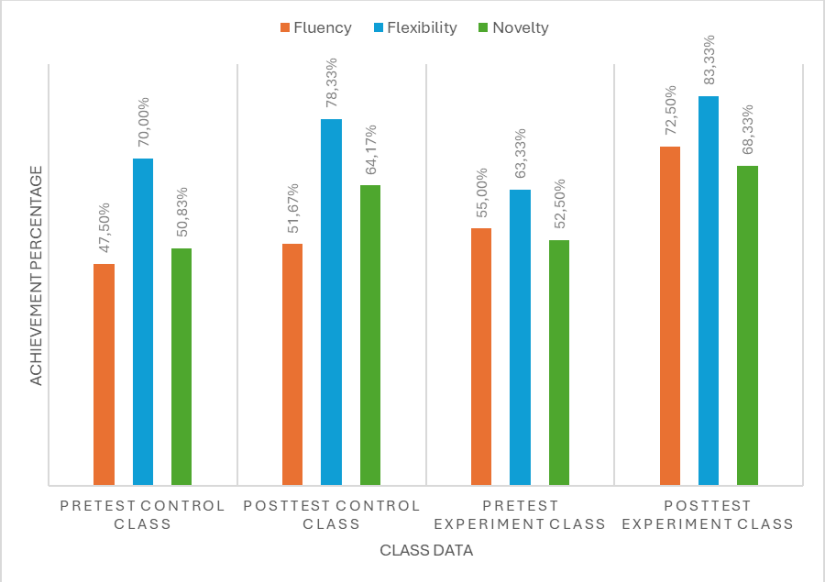

Figure 3. Comparison of Creative Thinking Scores for Experimental and Control Classes

Based on Figure 3, the achievement of indicators of creative thinking skills in the experimental class group has significantly increased between the pretest and posttest results. The increase in creative thinking skills in the experimental class group was higher than in the control class. The Problem-Based Learning model can increase students' creative thinking (Saptenno et al., 2019). In line with this Kardoyo et al., (2020), explain that the PBL model can improve and develop students' creative thinking skills. Results of previous research by Haryanti et al., (2022) shows that the application of the PBL model in experimental classes in social studies learning is quite effective in improving critical thinking skills compared to models Inquiry The PBL model involves students actively, physically, and mentally so that students can be trained to develop higher-order and creative thinking skills (Hujjatusnaini et al., 2022; Wenno et al., 2021).

Based on Figure 3, there is an indicator that consistently gets the highest score, namely the flexibility indicator. This indicator has the highest value compared to other indicators. From both the experimental and control classes, the pretest and posttest scores on the flexibility indicator always got the highest scores. These findings align with research by (Yayuk et al., 2020) which explains that the indicator with the highest percentage is flexibility. There is a difference in achievement scores in the experimental and control classes in the pretest and posttest scores. A comparison of the difference in pretest and posttest scores from the two groups can be seen in Figure 4 comparison of Gain Scores for creative thinking skills.

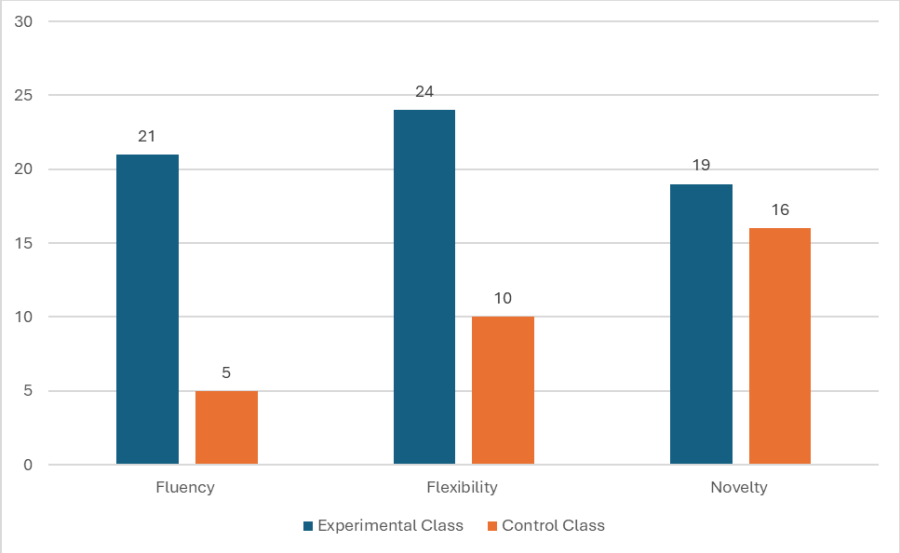

Figure 4. Comparison of Gain Scores for Creative Thinking Skills

Based on the Gain Score data in Figure 4, it can be seen that there is a significant difference between the experimental class and the control class. There was a significant increase in the experimental class for each indicator of creative thinking. Meanwhile, in the control class, the increase was not as high as that experienced by the experimental class. In line with this, the findings of Chen et al., (2022) show that the creative thinking ability of the experimental class is better than that of the control class.

The results of the MANOVA test carried out to test these two variables also showed positive results. Implementing the PBL model, assisted by interactive multimedia on Google Sites, significantly significantly affects fifth-grade elementary school students' critical and creative thinking skills. This shows that applying the PBL learning model, assisted by Google Sites' interactive multimedia, significantly improves students' critical and creative thinking abilities. In line with this, (Chang et al., 2022) and (Hu et al., 2024) explains that problem-oriented learning can improve critical and creative thinking skills.

Using interactive multimedia Google Sites can help students understand the material better. Students are more motivated during the learning process. This can be seen from the students' enthusiasm during the learning process. In line with this, Pande & Bharathi, (2020) state that learning media has the function of helping teachers concretize concepts, providing learning motivation to students, and being a stimulus for developing students' critical thinking. The Problem-Based Learning model is also suitable for NSS material related to biodiversity conservation issues. In this material, the existing problems are very relevant to current conditions. In line with this, the results of research conducted by Istri et al. (2020) and Latifah et al. (2020) explain that applying the PBL learning model can improve students' science learning outcomes.

CONCLUSION

Based on this explanation, applying the problem-based learning model, assisted by Google Sites' interactive multimedia learning, affects students' critical and creative thinking skills. Applying the Problem-Based Learning model assisted by Google Sites interactive learning multimedia can simultaneously improve critical and creative thinking skills in Class V Elementary School science subjects. Google Sites interactive learning multimedia will be

more effective if the ratio of laptops/Chromebooks used is more significant. Apart from that, to increase student motivation in learning, educational games contained in interactive multimedia can be further developed in terms of the number of questions and the form of the questions.

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