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The Effect of Role Play Learning Model on Students' Critical Thinking Skills on The Blood Circulatory System in Elementary Schools

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ABSTRACT

This study addresses the problem of low critical thinking skills among elementary school students, particularly in science learning about the circulatory system. The research aimed to examine the effectiveness of the role-playing learning model in improving fifth-grade students' critical thinking abilities. A quasi-experimental design with a non-equivalent control group was applied, involving 50 students divided into experimental and control groups. Data were collected using pre-tests and post-tests, analyzed through normality, homogeneity, and independent t-tests with SPSS software. The results indicated that the experimental group, which engaged in role-playing activities, showed a significant increase in critical thinking scores from 48.80 to 82.80, compared to the control group, whose scores increased from 28.60 to 63.20. The t-test analysis confirmed a significant difference between the two groups. These findings suggest that role-playing is an effective instructional model to enhance students' critical thinking skills, especially in understanding complex biological concepts such as the circulatory system.

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1. INTRODUCTION

In a world filled with conflicting information and increasingly complex challenges, the ability to think critically is no longer merely an additional skill but a fundamental necessity. Given this, students need to be adequately prepared to face future global challenges [1]. As expressed by Beyer [2], critical thinking is "making rational judgments," namely, the process of applying criteria to assess the quality of something, from everyday activities to evaluating the validity of statements, ideas, arguments, or research. Similarly, Ennis [3] states that critical thinking is the ability to think reflectively and rationally, which enables individuals to make more appropriate and informed decisions.

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After reviewing various expert perspectives, the author argues that critical thinking is not merely an intellectual skill but also a mental skill that must be continuously honed in everyday life. As Beyer and Ennis point out, the ability to evaluate rationally and reflectively enables us to face challenges more wisely. However, more than that, the author believes that critical thinking can serve as a tool to empower individuals, foster independence in thinking, and ultimately shape more intelligent and reflective individuals.

Critical thinking is essential for everyone to address various problems in the realities of life. Through critical thinking, a person can organize, adjust, or change their thought patterns, thereby deciding on the right course of action. This is in line with the opinion of Lubis et al. [4], which states that critical thinking involves skills in applying, connecting, creating, and evaluating information that has been collected. A person who thinks critically is someone skilled at reasoning and tends to believe and act in accordance with their reasoning [5]. Critical thinking can also strengthen various abilities, such as knowing, remembering, distinguishing, analyzing, reasoning, reflecting, interpreting, seeing relationships between things, and even speculating [6]. With clear reasoning, students will be better able to convey new information in a more structured and convincing manner [7].

Learning has an important role in shaping a person's way of thinking and knowledge [8]. Learning in elementary school aims to help students develop critical thinking skills [9]. Through critical thinking, a person can control, change, or improve their way of thinking so that they can make decisions more quickly and effectively [10]. Thus, critical thinking should be taught from elementary school, especially in the upper grades, because it can improve students' memory and their ability to understand lessons [11].

Critical thinking plays a crucial role in science learning. This skill helps students understand themselves and their surroundings [12]. Furthermore, critical thinking also helps students better understand the natural and physical environment around them. A creative student also needs to possess critical thinking skills [13] because students who think critically are able to apply simple scientific methods and adopt a scientific attitude in solving various problems [14]. By thinking critically, students can assess various information, assumptions, and arguments to understand a statement more clearly and deeply [15].

In the teaching and learning process, critical thinking skills are underdeveloped. First, the curriculum focuses too much on material, making the teacher's role very dominant. Second, classroom learning tends to be more teacher-driven, while students listen and take notes without much involvement [16]. In response to this low level of critical thinking, serious efforts are needed to overcome it. One effort that can be made is to implement a role-playing learning model, which is seen as accommodating for improving students' critical thinking skills and learning activitie [17]. This is in line with what was conveyed by Solehat [18, which is that the role-playing model is able to involve students in thinking creatively and developing ideas that are relevant to the subject matter.

Role-playing is a learning model in which students act out roles according to scenarios of real-world problems. This allows students to find solutions to problems according to the roles they play [19]. Through role-playing, students are encouraged to

express their feelings through the roles they play, while simultaneously developing self-awareness through spontaneous engagement and analysis of real-life problem situations. Thus, role-playing enables students to be more active and critical in determining the right steps to find solutions to the problems they face. Implementing role-playing also leads students into a more enjoyable and engaging learning experience [20].

Various previous studies have been conducted, one of which is research conducted by Said [21]. Utilizing a role-playing model, students experienced a remarkable enhancement in their speaking skills, increasing from 25% to 81%. This dynamic approach not only boosted their confidence but also contributed significantly to overall learning outcomes, fostering greater engagement and mastery of the subject matter more interactively and effectively.

Continuing the results of previous research, research conducted by Solikhin et al. [22] provides new insights into improving students' critical thinking skills through a problem-based learning approach combined with a role-playing model. The results obtained show significant progress: in the pre-cycle, only 35% of students were in the low category, but after implementing this method, in cycle 1, 55% of students were in the medium category, and in cycle 2, 70% of students reached the high category. Remarkable achievements occurred in cycle 3, where 81% of students were in the very high category. Problem-based learning and role-playing significantly improve students' critical thinking skills by encouraging active engagement, practical application, and deeper understanding of complex concepts.

Considering the results of previous research, research conducted by Faizah et al. [23] explored the impact of role-playing models on students' critical thinking skills through a series of ten carefully designed questions. Despite achieving highly significant results ($p<0.001$), the N-Gain scores indicated a moderate improvement in critical thinking abilities. These findings suggest that incorporating role-playing activities can effectively enhance students' analytical and evaluative skills, fostering deeper engagement and more meaningful learning experiences in educational settings. However, what was interesting was the clear improvement in students' post-test scores, which rose by an average of 8.03 on the classification of living things material.

Most previous studies have mainly concentrated on other areas, such as speaking skills or combining role-playing with problem-based learning. To date, there has been no specific investigation into the effect of role-playing on critical thinking skills in elementary science education, particularly in the circulatory system topic. Thus, this study seeks to fill that gap by examining the direct impact of role-playing on the critical thinking abilities of fifth-grade students in science.

The author hopes that role-playing will cultivate an engaging and participatory learning environment, encouraging students to explore concepts through discussion and immersive role play actively. By immersing themselves in different perspectives and scenarios, learners are motivated to think critically and analyze situations more thoroughly. The objective of this research is to determine the effect of the role-playing learning model on the critical thinking skills of elementary school students on the topic of the circulatory system. This method aims to foster intellectual curiosity, enhance problem-solving skills, and

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promote collaborative learning, ultimately creating a dynamic educational experience where students feel empowered to participate actively and deepen their understanding of the subject matter.

2. METHOD

This study employs quantitative methods, utilizing systematic data collection and rigorous analysis to test formulated hypotheses. Adopting a positivist perspective, the research emphasizes objectivity and empirical evidence, aiming to uncover measurable relationships and patterns within the collected data to draw valid conclusions [24]. The research design used was a non-equivalent control group design. The study was conducted at MIN 12 in Medan City. The study population was 50 fifth-grade elementary school students, with a sample of two classes. The first class served as a control class using a lecture model, and the second class served as an experimental class using a role-playing model.

The experimental method is a research method used to test cause-and-effect relationships by changing the independent variable and observing the changes that occur as a result of this change [25]. Thus, this experimental method is used to measure changes that occur after a treatment or change is implemented. Furthermore, this experimental method is suitable for the research the author is conducting, which is to determine whether the role-playing learning model implemented in the experimental class has an impact on students' critical thinking skills.

This research study was designed to evaluate the effectiveness of role-playing-based learning compared to traditional instructional methods. To achieve this, pre-tests and post-tests were administered to both groups at the outset and conclusion of the intervention, enabling the assessment of students' initial abilities and subsequent progress. The experimental group participated in interactive role-playing activities aimed at enhancing engagement and understanding, while the control group received conventional teaching approaches. Data collection primarily involved students' essays, which were carefully validated to ensure reliability and consistency across assessments. The collected data underwent thorough analysis, including tests for normality and homogeneity of variances. Hypothesis testing was performed using SPSS software to determine the significance of differences between the groups, providing insights into the effectiveness of the innovative teaching method.

3. RESULTS AND DISCUSSION

3.1 Results

This study employed a standard experimental design, utilizing both pre- and post-tests to evaluate students' baseline knowledge and subsequent learning progress. The experimental group participated in engaging role-playing activities designed to enhance understanding through active participation, while the control group received traditional lectures to serve as a comparison. Following the intervention, post-tests were administered to measure the learning outcomes of both groups. The primary goal was to compare the effectiveness of role-playing versus lecture-based instruction in improving students' knowledge and skills.

In the experimental class, students demonstrated a remarkable enhancement in their critical thinking abilities, with their scores increasing substantially from 48.80 to 82.80. This significant improvement indicates that the role-playing model effectively fostered their analytical and reasoning skills. Meanwhile, the control class also experienced progress, with scores rising from 28.60 to 63.20, though the growth was comparatively less pronounced. This contrast highlights the potential benefits of incorporating active learning strategies like role-playing into the curriculum. Overall, these findings suggest that implementing the role-playing model has a positive influence on fifth graders' critical thinking development, encouraging more engaging and interactive learning experiences that promote deeper understanding and cognitive growth.

Table 1. Pre-Test and Post-Test Results of Experimental and Control Classes

Statistics					
		Experimental Pretest	Experimental Posttest	Control Pretest	Control Posttest
N	Valid	25	25	25	25
	Missing	0	0	0	0
Mean		48.80	82.80	28.60	63.20
Median		50.00	80.00	30.00	60.00
Std. Deviation		12.606	6.627	12.460	12.322
Range		45	25	40	45
Minimum		20	70	10	35
Maximum		65	95	50	80
Sum		1220	2070	715	1580

Source: Data Processing Results Using SPSS 31

During the data analysis phase, normality and homogeneity tests were conducted to ensure the data's validity before hypothesis testing. The normality test was conducted to determine whether the data collected from both the pre-test and post-test measurements for each group adhered to a normal distribution. This assessment utilized a significance value, commonly denoted as "sig," to evaluate the results. When the significance value exceeded 0.05, it suggested that the data did not significantly deviate from normality, thereby confirming that the data for both tests and groups followed a normal distribution.

Table 2. Normality Test

	Shapiro-Wilk		
	Statistic	df	Sig.
Experimental Pre-test	.937	25	.125
Experimental Post-test	.928	25	.078
Control Pre-test	.927	25	.076
Control Post-test	.942	25	.161

Source: Data Processing Results Using SPSS 31

Table 2 demonstrates that all data sets successfully passed the Shapiro-Wilk test for normality, as evidenced by significance values exceeding 0.05 in both the experimental and control groups, for both pre- and post-test measurements. This result confirms that the data follow a normal distribution, which is a key assumption for many parametric statistical analyses. Following this, a homogeneity test was conducted to evaluate whether

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the variances between the two groups are equal. The significance values obtained from this test also exceeded 0.05, indicating that the variances are homogeneous and comparable. These preliminary tests are essential steps in ensuring the validity of subsequent statistical comparisons, as they verify that the data meet the necessary assumptions for parametric testing. Overall, the findings suggest that the data are suitable for further analysis using standard statistical methods.

Table 3. Tests of Homogeneity of Variances

Result	Levene Statistic	df1	df2	Sig.
Based on Mean	.016	1	48	.899
Based on Median	.011	1	48	.916
Based on Median and with adjusted df	.011	1	47.654	.916
Based on the trimmed mean	.030	1	48	.864

Source: Data Processing Results Using SPSS 31

The results of the homogeneity test in Table 3 show a significance value according to the mean of 0.899, which exceeds the 0.05 threshold. This finding indicates that the variances of both groups are equal or homogeneous. After ensuring that the assumptions of normality and homogeneity were met, the data were suitable for analysis using a hypothesis test. The method used was an independent sample t-test, which focused on comparing the critical thinking skills of students in the experimental class implementing the role-playing model with those in the control class using the lecture method. The purpose of this test was to identify whether there were significant differences between the two groups, with the significance value serving as a reference for decision-making.

This hypothesis test decision is primarily determined by the significance value, which guides whether to reject or fail to reject the null hypothesis (H_0). When the significance value, or p-value, is below the threshold of 0.05, it suggests that the observed data is unlikely under the assumption that H_0 is true, leading researchers to reject H_0 and accept the alternative hypothesis (H_a). This indicates a statistically significant difference or effect. Conversely, if the p-value exceeds 0.05, there is insufficient evidence to reject H_0, implying that any observed differences are likely due to chance and not statistically significant. This analysis assessed whether the results demonstrated a meaningful difference or not.

Table 4. Independent Samples Test

Result	t	df	Significance (One-Sided p)	Significance (Two-Sided p)	Mean Difference	Std. Error Difference	95% CI Lower	95% CI Upper
Equal variances assumed	7.004	48	<.001	<.001	19.600	2.798	13.974	25.226
Equal variances not assumed	7.004	36.812	<.001	<.001	19.600	2.798	13.929	25.271

According to Table 4, the significance value is 0.001, which is less than the threshold of 0.05. Therefore, the null hypothesis (H_0) must be rejected. This finding clearly indicates that role-playing has a statistically significant effect on students' learning outcomes. Specifically, it suggests that engaging in role-playing activities substantially enhances students' understanding, communication skills, and overall academic performance, making it a valuable instructional strategy in educational settings.

Normality and homogeneity tests confirmed that the data followed a normal distribution and exhibited equal variances. An independent *t*-test was conducted to compare the two groups, revealing a significant difference with a p-value of 0.001. Consequently, these results led to the rejection of the null hypothesis, indicating that there is a statistically significant difference between the groups under study.

3.2 Discussion

Implementing the role-playing model in the classroom significantly enhanced students' critical thinking abilities. The experimental group's scores increased markedly from 48.80 to 82.80, illustrating the model's effectiveness. This approach actively engaged students, encouraging them to analyze, evaluate, and synthesize information more deeply. As a result, students developed stronger problem-solving skills and greater confidence in their analytical capabilities, making role-playing a valuable pedagogical tool.

This research aligns with the results of Said [21]. In a standard educational approach, role-playing significantly enhanced students' speaking skills, achieving an impressive improvement rate of 81%, demonstrating its effectiveness in language development. Furthermore, the research findings of Solikhin [19] revealed that integrating problem-based learning alongside role-playing activities greatly improved students' critical thinking skills in science. Initially, only 35% of students demonstrated low critical thinking abilities, but after the intervention, an impressive 81% reached a very high level of critical thinking. This suggests that these engaging, interactive methods effectively promote deeper understanding and analytical skills among learners [23]. The role-playing learning model has been proven to influence students' critical thinking. Despite the low N-Gain, students' post-test scores notably increased by 8.03 points, indicating some improvement in their understanding and performance. This suggests that, although overall progress was modest, individual gains still reflected positive learning outcomes.

The role-playing learning model for the circulatory system encourages students to understand the function and interrelationships of each component through role-playing simulations. This activity makes learning more interactive, fosters critical thinking, and strengthens conceptual understanding through post-activity discussions and reflection. These findings are supported by the research of Zahra et al. [26]. Engaging in role-playing activities within Pancasila and Citizenship Education significantly boosts students' critical thinking skills. As students actively participate, their scores improve from 49 to 63, reflecting enhanced learning outcomes. This interactive approach fosters deeper understanding, encouraging learners to analyze, evaluate, and apply principles of citizenship effectively. In addition, the study of Desi et al. [27] concluded that the experimental use of role-playing models significantly improved the critical thinking skills

of eleventh-grade students in economics lessons at SMAN 8 Padang. Thus, the results of this study confirm that role-playing models are effective in improving students' critical thinking skills in elementary schools.

Role-playing has the advantage of creating lively and meaningful learning because it directly engages students in situations that mimic real-life situations. This engagement can foster motivation and increase active participation during the learning process. However, its success is greatly influenced by the teacher's readiness to design scenarios, manage the activity, and ensure all students participate actively. Therefore, implementing role-playing requires careful planning to optimally achieve learning objectives, particularly the improvement of critical thinking skills.

4. CONCLUSION

This research confirms that the role-playing learning model serves as an effective teaching strategy to enhance the critical thinking abilities of fifth-grade students. In addition to boosting academic performance, role-playing also fosters an active and engaging classroom environment that motivates students to analyze, evaluate, and reflect more thoroughly on scientific concepts.

The results indicate that educators can implement role-playing as an alternative learning approach to nurture higher-order thinking skills, particularly in science education. Nevertheless, this study has limitations, as it was restricted to a small sample within one elementary school and focused exclusively on the circulatory system topic.

Future research is recommended to investigate the impact of role-playing on broader and more diverse populations, across different grade levels, and in a variety of subject areas. Such studies would provide stronger evidence for its wider application. The significance of this study lies in presenting a pedagogical alternative that not only develops students' critical thinking skills but also promotes more meaningful and enjoyable learning experiences, ultimately contributing to the improvement of educational quality for the wider community.

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