



The Effect of Android-Based Science Learning Media on Critical Thinking Skills of Elementary School Students During the Covid-19 Pandemic

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Abstract. This study was prompted by the development of Android-based scientific learning media for elementary school students, with the goal of improving critical thinking abilities in pupils who wanted to know the level of efficacy during the covid-19 epidemic. The purpose of this study was to examine how android-based scientific learning media improved the critical thinking skills of primary school children. This study used a quasi-experimental design. The sample technique used was simple random sampling. The data was analyzed using the T-test. Ho was rejected since the hypothesis test indicated that $t_{count} > t_{table}$. It was discovered that primary school pupils who learned utilizing android-based learning material have varying levels of critical thinking ability. As a result, android-based scientific learning material has an influence. on elementary school students' critical thinking skills. The findings of this study can be used by teachers to help students improve their critical thinking skills in elementary school.

Keywords: Learning Media · Science · Android · Critical Thinking

1 Introduction

Science is a subject that is taught in elementary schools as a requirement [1]. This is due to the fact that science education is beneficial to elementary school students both today and in the future. Science education provides students with knowledge and skills that are applicable to everyday life [2]. The Indonesian Ministry of National Education has established science learning objectives for elementary school students to meet [3]. The purpose of scientific instruction in primary schools is for pupils to be able to think about science topics. Furthermore, scientific education in primary schools aims to strengthen pupils' reasoning abilities through the process of making conclusions. The purpose of primary school science education is to equip pupils to handle issues involving natural phenomena. However, improving students' thinking abilities is one of the most important aims of scientific instruction in primary schools [4].

Students' thinking skills is an ability related to their cognitive processes [5]. The process of reaching student learning goals, including science learning in elementary school, will be influenced by the ability to think. Critical thinking skills are one of the thinking skills that must be developed in science learning. Critical thinking skills are a way of thinking that tries to study a concept, clearly distinguish one thing from another, identify, analyze, and develop it in a more appropriate direction. Students' critical thinking skills refer to their ability to think rationally and examine something before reaching a decision. As a result, critical thinking skill is a process of reasoning in order to create more specific decisions.

In elementary schools, this critical thinking skill must be cultivated as part of the science education. This is because one of the thinking skills required in Industry 4.0 [8, 9] is the ability to think critically. Industry 4.0 is an era in which students must be able to think in terms of using technology to solve problems [10]. In industry 4.0, students will be confronted with more complicated problems, demanding the development of critical thinking skills. As a result, students need to be taught how to build critical thinking skills starting in elementary school.

Learning science is a complicated process [11]. This is in contrast to the developmental features of elementary school pupils, who are now in the operational period. As a result, the teacher, as a subject in the learning process, must be able to overcome this issue by making science instruction concrete [12]. In terms of content, science is abstract, yet it is realistic and applicable. This means that science learning is strongly connected to everyday life processes. So, the teacher's responsibility is to create an adequate environment to science learning in order to attain the objectives of science learning.

Using learning media is one way to do it. Everything that teachers utilize to aid the learning process is referred to as learning media [13]. Learning media, particularly in science learning, can visualize material that cannot be brought into the classroom, despite the fact that it is manipulative. Science learning media has an important role for teachers in making it easier to present information [14]. As a result, the utilization of learning media in the science learning process in elementary schools is appropriate.

During the COVID-19 pandemic, learning media plays a critical role in the learning process. During the COVID-19 epidemic, students and teachers learn through a home-based learning system, which minimizes the need for face-to-face learning. The goal of the home learning process is to reduce the corona virus's transmission. As a result, during this covid-19 pandemic, technological learning media development is necessary.

A great learning media is one that has been adapted to the characteristics of science learning, students, and times [15, 16]. Researchers have previously developed an Android-based learning media that is adapted to the characteristics of science learning, students, and Industry 4.0, as well as learning during the covid-19 pandemic [17].

In prior studies, the media was adapted to the development of Industry 4.0 and the home learning system. Based on the requirements analysis, the construction of learning material using Android is acceptable. During the COVID-19 pandemic, the production of this medium attempted to meet science learning objectives that stressed primary school students' critical thinking abilities. So, during the Covid-19 outbreak, this study was conducted to determine the impact of android-based learning media on the critical

thinking abilities of primary school children. As a result, the purpose of this research is to find out how android-based scientific learning media influenced primary school students’ critical thinking abilities during the covid-19 epidemic.

Astuti et al. reported that an android-based learning media has been developed in biology learning for high school students that can improve student learning outcomes [18]. This study, on the other hand, is different in that it tries to examine the impact of science learning media on critical thinking skills in elementary school students.

2 Research Methodology

This study is based on a quasi-experimental design. This study took place at a Bukittinggi City elementary school. Class IV A was the experimental class (which used Android-based learning media) and class IV B was the control class in this study (which used conventional learning media). Each class has 30 students in it. The Table 1 depicts the research design.

3 Results and Discussion

The following statistical figures can be viewed as a result of statistical calculations.

The first test carried out is a prerequisite test. Prerequisite test consists of normality test and homogeneity test. Normality test aims to determine whether the population is normally distributed or not. Testing for normality using the chi square test formula with a significance level of 5%. The results of the normality test are shown in the Table 2.

Table 3 shows that each class has an X2 Count X2 table, hence H0 is acceptable. This indicates that the data from both groups follows a normal distribution.

A homogeneity test was also carried out. The homogeneity test seeks to evaluate if the data are derived from the same variance. The Fisher test can be used to do a homogeneity test. When the computation yields F count = 1.164 and F table = 5.05, H0 is approved. This signifies that both classes are derived from the same set of data.

Once the prerequisite test was performed, the hypothesis was evaluated using the T-test. The t-test computation yields a t-count value of 2.187 and a t-table value of

Table 1. Research Design

Group	Group Treatment	Group Post-test
(R) → E	X	O ₁
(R) → K		O ₂

Annotation

R = The process of selecting subjects randomly.

E = Experimental class group.

K = Control class group media

X = Treatment using android-based learning

O1 = Result of experimental class.

O2 = Result of control class.

Table 2. Recapitulation of the calculation results of descriptive analysis

Class	Highest score	Lowest score	Mean	Mode	Median	Standard Deviation	Variance
Experimental	82	49	78,5	79	77	8,771	86,554
Control	78	34	70,8	71	72	8,002	74,313

Table 3. Recapitulation of the calculation results of the normality test

Class	Number of samples	X^2_{Count}	X^2_{table}	Conclusion
Experimental	30	7,921	11,070	Normal
Control	30	1,231	11,070	Normal

2.002, with a significance level of 0.05. And $dk = 58$. Then, because $t\text{-table} > t\text{-count}$, H_0 is rejected. As a result, there is a difference in critical thinking skills. Students in elementary school who use Android-based science learning media have better critical thinking skills than students who use conventional learning media.

This research shows that using technology-based learning media can help students enhance their critical thinking skills. Previous study backs up that statement. According to other research, using technology-based learning media can have an effect on the learning [19]. According to this study, technology-based learning media can help students learn more effectively. Other research have found that internet-based learning media can allow students to learn better [20]. This research reveals that employing internet technology to provide learning media can improve high school students' economic learning outcomes. Other research have found that using technology in the classroom can improve learning quality [21]. According to this study, incorporating technology into the learning process in the classroom will have a good impact on the learning process. Other studies back up this statement, and this one shows that using technology to learn media can increase students' ability [22]. The findings of this study show that using technology-based learning media can help students enhance their abilities. These research back up the conclusions of this study, which show that technology-based learning media improves learning quality. This research, on the other hand, is distinctive because it was designed for science learning using the Android system. Furthermore, this media is implemented on elementary school students with the goal of improving students' critical thinking skills. As a result, this research shows that using android-based science learning media has an impact on elementary school students' critical thinking skills.

During the COVID-19 epidemic, this study shows that Android-based science learning media has a positive effect on elementary school students' critical thinking skills. Several factors contribute to this. In this study, Android-based science learning media was developed based on the characteristics of science learning for elementary school students and the development of industry 4.0 which was adapted to the learning system from home.

This media was developed based on Android because Android is a technology that is close to students. Every student must be able to operate Android on a smartphone properly in the era of Industry 4.0 and this Covid-19 pandemic [9]. Smartphones have even become everyday objects for children. According to statistics, students frequently use Android as a game aid only [23]. Because elementary school-aged students prefer enjoyable games to complex science studies, this cannot be blamed. As a result, researchers turn this problem into a challenge, transforming the game into an engaging science learning tool for students.

A game system was used to create Android-based science learning media. This is what makes students happy when they are studying science. Students that see learning as entertaining will be able to improve their learning quality [24, 25]. As a consequence, while dealing with the covid-19 epidemic, this learning material is designed in such a manner that kids do not feel like they are studying science. This is motivated by a way of playing while learning that has been tailored to the needs of primary school kids [26, 27]. The games featured in this medium assist students improve their critical thinking abilities since students are given tasks to tackle the difficulties in the game. This problem-solving technique can help students improve their critical thinking abilities [28]. Students must be able to take the necessary procedures before reaching conclusions. This conclusion is consistent with critical thinking skills features, which include the application of thinking skills to critically assess information before making judgments.

4 Conclusion

T-arithmetic was determined to be bigger than t-table ($2.187 > 2.002$) in this study, hence H_0 was rejected. Finally, there was a difference in the critical thinking skills of elementary school students. Students who learned science using Android-based learning media had better critical thinking skills than students who learned science using traditional learning media. This implication can be utilized by teachers to help children enhance their critical thinking skills in elementary school. Teachers can use this learning media to help elementary school students improve their critical thinking skills.

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