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Assessing the enhancement of students' critical thinking skills through problem-based learning

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Abstract: This study aims to examine the differences and impacts of the Problem-Based Learning (PBL) and the expository learning on critical thinking skills in the topics of Social Action, Social Interaction, and Identity for grade X students at SMAN Boyolangu in the 2023/2024 academic year. A quasi-experimental method was adopted, following a one-group pretest-posttest design with a nonequivalent control group. The data analysis included tests for normality, homogeneity, and a paired sample t-test. The pretest results showed an average score of 66.74, which increased to 75.00 in the posttest. The independent sample t-test yielded a significance value (2-tailed) of 0.000, which is less than 0.05, thus confirming the result as statistically significant. The paired sample t-test revealed that both the PBL and expository models led to differences in students' critical thinking development. PBL demonstrated a significant positive impact on students' critical thinking enhancement.
Keywords: *Critical thinking ability, Expository learning, Problem based learning.*

1. Introduction

The quality and success of learning depend significantly on how well teachers can select and apply appropriate learning models [1]; [2]. Skilled teachers need to be proficient in various teaching models to match them effectively with the lesson content [3]; [4]. Additionally, motivation is crucial in achieving goals in the classroom [5]; [6]. The main goal of developing an effective learning model is to design a situation where students can learn actively and enjoyably, leading to better learning outcomes and achievements [7]; [8]. Using the right learning model helps students enjoy the material [9]; [10], boosts motivation to complete assignments [11], and makes it easier for them to grasp the content, ultimately improving their learning outcomes. As we know, a key measure of a teacher's success is often based on whether student learning outcomes improve [12]; [13]. A key sign of achievement is the improvement of students' critical thinking skills [14]; [15]. These skills play a vital role in students' cognitive growth and help them adapt to the rapid changes and innovations of the modern era. Given the vast amount of new information available, students must develop strong critical thinking abilities to evaluate and understand it effectively. However, Indonesia's 2022 Program for International Student Assessment (PISA) results reveal that student performance, particularly in mathematics, remains low. Scores dropped by 12-13 points compared to 2018, with most students reaching only basic understanding and application levels, without yet developing the critical thinking skills needed [16]; [17]. Critical thinking is pivotal for students as it enables them to make more rational and informed decisions by considering alternative solutions [18]. Furthermore, it is useful for analyzing everyday problems [19]; [20]. Although critical thinking is essential for students, many teachers overlook its importance in practice. In fact, strong critical thinking skills can enhance students' understanding of learning concepts [21]. The low level of critical thinking among students calls for augmentation. One solution to address this is by providing rooms for students to develop their critical thinking skills. Teachers need effective

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teaching methods and the ability to select appropriate instructions to help students achieve the required competencies in their learning. However, it is common for assessments to show less-than-ideal results. One of the main issues often lies in the teaching approach and learning model used [22]. To address this, teachers may opt for learning models that encourage greater student engagement and active participation. Therefore, choosing an approach that involves students in the learning process is essential [23].

Active student participation encourages them to think freely and question what they have learned from the teacher. One effective learning model for enhancing student understanding is Problem-Based Learning (PBL) [24]; [25]. PBL engages students with real-world problems, stimulating critical thinking. According to [20]) and [26], PBL confronts students with practical, contextually relevant issues, which helps bridge classroom learning with real-life applications. Through this approach, teachers can guide students in developing self-directed learning skills, helping them overcome challenges in achieving educational goals [27]. [28] suggest that PBL is a teaching approach that presents real-world problems. By introducing the problem before the lesson, PBL encourages students to investigate, analyze, and find solutions. Most prior research on PBL has focused on developing students' critical thinking in mathematics and science subjects. Studies by [29]) and [30] indicate that, in mathematics, PBL helps students become more active in exploring and sharing ideas in group discussions, which enhances their ability to solve various mathematical challenges. Several studies have shown that applying PBL enhance students' critical thinking skills in various subjects, such as accounting [31], temperature and heat [32], and mathematical functions [33]. Students' ability to think critically becomes evident as they analyze problems related to these topics. While most previous studies have investigated the role of critical thinking in mathematics and natural sciences, this research explores its impact within social sciences, specifically to assess how PBL influences the critical thinking skills of Grade 10 students studying "Social Action, Social Interaction, and Identity."

2. Theoretical Review

2.1. Problem Based Learning

One effective model for learning is PBL, which engages students in solving real-world problems. As described by [34]) and [35], PBL uses problems as a starting point to help students acquire and integrate new knowledge, focusing on scientific problem-solving processes. In this approach, students actively participate in learning, while the teacher acts as a facilitator. [36] notes that PBL offers students hands-on experiences and opportunities to engage in continuous, meaningful learning.

According to [37] PBL is a method that develops thinking abilitiy through active engagement. In PBL, students are not only encouraged to solve problems and find solutions independently but are also guided to implement their ideas, helping them understand and apply their knowledge effectively. This approach exposes students to real-world challenges, promoting innovative learning and creating an active learning environment. By working on practical problems, students enhance their thinking skills while deepening their understanding of key concepts. As [38] explain, teachers are central in PBL by developing self-directed learning, advanced thinking skills, and effective learning strategies in problem-focused settings.

PBL involves posing questions or problems, emphasizing interdisciplinary connections, conducting authentic investigations, collaborating, and creating presentations or products [39]. Its purpose isn't for teachers to deliver as much information as possible to students. Instead, PBL is designed to augment students' critical thinking and problem-solving skills. According to Arends (in [40], PBL management consists of five main steps: (1) introducing problems, (2) organizing learning activities, (3) supporting independent or group investigations, (4) guiding students to develop and communicate their work, and (5) assessing problem-solving outcomes.

The process begins with presenting students with a problem to address. They then work in small groups to discuss the problem, clarify facts, and define the core issues. Together, they brainstorm ideas based on prior knowledge, identify information they need, and determine knowledge gaps. The group then formulates a plan for solving the issue. Next, students study independently to gather data without direct teacher guidance. This may involve using libraries, databases, websites, community resources, or making observations. Afterward, students return to their PBL groups to share what they've learned, using peer teaching and cooperative learning to enhance their understanding of the problem. They then present their proposed solutions. Finally, the group reflects on the entire process. This reflection involves engaging students in peer and teacher-guided evaluations, and reflecting on each member's contribution to the group's progress.

2.2. Expository Learning

Roy Killen refers to this expository approach as the direct instruction model, as it involves the teacher directly presenting material and emphasizes the teacher's active role in pedagogical process [41]. According to Sagala in [42], an expository strategy combines lectures, question-and-answer sessions, and demonstrations. This mix of methods aims to help students better understand the material. According to Rizkiani, et al. (in [43] describe the expository method as a teaching approach where the teacher verbally delivers content to a group of students, intending to help them fully grasp the subject matter.

The expository learning model, also known as the conventional learning model, involves a sequence of learning activities. It starts with orienting students and presenting information about the concept being studied. The teacher then provides examples or sample questions, leads a discussion with questions and answers, and continues until the students understand the material. According to Ausubel [44], this model is rooted in meaningful learning through direct instruction. The approach relies on delivering information primarily from textbooks, references, or the teacher's own experience, using lectures, demonstrations, discussions, and study reports. Therefore, the knowledge students are expected to acquire is presented directly, with teachers offering clear definitions of the concepts students will learn.

In expository learning, a teacher typically takes a central role in providing guidance, while students primarily absorb the information presented by the teacher. In this context, the teacher serves as the main source of information, aiming to help students master the material effectively [45]; [46]. Even though expository learning incorporates methods beyond traditional lectures and utilizes various tools, the focus remains largely on acquiring information.

Sanjaya (in [42], outlines several benefits of the expository learning model: (a) it allows teachers to control the order and scope of the material, enabling them to assess students' mastery of the content presented; (b) it is highly effective for covering extensive material within a limited timeframe; (c) it enables students to listen to explanations and observe demonstrations of the material simultaneously; and (d) it is suitable for large class sizes. In expository learning, students are prepared to receive information and follow guidance [47].

Teachers often demonstrate concepts, principles, laws, or theories to help students understand them [48]. This teacher-centered approach has several benefits: (1) it allows for comprehensive delivery of learning materials, (2) accommodates large student groups, (3) enables learning to follow the allocated time schedule, and (4) makes it easier to meet curriculum goals. However, there are some drawbacks to this method: (1) it can become monotonous for students, (2) it is challenging to measure improvements in students' attitudes and behavior, and (3) the quality of learning outcomes may be lower, as teachers may focus more on covering all material rather than ensuring deep understanding. This approach often relies on lectures and brief Q&A sessions [49]; [50].

Expository learning has several advantages, primarily its simplicity and accessibility, making it suitable for students who rely heavily on memorization. However, it also has notable weaknesses. First, it provides limited opportunities for students to explore, be creative, think independently, and develop critical attitudes. Second, it may foster a passive learning environment, as students become accustomed to receiving information. Lastly, the activities can often feel mechanical.

Therefore, expository learning does not adhere to constructivist principles; rather, it focuses on traditional teaching methods commonly employed by teachers in actual classroom settings. According to [33]) and [51], this model follows a structured approach consisting of three main stages. In the introductory stage, the teacher presents the materials and learning objectives. During the core stage, the teacher delivers the content through lectures and facilitates a question-and-answer session, followed by demonstrations or experiments to clarify concepts. This stage concludes with a summary or practice questions. Finally, in the closing stage, the teacher assigns evaluations or homework for students to complete at home.

2.3. Critical Thinking

[52] define critical thinking as the skill that enables students to use their knowledge to reason effectively, allowing them to solve problems with precision [53]. This ability involves drawing conclusions by approaching tasks in a complex and systematic way, utilizing processes of analysis and evaluation [54]. Meanwhile, according to [55] critical thinking is a mental approach essential for solving problems, drawing conclusions, exploring possible options, and making informed decisions. [56] add that critical thinking is a logical, reflective, and systematic skill that encourages students to confidently make sound decisions. From these perspectives, critical thinking can be seen as an active mindset that involves analyzing and addressing issues encountered in life. It applies specific methods to arrive at logical conclusions and effective solutions.

Brookfield [in 57] describes five key aspects and four components that make up critical thinking. He explains that critical thinking is a constructive and beneficial activity, is more of an ongoing process than a final outcome, and its expression can vary widely depending on the context. Additionally, critical thinking can be experienced as either positive or negative, and it involves both emotional and rational elements. To assess students' critical thinking skills, specific indicators are used as benchmarks. [58] identify several indicators of students' critical thinking skills, including offering simple explanations, developing foundational thinking skills, drawing conclusions, providing additional explanations, and forming strategies and tactics. John Butterworth [in 59] further emphasizes that critical thinking involves three main activities: analysis, evaluation, and constructing further arguments. Analysis requires identifying the main parts of a text and reconstructing them to fully and accurately convey the meaning. Evaluation involves assessing the effectiveness of the text, such as determining how well an argument supports its conclusion or how convincing the evidence is for a particular claim. Constructing further arguments allows students to respond thoughtfully, presenting their own reasoned cases to either support or challenge the claims made in the text.

3. Research Method

This quantitative study used a quasi-experimental method, meaning that the control class did not receive a full treatment. The research took place with 10th-grade students at SMAN Boyolangu. Samples were drawn from classes XA and XB, each with 36 students. The study followed a Pretest-Posttest Non-Equivalent Control Group design, as shown in Table 1.

Table 1.
Research design.

R1	**O1**	**X**	**O2**
R2	O3	Y	O4

Description:
R1: PBL
R2: Expository learning
O1: PBL (pretest)
O2: PBL (posttest)
O3: Expository learning (pretest)
O4: Expository learning (posttest)
X: PBL implementation
Y: Expository learning implementation

The data collection involved a test with 6 descriptive questions. These questions were designed to measure various critical thinking abilities, including: (1) Providing simple explanations, (2) Developing basic skills, (3) Drawing conclusions, (4) Giving advanced clarifications, and (5) Applying strategies and tactics. Each question is scored from 0 to 4, with 4 as the highest possible score and 0 as the lowest. The scoring criteria used are outlined in Table 2 below.

Table 2.
Critical thinking ability test scoring rubric.

Measured Indicators	**Criteria for evaluating students' answers to critical thinking questions**	**No**
Elementary clarification (Providing simple explanations)	Formulating focused questions, evaluating arguments, and effectively asking and responding to questions.	1
Basic support (Developing basic skills)	Assessing the reliability of a source.	2
Inference (Drawing conclusions)	Arranging and evaluating deductive reasoning, structuring and evaluating inductive reasoning, making informed decisions, and reflecting on the outcomes.	3
Giving advanced clarifications	Recognizing key terms and definitions, and examining underlying assumptions.	4
Applying strategies and tactics	Choosing actions and engaging effectively with others.	5

The data analysis phase includes the following steps: 1) a normality test using the Kolmogorov-Smirnov method, where data is considered in a normal distribution if the p-value > 0.05; 2) a homogeneity test conducted with Levene's test; 3) an Independent Sample t-test, which determines that if the p-value < 0.05, there is a significant difference in critical thinking skills between the posttest results of the experimental and control groups; and 4) a Paired Sample t-test, which checks if PBL significantly enhances students' critical thinking skills, indicated by a p-value < 0.05.

4. Results

The learning implementation was observed by a single observer who used an observation sheet to track the process. The results, expressed as percentages of the observed learning activities, are presented in Table 3.

Table 3.
Presentation of the observed learning activities.

Stages	**Observer**	**Teacher activity (%)**			**Student activity (%)**		
		Meeting			**Meeting**		
		1	2	3	1	2	3
Introduction	1	100%			100%		
PBL syntax							
Introducing students to the problem	1	100%			100%		
Arranging students for effective learning	1	100%					
Supporting individual and group research	1		100%			100%	
Creating and sharing findings	1		100%			100%	
Reviewing and assessing the problem-solving process	1			100%			100%

Conclusion	1			100%			100%

The observation results indicate that the implementation of PBL was highly successful. From the first to the third meeting, all learning activities were conducted effectively, achieving 100%. This demonstrates that PBL was executed well.

4.1. Descriptive Analysis

4.1.1. Validity Test

The SPSS analysis for this empirical validity test employs the product moment formula. A question item is valid if the calculated r value > the r table value at a significance level of 0.05. The findings from the instrument validity test conducted in this study are presented in Table 4.

Table 4.
Validity test results.

Item	Correlation coefficient value (r_{stat})	Sig.	r_{table}	Reliability statistic (Cronbach's alpha)
1	0.856	0.000	0.389	0.864
2	0.617	0.001	0.389	
3	0.843	0.000	0.389	
4	0.905	0.000	0.389	
5	0.656	0.000	0.389	

According to Table 4, all the questions are valid since they have a calculated r value exceeding the r table value.

4.1.2. Reliability Test

The reliability test shows a Cronbach's Alpha value of 0.864. Since it is larger than the 0.60, we can conclude that the research instrument is reliable.

3.1.3. Normality Test

This test is conducted using the one-sample Kolmogorov-Smirnov method. Table 5 shows the normality test results.

Table 5.
Normality test results.

Variable	Sig. level	Normality test criteria
Control class (Before intervention)	0.519	0.05
Control class (After intervention)	0.120	
Experiment class (Before intervention)	0.537	
Experiment class (After intervention)	0.501	

Referring to Table 5, all the values are all greater than 0.05. Thus, we can conclude that the data is normally distributed.

4.1.4. Homogeneity Test

The Levene Statistic test for homogeneity checks if the two sample classes have similar variances. According to the criteria, if the significance value for the mean exceeds 0.05, the data is considered to be homogeneously distributed. The homogeneity test results are shown in Table 6.

Table 6.
Homogeneity test results for pretest-postest questions.

Test of homogeneity of variance					
		Levene statistic	**df1**	**df2**	**Sig.**
Pretest	Mean	0.428	1	36	0.513
	Median	0.557	1	36	0.480
	Median and with adjusted df	0.564	1	35.401	0.461
	Trimmed mean	0.432	1	36	0.519
Posttest	Mean	2.461	1	36	0.135
	Median	2.261	1	36	0.134
	Median and with adjusted df	2.281	1	32.610	0.151
	Trimmed mean	2.642	1	36	0.124

As Table 6 shows, the significance values (sig) for the mean, median, median and df, and the average of the pretest data in both the control and experimental groups are all greater than 0.05. This indicates that the variances are homogeneous for the pretest data. Similarly, for the posttest data, all significance values are above 0.05. Thus, it can also be concluded that the posttest variances are homogeneous.

4.2. Differences in Results

The paired sample t-test results indicate a difference in pretest and posttest scores between the two groups. This suggests that PBL had an impact on students' critical thinking, as shown in Table 7.

Table 7.
Pretest and posttest results.

Sample group	**N**	**Average**	**Standard deviation**	**Varians**	**Lowest score**	**Highest score**
Pretest XA	36	57.83	10.748	115.514	35	80
Posttest XA	36	66.74	8.740	76.383	45	80
Pretest XB	36	52.61	12.235	149.704	40	80
Posttest XB	36	78.48	8.974	80.534	60	95

According to Table 7, the experimental class had a mean of 52.61, which improved to 78.48. In comparison, the control class had a mean of 57.83, which increased to 66.74. For the median scores, the experimental class improved from 50 in the pretest to 75 in the posttest, while the control class went from 60 to 65. The mode in the experimental class rose from 40 in the pretest to 75 in the posttest, whereas in the control class, it was 60 in the pretest and 65 in the posttest. The table shows that the average pretest scores for the control and experimental classes were 57.83 and 52.61, respectively, with standard deviations of 10.748 for the control class and 12.235 for the experimental class. The pretest scores ranged from 80 to 35. After the intervention, the average posttest scores increased to 66.74 for the control class and 75.00 for the experimental class, with standard deviations of 8.740 and 8.974. The posttest scores ranged from 95 to 45. This indicates that the average posttest scores were higher than the pretest scores, suggesting an improvement in student performance after the intervention.

Table 8.
Summary of student scores in the experimental class.

No	Indicators of critical thinking skill	Experiment class				Control class			
		Average		Difference	Improvement	Average		Difference	Improvement
		Pretest	Posttest			Pretest	Posttest		
1	Elementary clarification	40	80	40	40%	45	62	17	17%
2	Basic support	55	86	31	31%	66	70	4	4%
3	Inference	55	67	12	12%	63	63	0	0%
4	Advanced clarification	55	80	25	25%	55	67	12	12%
5	Strategies and tactics	56	78	22	22%	59	72	13	13%

Table 8 shows that critical thinking skills in the experimental class improved across each independent variable, with increases of 40%, 31%, 12%, 25%, and 22%, respectively. In contrast, in the control class, critical thinking skills improved with smaller percentages across the independent variables, showing increases of 17%, 4%, 0%, 12%, and 13%, respectively.

4.3. Hypothesis Testing

This study used an independent sample t-test in SPSS to assess whether PBL model affected students' critical thinking skills. Additionally, a paired sample t-test was used to examine any differences in students' critical thinking skills before and after implementing PBL. The paired sample t-test results are displayed in Table 9, while the independent sample t-test results are shown in Table 10.

Table 9.
Paired sample t-test results.

Class	N	Std. deviation	Std. errormean	Sig. (2-tailed)
Control	36	7.379	1.539	0.002
Experiment	36	13.539	2.823	0.001

The results of the Paired Sample t-test show a significance (2-tailed) value of 0.000, which is below 0.05. This indicates that implementing PBL has a significant effect on students' critical thinking skills.

Table 10.
Independent sample t-test results.

Class	N	Mean	Std. deviation	Std. errormean	Sig. (2-tailed)
Control	36	66.74	8.740	1.822	0.000
Experiment	36	78.48	8.974	1.871	0.000

The Independent Sample t-test results show a sig. (2-tailed) value of 0.000. Falling below 0.05, this value indicates a significant difference in students' critical thinking skills before and after the intervention.

5. Discussion

5.1. Differences on Students' Critical Thinking Skills

According to Table 8, the percentage of indicators for providing simple explanations (elementary clarification) is higher in the experimental class than in the control class, with scores of 80 and 62, respectively. For the indicator of building basic skills (basic support), the experimental class also scored higher (86), compared to the control class (70). Additionally, the indicator for drawing conclusions (inference) was higher in the experimental class, with a score of 67 versus 63 in the control class. The indicator for giving advanced clarification is higher in the experimental class, with a score of 80,

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compared to 67 in the control class. Similarly, the indicator for developing strategies and tactics is also higher in the experimental class, scoring 78, while the control class scored 72.

After implementing PBL, students showed improvement across various critical thinking skill indicators. Specifically, there was a 40% increase in the ability to provide simple explanations (elementary clarification), a 31% increase in basic skills (basic support), a 12% increase in drawing conclusions (inference), a 25% increase in providing advanced clarification, and a 22% increase in organizing strategies and tactics.

This study suggests that students using PBL have better critical thinking skills than those using conventional methods. This is consistent with findings from [60]) and [61]. The largest improvement was seen in the "simple explanation" indicator, which increased by 40%. This indicator assesses students' ability to focus questions and analyze explanations or challenges [62]; [63]. In the experimental group, the teacher guided students only toward pre-selected problems, allowing them to independently engage in problem-solving. As students worked through these problems, they optimized their thinking through group collaboration, gathering relevant information from their handbooks, discussing their findings with group members, conducting experiments, and presenting their group results to the class.

Students are becoming more accustomed to PBL, as well as to the exercises provided by the researcher, which are designed to stimulate their engagement and critical thinking. This approach has proven engaging and motivates students to analyze and answer questions thoughtfully. Strong critical thinking skills help students better understand concepts, enhance their awareness of problems, and enable them to find accurate and applicable solutions. In line with this, [64] affirm that critical thinking involves the ability to focus on and solve problems effectively. To give in-depth explanations, students must connect their knowledge to the specific context of the problem. As Smith [59] explains, critical thinking is fundamentally about forming well-reasoned arguments, which provide a solid, logical foundation for problem-solving.

5.2. The Influence of PBL on Critical Thinking Skills

The increase in students' critical thinking skills occurred because each stage of the PBL process was implemented precisely as planned in the research design, as shown by observation results. Observational data revealed that both teachers and students effectively carried out the stages of analytical thinking infusion during the learning process, with an average implementation rate of 100%, indicating an excellent implementation of the model. On the first day, although the learning activities were fully implemented (100%), students' critical thinking skills had yet to emerge. They were still unfamiliar with answering lengthy essay questions and had difficulty solving problems. This was largely due to their lack of prior experience with PBL activities; typically, teachers had only trained students' cognitive skills at basic levels (C1 and C2 in daily tests), which did not adequately foster their critical thinking abilities.

This study showed a significant impact on students' critical thinking skills when using PBL. Based on the Independent Sample t-test, a sig. (2-tailed) value of 0.000 was obtained, which is ≤ 0.05, indicating that the average critical thinking score for students using PBL was higher than that of students in the conventional model. PBL enhances critical thinking through specific phases, including understanding the problem, planning a solution, and executing the solution.

PBL offers several benefits. By addressing problems, it helps develop critical thinking skills, fosters the discovery of new knowledge, enhances engagement in learning activities, and encourages students to apply their knowledge in practical situations [65]; [54]. PBL encourages students to become more active and independent as they develop critical thinking abilities to deal with problems by gathering data and forming rational and authentic solutions [66]; [26]. PBL also promotes greater collaboration, improves learning capacity, provides opportunities for skill development, and prepares students with a comprehensive perspective. Additionally, it enhances critical thinking and better equips students to adapt to diverse market challenges [25]; [18].

The essential aspects for effective PBL in education can be grouped into three main themes: (i) intrinsic empowerment, (ii) confidence, and (iii) functional skills. This model is designed to engage students in active learning, helping them develop a deeper understanding and practical skills that are relevant to real-world situations. It also supports students' growth as active and independent learners [38]. PBL has been shown to help students acquire new knowledge by analyzing information from various sources and their prior learning experiences. Students then connect this knowledge to the learning problems presented by their teachers. This approach emphasizes the importance of students independently analyzing learning materials and encourages critical thinking to solve real-world problems they encounter.

6. Conclusion

The use of PBL has shown notable differences compared to direct learning models, particularly in enhancing the critical thinking skills of Grade X students at SMAN Boyolangu. In the experimental group, students' critical thinking skills improved across various components: elementary clarification increased by 40%, inference by 31%, advanced clarification by 12%, basic support by 25%, and strategies and tactics by 22%.

The research findings indicate that applying PBL model significantly impacts critical thinking skills. This is supported by the results of an Independent Sample t-test, which showed a p-value (sig. 2-tailed) of 0.000, less than 0.05. PBL is an instructional model that uses real-world problems as a starting point to acquire and integrate new knowledge. This model encourages students to engage in critical thinking, develop problem-solving abilities, and make connections between their knowledge and real-world challenges.

Based on the research findings, it is recommended that future researchers studying critical thinking skills at the elementary level consider developing their own instruments. Currently, there are no standard tools specifically for measuring critical thinking skills in elementary students. Researchers can create their instruments by adapting from existing standardized instruments.

Authors' Contributions:

Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.

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