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The Effect of Wordwall Media on Improving Critical Thinking Skills of Grade IV Students in Science IPAS Learning at SDN Inpres Kombo

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A B S T R A C T

This study aims to determine the effect of Wordwall media on improving the critical thinking skills of fourth-grade students in Integrated Science and Social Studies (IPAS) at SDN Inpres Kombo. The background of this study is the low critical thinking ability of students, indicated by difficulties in analyzing problems, formulating solutions, and providing logical reasons. This condition is worsened by the predominantly conventional teaching methods, which results in low student engagement during the learning process. This study employed a quasi-experimental method with a one-group pretest-posttest design. The sample consisted of 18 students, including 10 females and 8 males, selected through saturated sampling. The instrument used was a 10-item multiple-choice test based on Ennis's critical thinking indicators: basic clarification, decision-making fundamentals, inference, advanced clarification, and strategy/tactics. Data analysis involved descriptive and inferential statistics (paired sample t-test). The results showed a significant increase in the students' average scores from the pretest to the posttest. The t-test significance value of 0.000 < 0.05 indicates that Wordwall media has a significant effect on improving students' critical thinking skills and can be an effective, interactive, and enjoyable learning innovation in elementary schools.

1. Introduction

The 21st century is characterized by rapid technological developments and a global knowledge-based economy that demands advanced thinking skills from students. Among these skills, critical thinking is considered one of the most essential competencies. Critical thinking enables learners to engage in reasoned analysis, make informed judgments, solve complex problems, and reflect deeply on the validity of information (Ennis, 2017). In educational contexts, especially at the elementary level, cultivating critical thinking is crucial to laying the foundation for lifelong learning and informed citizenship.

Despite its importance, observations in elementary schools across Indonesia indicate that critical thinking remains underdeveloped in many students. Specifically, at SDN Inpres Kombo, fourth-grade students struggled to justify their answers, present arguments, or logically evaluate solutions during Integrated Social and Natural Sciences (IPAS) lessons. This reflects a broader problem in Indonesian elementary education, where rote learning and textbook-based learning often prioritize reflective, inquiry-based practice. As a result, students tend to focus on memorizing facts rather than developing higher-order thinking skills.

Recent studies emphasize the need for innovative teaching strategies and tools that can foster critical engagement. One promising strategy is the integration of digital educational media that supports interactive learning. Wordwall, a web-based platform that allows teachers to design interactive quizzes, games, and activities, has become a popular educational tool in many schools.class (Aprilia, Tryanasari, & Kartikasari, 2024; Layyina, Nursyahadiyah, & Listyarini, 2023). The format encourages participation, provides immediate feedback, and creates a game-like environment that increases students' motivation and cognitive engagement (Hafidzah, 2023; Kusuma, 2019).

Several researchers have examined the potential of Wordwalls in improving student learning outcomes,Quantitative research on elementary school students shows that the use of Wordwall media significantly improves science learning outcomes,motivation, and creating an interactive and enjoyable learning atmosphere (Lestari & Rohmani, 2024).According to Lai'Mandi et al. (2023) foundWordwall-based learning significantly improves students' critical thinking and problem-solving skills in science classes. Similarly, Sari (2020) stated that effectively implemented digital media can improve students' analytical and conclusion-drawing skills in mathematics learning. However, most studies focus on junior high/high school students or specific subjects, resulting in a lack of research on the impact of Wordwalls on science learning in elementary schools, particularly in rural schools like SDN Inpres Kombo.

In addition to the lack of subject-specific evidence, few studies have used quantitative experimental designs to measure the statistical impact of Wordwalls on critical thinking using a validated framework. One widely accepted model for evaluating critical thinking skills is the framework proposed by Ennis (2017), which groups thinking skills into five main components: basic clarification, decision-making, inference, further clarification, and strategies and tactics. This framework has been used in various studies, including by Muzaini, Noptario, and Arifin (2023), as a strong theoretical foundation for assessing the development of students' critical reasoning skills in educational settings.

Therefore, this study was designed to address this gap by investigating the effect of Wordwall media on the critical thinking skills of fourth-grade students in science learning at SDN Inpres Kombo. This study used a pre-experimental design with a single-group pretest-posttest approach, which measured students' abilities before and after the use of Wordwall-based learning. The results of this study are expected to provide evidence of the effectiveness of digital learning media in supporting

critical thinking in elementary education and provide practical insights for teachers and policymakers who want to integrate 21st-century learning tools into the curriculum. The purpose of this study was to determine whether the use of Wordwall media can significantly improve the critical thinking skills of fourth grade students in science learning at SDN Inpres Kombo.

2. Methodology

This study employed a quantitative research design. According to Kuncoro (2021), quantitative data refers to data that can be directly measured or calculated and expressed in numerical or statistical form. The research approach used in this study was a pre-experimental method with a One-Group Pretest-Posttest Design model. According to Sugiyono (2019), this design involves a predetermined group of subjects, who are then tested twice—once before treatment (pretest) and once after treatment (posttest). The One-Group Pretest-Posttest design is illustrated in Table 1 below.

Table 1. One Group Pretest Posttest Design

Pretest	***Treatment***	***Posttest***
O1	X	O2

Source: Sugiyono (2019)

Information:

- O_1= Initial test (pretest) which is carried out before treatment is carried out
- X= Maintenance in the form of using Wordwall media
- O_2= Final test (posttest) which is carried out after the treatment is carried out

According to Nazir (in Rahmah, 2017), a population is a group of individuals with certain characteristics and qualities determined by the researcher. Usman and Akbar (in Rahmah, 2017) define a sample as a portion of a population selected using a specific sampling technique. Arikunto (2017) states that if the research subjects are less than 100 people, all members of the population can be used as research samples. Because the total population in this study was less than 100 students, the researcher used the entire population, consisting of 18 fourth-grade students at SDN Inpres Kombo. Therefore, this study used a saturated sampling technique (Amin, 2023).

Data Collection Techniques and Procedures

Data were collected through a critical thinking skills test developed based on Ennis' critical thinking indicators, which include the ability to provide simple explanations, build basic skills, draw conclusions, provide further explanations, and develop strategies and techniques. This test consists of 10 multiple-choice questions based on the science learning material with the theme "Living Things and Their Environment." This test was administered twice, namely before (pretest) and after (posttest) the implementation of the Wordwall media. The test was conducted under

close supervision and with clear instructions. Assessment was carried out using answer keys and assessment guidelines that have been validated by experts.

Data Collection Instruments

The main instrument used in this study was a critical thinking skills test developed in the form of multiple-choice questions. This test aims to measure the effectiveness of Wordwall media in improving students' critical thinking skills in the context of Integrated Science and Social Sciences (IPAS) learning for fourth-grade elementary school students. This instrument consists of 15 questions arranged systematically based on Ennis's critical thinking indicators, which include: (1) providing simple explanations, (2) building basic skills, (3) drawing conclusions, (4) providing further explanations, and (5) formulating strategies and techniques.

The questions are designed in accordance with the Natural Sciences subject matter with the theme "Living Things and Their Environment." Each question is contextualized to align with students' life experiences, encouraging them to analyze information, develop arguments, make logical inferences, and critically evaluate situations. The questions are arranged based on the Revised Bloom's Taxonomy, with a focus on higher-order thinking skills at the cognitive levels C4 (analyzing), C5 (evaluating), and C6 (creating).

Prior to implementation, the test underwent a validation process involving subject matter experts and primary education assessment specialists. This process ensured content validity, alignment with learning objectives, and item clarity. Additionally, a small-scale pilot test was conducted to examine item quality, including difficulty and discriminatory power. Using this validated test instrument, this study was able to accurately assess students' critical thinking development before and after the implementation of the Wordwall media in the classroom.

Data Analysis Techniques

The data in this study were analyzed quantitatively using descriptive and inferential statistical approaches (Sugiyono, 2019). Descriptive statistics were used to describe the characteristics of the data by calculating the mean, median, standard deviation, and distribution of pretest and posttest scores. This step aims to provide an initial overview of students' critical thinking skills before and after the implementation of Wordwall media in science learning. Before continuing with the inferential analysis, a normality test was conducted using the Shapiro-Wilk method. This test was necessary because the sample size was relatively small (less than 30 respondents (Ghasemi & Zahediasl, 2012). This test ensures that the data follows a normal distribution and meets the assumptions for parametric testing.

After normality was confirmed, a paired-sample t-test was applied to determine whether there was a statistically significant difference between students' pretest and posttest results. This test was used to evaluate the effectiveness of the Wordwall media in improving students' critical thinking skills. All data processing was performed using statistical software such as Jamovi and SPSS to ensure accuracy

and reliability (Pallant, 2020). In addition to quantitative data, the researcher also documented the learning process and student discussions to provide supporting evidence and enrich the interpretation of the results from a qualitative perspective.

3. Results and Discussion

This study involved a total of 18 fourth-grade students of SDN Inpres Kombo as the research sample, consisting of 8 boys and 10 girls (Arikunto, 2017). The learning process in the experimental class used Wordwall media to increase active student engagement in class, while also stimulating them to express logical reasons to develop critical thinking skills (Kusuma, 2019; Hafidzah, 2023). Before the study was conducted, learning in this class tended to use conventional methods, where the teacher delivered the material directly through lectures and students took notes on important information (Sanjaya, 2016). Although this method was able to convey the material, active student involvement in the learning process was still limited. Students with high learning motivation usually participated actively, while other students tended to be passive.(Uno, 2016).Therefore, innovation in learning media is needed that can increase student participation and involvement (Arsyad, 2020).

In this research, teachers implemented interactive learning media, Wordwall, to replace most conventional methods. This media was used at each meeting to deliver material, review concepts, and provide practice questions designed according to critical thinking skills indicators according to Ennis (2017). Students were given the opportunity to actively participate by answering questions, completing challenges, and competing in educational games. This activity created a more enjoyable and competitive learning atmosphere and encouraged students to think more deeply. With game features such as quizzes and matching games, students could learn while playing, significantly increasing their motivation and engagement compared to previous learning methods. Technology-based interactive learning media can increase student engagement and facilitate the development of critical thinking skills (Katili, 2022).

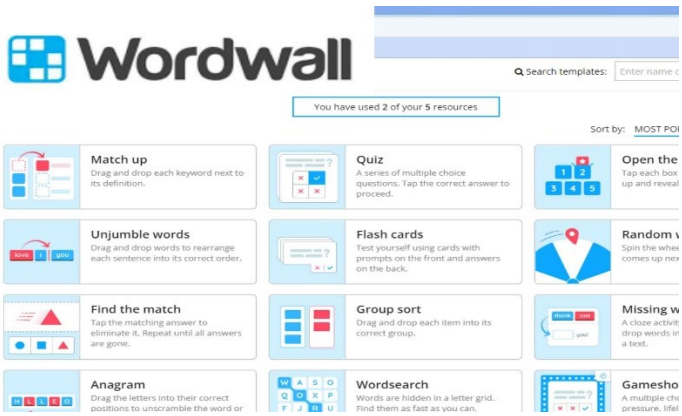

Figure 1. Wordwall Media Display

Comparison of the average pretest and posttest scores of 18 fourth grade students of SDN Inpres Kombo in the subject of Natural Sciences after the application of Wordwall media

The chart shows a significant increase in the average posttest score compared to the pretest, which indicates the effectiveness of using Wordwall media in improving students' critical thinking skills.

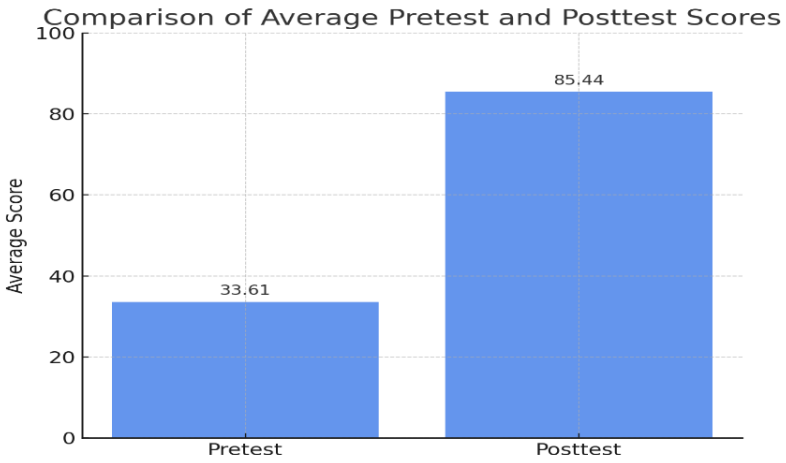

Figure 2. Comparison of Average Pretest and Posttest Scores

1. Pre-Test ScoreThe average pretest score of 33.61 points reflects students' initial level of critical thinking skills before the Wordwall medium was introduced in class. This indicates that most students still have a basic understanding of analyzing and drawing conclusions from science material.
2. Post-Test ScoreAfter implementing Wordwall-based learning, the average posttest score increased significantly to 85.44 points. These results indicate a significant improvement in students' critical thinking skills after using Wordwall's interactive and game-based features.
3. Score ImprovementThe 51.83 points obtained demonstrate the Wordwall's high effectiveness in improving students' analytical thinking skills. This medium facilitates students in identifying main ideas, constructing logical arguments, and drawing relevant conclusions based on the information provided—especially in topics that connect humans with their environment, as explored in science learning.

Based on the results of the paired sample t-test between pretest and posttest scores, the mean difference was recorded at -51.833, indicating an increase of 51.833 points from pretest to posttest. The calculated t-value was -15.567 with 17 degrees of freedom (df), and the significance value (Sig. 2-tailed) was 0.000, far below the 0.05 significance level. These results indicate that the difference between pretest and posttest scores is highly statistically significant, indicating that the treatment or intervention provided has a clear and measurable impact on improving students' academic achievement.

The results of the study showed a significant difference between pretest and posttest scores. Therefore, the alternative hypothesis was accepted, indicating that the use of Wordwall media had a significant impact on improving students' critical thinking skills (Layyina, Nursyahadiyah, & Listyarini, 2023). Further analysis was conducted by observing the increase in students' average scores in each critical thinking indicator. The pretest and posttest scores for these indicators were previously presented in a bar chart. The average pretest score was 33.61, which increased to 85.44 in the posttest. This indicates that after the implementation of Wordwall, students became better able to identify key information, construct logical arguments, and draw conclusions based on the material provided. The complete statistical test results are presented in Table 2 below:

Table 2. Paired Sample T-Test Results Between Pre-test and Post-test Scores

Means	33.61	85.44
Difference	155.36	61.43
Observation	18	18
Pearson Correlation	0.913	
Mean Difference Hypothesis	0	
Df	17	
t Stat	-18,425	
P(T<=t) one tail	1.23E-11	
t One-tailed critical	1.7396	
P(T<=t) two tails	2.47E-11	
t Two-tailed critical	2.1098	

The reliability of the research instrument was tested using the Cronbach's Alpha formula with the help of SPSS version 27. This reliability test aims to ensure the internal consistency of the measuring instrument used, so that the measurement results are reliable and stable when applied to different subjects. Furthermore, the results of the descriptive analysis of students' critical thinking test scores are presented in the form of mean values, standard deviations, and minimum and maximum values. These descriptive statistics provide a comprehensive overview of the distribution of the data as it is, without making broader generalizations to the population. According to Yunita (2021), descriptive data presentation is an important initial step in understanding the characteristics of learning outcomes before conducting further analysis.

To assess changes or improvements in students' critical thinking skills after being exposed to the Wordwall learning method, an N-Gain analysis was conducted. The N-Gain value is calculated to measure the magnitude of improvement from each participant's pretest to posttest score. Through this calculation, the effectiveness of the learning method can be quantitatively evaluated. Katili (2022) emphasized that the N-Gain value is a commonly used measure to determine the success of an intervention or educational approach in significantly improving student abilities.

Before conducting a hypothesis test to determine whether there is a significant difference between the pretest and posttest scores, the normality of the data was first tested using the Shapiro-Wilk test. If the data is normally distributed, the analysis is continued with a Paired Sample T-Test operated in SPSS 27. This test

aims to compare the average of two related samples, namely the scores before and after treatment, at a significance level of $\alpha = 0.05$. Thus, the results of this test can provide a conclusion whether the Wordwall-based learning method has a significant influence on students' critical thinking skills.

Discussion

The results of this study indicate that the application of Wordwall media in science learning can significantly improve students' critical thinking skills. This is evident from the significant increase in students' posttest scores after the media application, compared to their pretest scores. The results of the paired sample t-test showed a p-value below 0.05, confirming that the observed improvement is statistically significant and not due to chance. Wordwall provides educational games and quizzes that challenge students to analyze information, solve problems, and critically evaluate answers. Furthermore, the instant feedback feature allows students to immediately identify and correct their errors, which helps strengthen understanding and supports the development of logical reasoning (Hafidzah, 2023).

These results align with research by Ragil Nur Laila et al. (2023) which showed that the use of Wordwalls improves elementary school students' critical thinking skills. In their study, learning mastery increased from 24% to 86%, indicating that Wordwalls can help students think more deeply and critically. This research is also theoretically supported by Ennis (2017), who stated that critical thinking includes indicators such as providing simple explanations, building basic skills, summarizing, providing further explanations, and organizing strategies and techniques. During the learning process, students begin to demonstrate the ability to explain logical reasoning, draw conclusions, and solve problems critically.

4. Conclusion

This study concluded that the use of Wordwall media in science learning for fourth-grade students of SDN Inpres Kombo was effective in improving students' critical thinking skills. The learning process became more interactive, engaging, and provided opportunities for students to actively participate in problem-solving activities. The game format of Wordwall encouraged students to analyze questions, connect concepts, and draw logical conclusions with greater confidence. Students also showed higher motivation to engage in discussions and express opinions, with significant improvements in critical thinking skill indicators, including providing simple explanations, building basic skills, summarizing, providing further explanations, and implementing strategies effectively.

The success of this implementation is supported by the suitability of the Wordwall features to the learning objectives, as well as the ease of integration of this media into classroom activities. The teacher's role in guiding the learning process is also very influential in maintaining student focus and encouraging active participation. Although this study successfully achieved its goal of improving critical thinking skills, it was conducted on a limited scale in one class. Therefore, wider

implementation and further research are recommended to ensure the consistency of the results across different contexts. Overall, the Wordwall proves to be a promising and practical tool for fostering critical thinking skills in science learning in elementary schools.

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