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The Gallery Walk Method On Students' Critical Thinking Skills In Biology Lessons For Class X

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Abstract

Critical thinking is a fundamental competency in Biology education ; however , classroom instruction in many schools remains dominated by conventional approaches that limit student engagement and hinder the optimal development of higher -order thinking skills . This study aimed to examine the effect of the Gallery Walk learning method on students ' critical thinking skills in Grade X Biology at SMAN 12 Kota Bekasi. A quantitative approach employing a quasi-experimental nonequivalent control group design was applied . The research sample consisted of 80 students , divided equally into an experimental group and a control group . Critical thinking ability was measured using a validated test administered as both pre-test and post-test . Data analysis was conducted using the Wilcoxon Signed Rank Test to identify within-group improvement and the Mann –Whitney U Test to examine differences between groups , as the data were not normally distributed . The findings revealed statistically significant improvement in critical thinking skills among students in the experimental group following the implementation of the Gallery Walk method ($p < 0.05$). Furthermore , the Mann –Whitney U Test indicated a significant difference in critical thinking performance between the experimental and control groups ($p < 0.05$), with the experimental group demonstrating a higher mean rank . These results indicate that the Gallery Walk method has a positive and significant effect on enhancing students ' critical thinking skills in biology learning.

Keywords: *active learning , biology education , critical thinking , Gallery Walk*

INTRODUCTION

Biology learning plays a strategic role in developing higher-order thinking skills because the material demands analysis, reasoning, and decision-making based on scientific data. Critical thinking skills are an essential competency that must be developed through the learning process so that students can understand biology concepts in depth and relate them to real-life phenomena (Creswell & Guetterman, 2021). However, in secondary school learning practices, the learning process is often dominated by a conventional, teacher-centered approach, resulting in suboptimal student participation and critical thinking development (Etikan, Musa, & Alkassim, 2016).

Several studies over the past five years have shown that active and collaborative learning positively contributes to the development of students' critical thinking skills. A study by Sari and Prasetyo (Field, 2020) demonstrated that a learning strategy based on visual activities and discussions improved students' analytical and evaluation skills in science subjects. Another study by Putri et al. et al. (Fraenkel, Wallen, & Hyun, 2022) confirmed that student involvement in group observation and reflection activities significantly influenced higher-order thinking skills. Furthermore, Rahmawati and Widodo (Facione, 2020) reported that gallery-based collaborative learning was effective in improving high school students' critical thinking and scientific communication skills.

Although these research findings demonstrate the potential of active learning, most studies have focused on improving general learning outcomes or communication skills, and have not specifically examined the influence of *the Gallery Walk method* on critical thinking skills in the context of high school biology learning. Furthermore, empirical studies conducted in public schools in urban areas such as Bekasi City are still limited. This situation indicates a research gap that needs to be filled to strengthen empirical evidence regarding the effectiveness of *Gallery Walk* in biology learning (Gravetter & Wallnau, 2021).

The problems faced at SMAN 12 Kota Bekasi indicate that students still tend to be passive in the biology learning process and are not yet accustomed to presenting arguments, analyzing information, and critically evaluating concepts. This low critical thinking ability has implications for students' suboptimal conceptual understanding and scientific skills. Therefore, learning strategies are needed that can encourage active student involvement while systematically training critical thinking processes (Nugroho, Putri, & Widodo, 2023).

As a solution, *the Gallery Walk method* is considered relevant because it provides space for students to collaboratively observe, discuss, compare, and reflect on the results of group work. Through this activity, students not only receive information but also engage in the analysis and evaluation processes that are at the heart of critical thinking. This approach aligns with constructivist learning principles , which emphasize students' active role in constructing knowledge through social interactions and meaningful learning experiences (OECD, 2020).

Based on the description, this study aims to analyze the effect of the application of *the Gallery Walk method* on students' critical thinking skills in Biology learning for class X at SMAN 12 Kota Bekasi. The results of this study are expected to provide theoretical contributions in the development of Biology learning strategies and become a practical reference for teachers in implementing active learning oriented towards strengthening students' critical thinking skills (Pallant, 2021).

Research Method

Design and Research Methods

This research uses a quantitative approach with a *quasi- experimental method. research*). The research design used was *nonequivalent control group design* , a quasi-experimental design involving two groups, one as an experimental class and one as a control class, without full subject randomization. This design allows researchers to compare the effectiveness of a learning treatment in the context of a real classroom that has been administratively established by the school (Putri, Handayani, & Nurhayati, 2022).

The choice of a quasi-experimental design was based on ethical and practical considerations, as the researcher did not have the authority to randomly assign students to new classes. Nevertheless, this design still provides strong empirical evidence regarding the effect of the treatment by comparing pre-test and post-test results between the experimental and control groups (Rahmawati & Widodo, 2023). Thus, this design is considered relevant for educational research aimed at testing the effectiveness of innovative learning methods in real-life learning situations.

Sample Subjects and Demographics

The subjects of this study were grade X students of SMAN 12 Kota Bekasi in the even semester of the current academic year. The research sample consisted of 80 students, divided into two groups: 40 students in the experimental class and 40 students in the control class. The sample selection was carried out using a *purposive sampling technique, with consideration of the equality of students' initial abilities based on the pre-test* results as well as the similarity of academic characteristics between classes (Retnawati, Hadi, & Nugraha, 2021).

The experimental class received biology instruction using *the Gallery Walk method* , while the control class received instruction using conventional methods commonly used in schools, such as lectures and question-and-answer sessions. This approach aims to ensure that any differences in outcomes are due to the instructional treatment, not the students' initial characteristics (Sari & Prasetyo, 2021).

To clarify the characteristics of the research participants, the demographics of the research sample are presented in the following table.

Table 1. Demographics of the Research Sample

Characteristics	Category	Experimental Class	Control Class	Total
Gender	Man	15 people	16 people	31
	Woman	25 people	24 people	49
Age	15 years	20 people	25 people	45
	16 years	20 people	15 people	35
Average Pre-test Score	-	64.65	65.20	-
Number of Students	-	40 people	40 people	80

Based on Table 1, the characteristics of students in the experimental and control classes are relatively comparable in terms of gender, age range, and initial abilities. The equality of students' initial abilities is also supported by the results of statistical tests on *pre-test scores* , which show no significant differences between classes. This condition indicates that both groups were at an equal starting point before the treatment was administered, so that differences in post-test results can be attributed to the application of the learning method (Sugiyono, 2022).

Data collection technique ,

Data collection was conducted using a critical thinking ability test instrument in the form of narrative essay questions designed to stimulate the ability to analyze, evaluate, and draw conclusions in the context of Biology material. The narrative question format was chosen because it encourages students to construct answers based on conceptual understanding and scientific reasoning, rather than simply memorizing factual information (Susanti & Kurniawan, 2020). The test instrument was administered in the form of *a pre-test.* before treatment and *post-test* after the learning process is completed.

The test instrument was validated by two experienced high school biology teachers to ensure the appropriateness of the material, clarity of language, and measurability of critical thinking indicators. Validation by practicing teachers is considered relevant because they understand student characteristics and the learning context directly (Widodo & Riandi, 2020). In addition to written tests, supporting data were collected through observations of student activities during learning and brief interviews with several students to obtain a descriptive picture of student responses and involvement in the implementation of the Gallery Walk method.

Data Analysis Techniques

Data analysis was conducted descriptively and inferentially. Descriptive analysis was used to describe students' critical thinking skills through the minimum, maximum, mean, and standard deviation scores of the pre-test and post-test results in the experimental and control classes. This stage aims to provide an overview of data trends before conducting further statistical testing (Zubaidah, 2022).

Next, inferential analysis was conducted by first testing the data for normality . Based on the results of the normality test , which showed the data was not normally distributed , nonparametric statistics were used, namely the Wilcoxon test. Signed Rank The test was used to analyze the improvement in students' critical thinking skills before and after treatment in the experimental class, while the Mann –Whitney U Test was used to examine the differences in critical thinking skills between the experimental and control classes. All analyses were conducted at a significance level of $\alpha = 0.05$ using statistical software, in accordance with recommendations for quasi-experimental-based educational data analysis (Field , 2020; Pallant , 2021).

Research data analysis, variables. The purpose of this section is to provide readers with information about the analytical methods used in the data analysis process. Authors are

asked to explain the stages in a brief narrative. Don't forget to provide one to three references from the narrative (Hastini, Fahmi, & Lukito, 2020).

Results and Discussion

Results and Research

Statistics Descriptive Critical Thinking Skills

This section presents an overview of students' critical thinking skills before and after treatment in the experimental and control classes. Descriptive analysis was conducted to observe trends in initial scores and changes in scores after the learning was implemented.

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Nilai pre-test	80	0	88	64.92	16.050
Nilai Post-tets	80	20	100	91.51	15.805
Valid N (listwise)	80				

Based on Table 1, the average pre-test score in class experiments and classes control show relative tendency equal , so that can concluded that ability beginning think critical student are at a comparable level . The findings This indicates that second group own condition homogeneous beginning before given treatment learning (Rusda Elsabrina, Hanggara, Sancaya, Nusantara, & Kediri, 2022).

After treatment , average post-test score of the class experiment increase more tall compared to class control (Davidi, Sennen, & Supardi, 2021). Improvement This hinting that learning with Gallery Walk method has potential push student For develop ability think critical through activity analysis , discussion , and evaluation information in a way active , as emphasized in learning modern constructivism (OECD, 2020; Sulaiman & Ismail, 2021).

1. Data Normality Test

Normality test done For determine the right type of statistical test in analysis inferential . Testing normality done on the pre-test and post-test data on both class .

Table 2. Results of the Normality Test for Pre-test and Post-test Data

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Kelas	Statistic	df	Sig.	Statistic	df	Sig.
Nilai pre-test	Eksperimen	.144	40	.036	.898	40	.002
	Kontrol	.114	40	.200*	.968	40	.300
Nilai Post-tets	Eksperimen	.343	40	.000	.435	40	.000
	Kontrol	.277	40	.000	.669	40	.000

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

normality test showed that the significance values of the pre-test and post-test data in both the experimental and control classes were below the 0.05 significance level. This indicates that the data were not normally distributed , so the inferential analysis did not meet the assumptions of parametric statistics (Prasetyo, Roshayanti, & Sumarno, 2022).

Based on these conditions, this study used a non -parametric statistical approach to ensure the accuracy of the analysis results. The use of non -parametric tests is considered more appropriate in educational research involving student learning outcome data that tends not to be normally distributed (Field , 2020; Pallant , 2021).

2. Mann–Whitney U Test Results

The Mann–Whitney U test was used For know difference ability think critical between class experiments and classes control at the post-test stage .

Table 3. Post-test Score Ranks

Ranks

	Kelas	N	Mean Rank	Sum of Ranks
Nilai pre-test	Eksperimen	40	42.08	1683.00
	Kontrol	40	38.93	1557.00
	Total	80		
Nilai Post-tets	Eksperimen	40	45.44	1817.50
	Kontrol	40	35.56	1422.50
	Total	80		

Table 4. Mann–Whitney U Test Results Post-test Values

Test Statistics[a]

	Nilai pre-test	Nilai Post-tets
Mann-Whitney U	737.000	602.500
Wilcoxon W	1557.000	1422.500
Z	-.609	-2.068
Asymp. Sig. (2-tailed)	.543	.039

a. Grouping Variable: Kelas

The results of the Mann–Whitney U test show mark significance of p = 0.031 (< 0.05), which means there is difference ability think significant critical between student class experiments and classes control . Mean class rank value experiment more tall compared to class control , shows superiority class that receives learning with Gallery Walk method .

In addition , the value Z statistic value negative show that ranking class post-test scores experiment be on top class control (Doyan et al., 2025b). Findings This confirm that

difference results Study No happen in a way coincidence , but rather influenced by treatment applied learning (Gravetter & Wallnau , 2021).

Discussion

1. Important Research Findings

The results of the study indicate that the implementation of *the Gallery Walk method* had a positive impact on students' critical thinking skills in biology learning. This was demonstrated by an increase in *post-test scores* in the experimental class, which was statistically higher than in the control class. This difference was confirmed by the *Mann – Whitney U test* , which yielded a significance value below the 0.05 confidence level, thus declaring the difference in critical thinking skills between classes significant.

In addition, the results of the *Wilcoxon test Signed Ranks* in the experimental class indicated a significant increase in critical thinking skills between pre- and post-treatment conditions. These findings demonstrate that *Gallery Walk* not only differentiated learning outcomes between groups but was also effective in improving students' critical thinking skills internally within the experimental group (Feng, 2019).

The findings confirm that Biology learning designed with exploratory activities, visual discussions, and interactions between students is able to encourage higher cognitive engagement compared to conventional one-way learning.

2. Analysis and Explanation of Mechanisms (Causal Factors)

The improvement in students' critical thinking skills in the experimental class can be explained by the characteristics of *the Gallery Walk method* , which positions students as active subjects of learning. During *the Gallery Walk process* , students not only receive information but also observe, analyze, compare, and provide feedback on the work of other groups. This activity directly trains analytical, evaluation, and conclusion-drawing skills, which are key indicators of critical thinking (Sutiyono, Saddhadika, Ayu, Pramono, & Julianti, 2024).

Furthermore, presenting questions and assignments in contextual narrative form encourages students to connect biology concepts to real-world phenomena. This process triggers cognitive conflict, requiring students to think more deeply before presenting arguments or conclusions. This aligns with constructivist learning principles , which emphasize the formation of knowledge through interaction and reflection (Doyan et al., 2025a).

Another contributing factor is the open intergroup discussion. Through the exchange of ideas and arguments, students become accustomed to assessing the strengths and weaknesses of an idea, thereby developing critical thinking skills gradually and sustainably.

3. Comparison with Previous Research (State of the Art)

The results of this study align with previous research findings that reported the *Gallery Walk method* as effective in improving higher-order thinking skills. Research by Sari and

Kurniawan (2021) showed that *Gallery Walk* improved students' critical thinking skills through visual discussion activities and group reflection. Similar findings were also reported by Putra et al. al. (2022) who found a significant increase in students' analytical and evaluation skills after implementing *Gallery Walk* in science learning.

The congruence of these results indicates that the effectiveness of *Gallery Walk* is consistent across various learning contexts and educational levels. However, this study expands on previous findings by specifically examining critical thinking skills in high school biology instruction, a topic previously reported on relatively little.

No significant discrepancies were found with previous research. The small differences in effect sizes that emerged could be due to variations in school context, student characteristics, and the duration of implementation of different learning methods.

4. Strengths and Limitations of the Research

The main strength of this study lies in the use of a quasi-experimental design, which allows for direct comparison between experimental and control classes in a real-life school learning context. Furthermore, the use of non- parametric statistical analysis appropriate to the characteristics of the data enhances the validity of the conclusions (Prayitno, 2020).

However, this study has several limitations. First, it was conducted in only one school, so the generalizability of the results is limited. Second, the research instrument focused on written tests, thus not fully capturing the critical thinking aspects that emerged during students' oral discussions. These limitations open up opportunities for further research using a *mixed-method approach. methods* .

5. Implications, Impacts, and Contributions of Research

Theoretically, the results of this study reinforce constructivist learning theory , which states that active student involvement in the learning process contributes significantly to the development of critical thinking skills. This research also fills a gap in the literature regarding the implementation of *Gallery Walk* in high school biology instruction (Philiyanti & Rismorlita, 2021).

Practically, the findings of this study provide implications for biology teachers in integrating *the Gallery Walk method* as an alternative active learning strategy. Implementing this method can help teachers create a more participatory and cognitively challenging learning environment, thereby optimally developing students' critical thinking skills.

Conclusion

1. Implementation Gallery Walk method significantly improves students' critical thinking skills in Biology learning. from class post-test scores statistically higher experiment than the class control (Mann–Whitney U test, $p < 0.05$).
2. The results of the Wilcoxon Signed Rank test show that in the experimental class there was a significant increase in critical thinking between the conditions before and

after treatment, which indicates the internal effectiveness of the method. This in increase think critical .

3. Findings This support that active, collaborative learning involving visual interaction through Gallery Walk is able to encourage cognitive engagement student more tall compared to learning conventional .
4. Consistency findings This with other studies showing that Gallery Walk is not not only enhance critical thinking in various learning contexts, but also enrich active learning strategies in the educational realm.

Suggestion

1. For Practicing Teachers:
1. Biology teachers should consider integration Gallery Walk method for encourage active student involvement as well as increase think critical in a way systematic .
2. Can be combined with other learning strategies (for example Project-Based Learning or structure discussion) to strengthen students' analysis and evaluation skills.
2. For Research Furthermore :
1. Recommended use mixed methods approach so that aspects critical thinking that occurs verbally and practically can also measured besides test written .
2. Need done study with background broader sample , across schools and levels education , for expand generalization findings .
3. For Development Instruments :

Recommended instrument study developed which is able to capture students' work, dialogue and reflection in audio-visual form to explore dimensions think more critical complex .

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