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Research Article

The Influence of Chromebooks on Students' Critical Reasoning Skills in Science Learning in Elementary Schools

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ABSTRACT

In this study, the problems found were the less-than-optimal use of technology-based media in schools, the low critical reasoning ability of students in science learning, and whether this Chrome book can improve students' critical reasoning. This study discusses how the influence of Chrome book media on students' essential abilities of reasoning in science learning. This study uses a quantitative approach with a pre-experimental design of the one-group pretest-posttest design. This study aims to test the effect of using Chromebook media on students' critical reasoning abilities in Elementary Schools. This study focuses on science learning with the material Energy Changes. The population in this study were all fourth-grade students of SD Negeri Kalianget Barat III in the 2024 academic year, as many as ten people. The design taken from this study is a group pretest-posttest design. Based on the calculation of the t-test, tcount = 13.4715 and ttable = 2.262157 were obtained. Thus, count> ttable, then the hypothesis proposed is H1 = "There is an influence of the use of chrome books on students' critical reasoning abilities in science learning." The hypothesis is accepted.

Keywords: Chromebooks; Critical Reasoning Ability; Science Learning

1. INTRODUCTION

Critical reasoning ability is one of the essential skills that students must have, especially in the ever-evolving digital era. Critical reasoning allows students to analyze information objectively, consider multiple perspectives, and solve problems with a logical and structured approach. It is a thinking process that involves careful assessment of available information, arguments, and evidence. This includes the ability to identify weaknesses and strengths in arguments and ask relevant questions. In the context of learning, this critical reasoning ability plays a vital role in helping students understand more complex concepts and increasing their involvement in the learning process. The use of interactive media in learning has also proven effective in strengthening the critical reasoning dimension (Purwanti, Y.D., Suneki, S., Mulyadi, M.S., & Maryanto, 2024). The increasingly developing technology makes teachers increasingly required to be able to utilize it in learning. One of the devices that is now increasingly popular is the Chromebook. The Chrome book itself is a development of the PC and Laptop, which is designed to facilitate learning (Fatikhah, M. H., & Samsiyah, 2023). Chromebooks, as technology-based learning tools, offer a variety of applications and platforms that can support student interaction with subject matter more interactively and interestingly. The use of Chromebooks in elementary school learning is expected to help students not only gain knowledge but also improve their critical thinking skills.

Learning Natural and Social Sciences (IPAS) in elementary school is one of the subjects that requires students' critical thinking skills. In IPAS learning, students are not only required to memorize facts but also to be able to interpret natural and social phenomena that occur around them. Natural Sciences is learning that emphasizes how we understand events in nature (Hayati, N., & Setiawan, 2022). Therefore, it is essential to know that using technological aids, such as Chromebooks, can be an effective medium to stimulate students' critical reasoning skills.

Previous research only examined the proper learning methods for improving learning media, whereas this study only focuses on project-based learning (Kaharudin et al., 2023). However, other studies have shown that improving critical reasoning skills can also use media such as interactive videos (Suminar, 2022). There is also research that shows that print media is also effective in improving students' critical reasoning skills (Mariatul Kibtiyah, 2022). Due to these problems, further research is needed on appropriate, complex, and efficient media to improve essential reasoning skills. Therefore, researchers have provided a solution for selecting complex technology-based media such as Chromebooks. However,

although technology has great potential to improve critical thinking skills, its implementation in elementary schools still requires further evaluation. Some essential questions that arise are: How does the use of Chromebooks affect students' critical reasoning skills? Is there a significant difference in improving students' critical thinking skills using Chromebooks compared to conventional learning methods?. This study aims to examine the effect of using Chromebooks on students' critical reasoning skills in science learning in elementary schools. It hopes to provide insight into how these digital devices can be optimally utilized to improve the quality of education in elementary schools, especially in terms of developing students' critical thinking skills.

2. RESEARCH METHOD

This study uses a quantitative approach with a pre-experimental design of the one-group pretest-posttest design (Arikunto, 2010). This study aims to test the effect of the use of Chromebook media on students' critical reasoning skills in Elementary Schools. The population in this study were all fourth-grade students of SD Negeri Kalianget Barat III in the 2024 academic year. The design taken from this study is a one-group pretest-posttest design, where before the treatment is given, an initial test (pretest) is provided, and after the treatment, another test is offered as a final test (posttest). The research design can be described in the **Table 1**.

Table 1. One Group Pretest Posttest Design

Pre-Test	Treatment	Post-Test
O_1	X	O_2

X: Giving treatment using Chromebook media
01: Initial test before treatment
02: Final test after treatment

The sample in this study was taken using a purposive sampling technique. The sample selected was fourth-grade students who had sufficient basic computer skills to use Chromebook media in the learning process. The sample involved in this study was ten students. There were five essay questions arranged based on critical reasoning indicators, namely: 1. Information identification is an indicator reflected in questions 1 and 2, where students are asked to recognize, select, and extract relevant information from the text. Both questions are designed to test students' ability to assess and choose the most pertinent information, which is an essential skill in critical thinking. 2. In conclusion, this indicator is found in questions 3 and 4, where it is used to measure their critical thinking skills in constructing the proper understanding or decision from the information that has been analyzed. 3. Evaluation of evidence and reasons, found in question 5, where students are asked to assess the validity and relevance of the evidence or reasons given in supporting an argument.

This study has three stages of procedures that need to be carried out. (1) Preparation stage, at this stage, the researcher prepares learning devices and research instruments in the form of questions that have undergone validity and reliability tests using the Microsoft Excel application as a calculation tool; (2) implementation stage, at this stage learning is carried out in class by providing special treatment using Chromebooks for grade IV students at SD N Kalianget Barat III, (3) final stage, at this stage the researcher carries out calculations using all the data collected by conducting normality tests, homogeneity tests and T-tests. The application used is Microsoft Excel. This test is designed to test the differences between two sets of paired data, such as before and after treatment on the same subject (Arikunto, 2010).

3. RESULTS AND DISCUSSION

Validity and reliability tests can be used in research to test instruments used to measure students' critical reasoning skills (for example, tests or questionnaires). Both of these tests are important to ensure that the instruments used in the research actually measure what is intended (validity) and can produce consistent results (reliability).

Validity Test

Based on the results of the trial conducted on ten respondents from class IV SDN Kalianget Barat 3, with a total of 5 essay questions, it can be concluded that the questions tested were declared valid. This shows that the instruments used in this study have met the validity criteria and can be considered for use in broader measurements. The rtable is 0.6319. Five items were used for the analysis based on the results of the validity test.

Reliability Test

For the research test, the Chroncbach alpha formula is used (Alwi, 2015) as follows:

$$r = \frac{k}{(k-1)}\left(1 - \frac{\sum \sigma b^2}{\sigma t^2}\right)$$

Based on the analysis's results, the reliability value of 0.78 indicates that the instrument or measuring instrument used in the study has a fairly good or reliable level of consistency.

Data Analysis

This study collected data from the pretest and posttest. In addition, inferential analysis was applied to test the hypothesis and see if there was a significant difference before and after treatment. The results of this analysis are expected to provide a deeper understanding of the effect of the use of learning media on improving students' critical thinking skills in science learning.

Normality Test

In this study, a normality test was carried out to determine whether the data was normally distributed. This test aims to ensure that the data used in the study meets the criteria for normal distribution so that the results of the analysis carried out can be considered valid and reliable. The normality test carried out in this study was the Kolmograph-Sminorf normality test with the provision that the data is declared generally distributed if the calculated D value is greater than the D table with a significance value of 0.05% or it can be said that the data is usually distributed. Based on the results of the normality analysis, the calculated D value was obtained as 0.241, which is smaller than the D table value of 0.409. This indicates that the analyzed data is usually distributed.

Homogeneity Test

In this study, the homogeneity test was conducted to test whether the variance between groups in the analyzed data has similarities or, in other words, whether the data is homogeneous. The homogeneity test aims to ensure that the variance between groups is not significantly different, which is an essential aspect in several statistical tests. The results of the homogeneity test show an F count value of 0.197938, which is smaller than the F table value of 0.314575. Where the data is said to be homogeneous when the F count is less than the F table, this indicates that the variance between groups in the analyzed data is not significantly different, so it can be concluded that the data is homogeneous. Thus, the homogeneity of variance is met, and the use of parametric statistical tests can be continued with the confidence that the results are valid and interpretable. The results of the study on students' critical reasoning abilities were obtained through tests. Where students were given pretests and posttests that were in accordance with the essential indicators of reasoning. The following are the results of the study related to students' critical reasoning abilities after being given Chromebook learning media treatment, as shown in **Figure 1**.

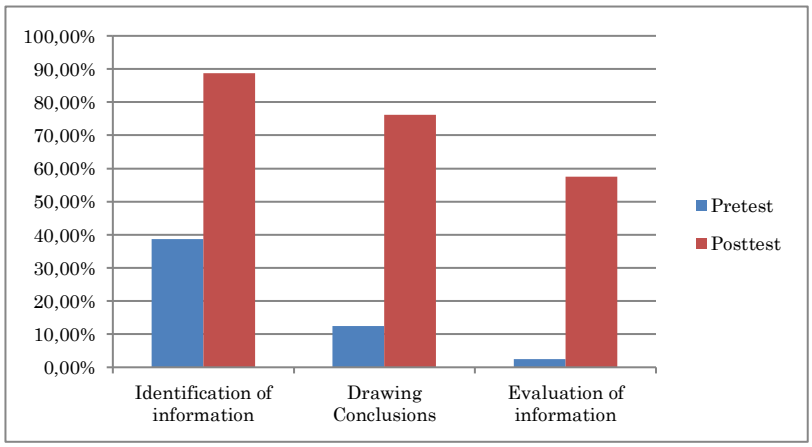

Figure 1. Results of Pretest Posttest Critical Reasoning Ability

The **Figure 1**, shows that there is a significant increase in each critical reasoning indicator measured. It shows that students are starting to be more critical in assessing the credibility and relevance of the information obtained. Students' ability to identify information initially reached 38.75%, while in the second period, this ability increased to 88.75%. This shows a significant increase in students' ability to recognize and extract relevant information from various sources, which is an essential basis for critical thinking. In the conclusion-drawing indicator, students' ability to conclude was initially only 12.50%, but after being given treatment, there was an increase to 76.25%. This increase shows that students are increasingly able to process existing information to draw logical conclusions based on relevant evidence. Information

evaluation shows an increase from 2.50% in the first period to 57.50% in the second period. Although still lower than the other two indicators, this increase indicates that students are starting to be more critical in assessing the quality and credibility of the information received, as well as in considering various points of view before making decisions. Overall, the positive changes in each of these indicators indicate that students have developed better critical reasoning skills. Hypothesis testing is needed to find out whether the formulated hypothesis can be tested for truth or not. The test used is the t-test. In this study, the researcher used Microsoft Excel. Based on the calculation of the t-test, the t count = 13.4715 and t table = 2.262157 were obtained. Thus, t count > t table, then the hypothesis proposed is H1 = "There is an effect of the use of chrome books on students' critical reasoning abilities in science learning" The hypothesis is accepted. The results of the t-test can be seen in **Table 2**.

Table 2. Paired Sample Test Results

	Posttest	*Pretest*
Mean	77,5	21
Variance	134,7222222	26,66667
Observations	10	10
Pearson Correlation	-0,185375999	
Hypothesized Mean Difference	0	
Df	9	
t Stat	13,18557181	
P(T<=t) one-tail	1,71889E-07	
t Critical one-tail	1,833112933	
P(T<=t) two-tail	3,43779E-07	
t Critical two-tail	2,262157163	

Based on the **Table 2**, the influence of Chromebook use on students' critical reasoning skills is shown. The use of technological tools such as Chromebooks plays a role in improving students' skills in identifying information, drawing conclusions, and evaluating information more effectively. By utilizing Chromebooks, students may be more exposed to diverse sources of information and can access various digital learning tools that support the development of critical thinking skills. The results of this test indicate that technology, such as Chromebooks, has a positive influence on improving the quality of students' critical thinking. This is also supported by previous research that utilizing the features contained in Chromebooks has a positive influence on enhancing students' critical reasoning skills (Kusmiyati, 2024). The use of this media has a significant impact on improving students' critical reasoning skills, especially in science learning. In science learning, students are faced with problem-solving in the form of experiments, data analysis, and research. With this Chromebook, students are more efficient in finding information, collecting data and analyzing it. Critical reasoning itself is the ability to collect and analyze information so that conclusions can be drawn (Fitriyanti & Suciptaningsih, 2024). Therefore, this Chromebook can be used for simple simulations to improve their critical reasoning skills.

Not only that, Chrome improvesChrome improves students' critical reasoning skills in learning because using Chromebooks makes it easier to access videos, images, readings, and other learning resources. Chromebook media is used as a medium for finding information and doing assignments (Averina & Widagda, 2021). Students feel happy completing assignments given by the teacher. With the availability of various easily accessible learning resources, students are better trained to assess information and draw conclusions from existing evidence.

With this media, students are also more enthusiastic because this chromebook media is practical and relevant to their daily lives, so students are more enthusiastic in their learning process. (Aurelia, B.F., Sufa, F.F., & Jumanto, 2024). The use of Chromebook media has proven to be useful and very applicable to their daily lives so that students feel more connected to the material being taught. In addition, the use of Chromebooks also supports the improvement of students' critical reasoning skills at SD N Kalianget Barat III because they can access various sources of information directly, interact with the material in more depth, and develop their analytical skills in solving problems. This makes the learning process more enjoyable and equips students with more critical thinking skills. Chromebooks are an effective medium through various applications that can help in the development of critical thinking skills. In addition, Chromebooks allow the use of educational applications that facilitate interactive experiments and research. So, with this media, students are given the freedom to apply their respective learning styles. Students' learning styles can be in the form of video, audio, or writing (Dewi & Yusri, 2023). By choosing their learning style, learning is more relevant and in-depth, which will

encourage them to think critically about what they are learning and how to apply that knowledge in learning.

4. CONCLUSION

The use of Chromebooks in learning Natural and Social Sciences (IPAS) has been proven to have a significant positive impact on students' critical thinking skills. Based on the findings presented, the average score on the protests and evaluations carried out showed a substantial increase, from 21 to 77.5, indicating that this intervention has a significant effect on improving students' critical thinking skills. With access to more interactive and digital-based technology, Chromebooks allow students to access information faster, analyze data more deeply, and collaborate more effectively in learning activities. This enriches their learning experience and gives them the opportunity to be more actively involved in the learning process. Through further study and research, it can be understood how educational technology, such as Chromebooks, can stimulate critical thinking skills, which are essential in facing the challenges of the modern world. Overall, the results of this study support the idea that the use of technological devices such as Chromebooks can be an effective tool in improving the quality of learning, especially in developing students' critical thinking skills in the context of IPAS.

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