



THE EFFECT OF A SCIENTIFIC APPROACH ON THE CRITICAL THINKING SKILLS OF STUDENTS OF SD NEGERI 101947 TANJUNG BULUH T.A. 2022/2023

Wirda Mega Ermita Lubis^{1*}, Indah Pratiwi², Suci Perwita Sari³

Basic Education Study Program, Faculty of Teacher Training and Education

Universitas Muhammadiyah Sumatera Utara;

Email: wirdaermitalubis076@gmail.com, indahpratiwi@umsu.ac.id, suciperwitasari@umsu.ac.id

Abstract

This study aims to find out whether there is an influence of the scientific learning model on the critical thinking ability of students of SD Negeri 101947 Tanjung Buluh in the 2022/2023 school year. This study is a research with quantitative data processing and using a total sampling technique where the entire population is used as a sample of 50 people. The data collection process uses pretest and posttest with an assessment scale of 0 and 1. Then it was analyzed using SPSS software version 28. The results of the t-test showed that there was an influence of the scientific learning model with critical thinking skills with a significance of $0.025 < 0.05$ with the conclusion that H1 was accepted and H0 was rejected and the t_{hitung} value was $2.306 > 2.0106$.

Keywords: *Scientific, Thinking, Critical.*

1. INTRODUCTION

KH Dewantara argues that all the work that parents do to raise their children is education (Marwah et al., 2018). Prof. Zaharai Idris defines education as a series of interactions between adult humans and students, either directly or through other media, with the aim of fostering personal and intellectual growth of students. (Rahman et al., 2022).

According to Law No. 20 of 2003, education is defined as "a fundamental and planned effort to shape and give birth to human beings to become learners in a learning environment and actively develop their potential to have noble morals, personality, religious spiritual strength, intelligence, and skills that are beneficial to society, nation, and state".

Learning means engaging in an active process designed to change one's beliefs and ways of behaving under conditions different from those faced before and after the learning experience. There are four distinguishing features of the learning process: flexibility, perseverance, exertion, and adaptation. The cognitive realm, the affective realm, and the psychomotor realm are the three parts or realms that make up the whole of learning.

In a learning, especially in science learning about changes in the form of objects, learning that is still very

monotonous and does not involve students in a learning process makes learning less interesting and makes students bored so that they do not understand and understand the material being taught. This condition is supported by the research of teachers who have not utilized creative learning methods and also do not use teaching aids that are in accordance with the material. In the learning process IPA, So far, teachers are still using the learning method, namely the lecture method, this is what actually makes the atmosphere in learning monotonous and boring. This is evidenced by the data obtained during observation at SD Negeri 10194 Tanjung Buluh..

Students do not have the critical thinking skills necessary to be adequately trained in the development of problem-solving and application skills. As a result, it becomes a challenge for students to apply critical thinking skills to real-world situations that are relevant to the subjects they are studying in class, such as in the discussion of science students. In science, the purpose of learning is discovery (research). That is, in order for students to learn more about their natural environment, they are compared to researchers. Reliable, elementary school science teachers guide students towards self-learning by having them conduct their own experiments and make their own observations to spark their

natural curiosity and encourage the growth of their capacity for critical analysis. (Ilhamdi, et al., 2020)

The results of the initial observation carried out by interviewing teachers and students on Tuesday, November 8, 2022 at SD Negeri 10194 Tanjung Buluh, the problem found was that students' critical thinking was still relatively low or minimal during learning, especially science learning. The low thinking ability of students is caused by several factors, namely, teachers are too dependent on one book only, and traditional teaching methods such as lectures and answering students' questions are still used, which is boring and tends to reduce students' ability to think independently. Furthermore, it can be seen from the observation results that there are problems in the learning process at SDN 101947 Tanjung Buluh, especially in grade IV, including: (1) There is no fun learning; (2) Lack of student involvement in the classroom; (3) Lack of motivation to learn for students; (4) Less creative learning; (5) Absence of teaching aids and use; (6) Not fostering critical thinking among students; and (7) Not using simple experiments to prove a concept.

By conducting research, it is hoped that students will have an understanding, knowledge and attraction of students in understanding science material in grade IV about changes in the form of objects, there is a need for a learning method that is in accordance with the material, so that students can better understand, be interested, and interested in participating in learning with the material that has been delivered by the teacher. In today's era, there are actually many modern learning methods. Therefore, teachers need to use technology to learn methods that can attract the focus of learning on students according to their learning materials.

Teachers use learning methods as a technique to make their students more interested in learning; In turn, this interest leads to improved social skills and overall better performance in the classroom. The scientific method is one of the successful approaches to material changes in the shape of objects. Hosnan (2014: 34) Observation, problem solving, hypothesis testing, data collection using various methods, data analysis, and presentation of "discovered" ideas are steps in the process of developing concepts, laws, or principles by students using a scientific approach. And this is in

line with what Daryanto (2014: 51) said. The purpose of teaching with the scientific method is to help students see that knowledge and information are not limited to what they receive from the teacher but can come from a variety of sources.

The conclusion of experts is that the scientific approach is a process that encourages students to think critically actively through the stages of observation, question and answer, data collection, analysis, and presentation. The scientific method has a 6-stage syntax. Each of these stages consists of 1) observation, 2) questioning, 3) analysis, 3) implementation. 5). Analyzing data and drawing conclusions, and 6). Communicate. This syntax is unique in that it teaches students to reframe their knowledge for a wider audience during the communication stage. Both through written means, such as publication and assessment of learning outcomes, as well as oral means, such as question and answer sessions, and others. (Kusumah : 2019)

Several previous studies on the scientific approach have been published. As research conducted by Arif shows that learning media to support a scientific approach uses digital technology-based media. (Arif, 2020) As well as research conducted by Habidah which shows that e-modules are a medium used to support scientific approaches. Both studies use technology-based media in relation to a scientific approach. This research will focus on changing the conventional method of providing material only with powerpoint media and forming a group of each student.

Based on the above, researchers use scientific methods to help students develop critical thinking skills when learning about changes in the form of objects. Therefore, the researcher will consider that he will conduct a study with the title: "The Influence of Scientific Approach on the Critical Thinking Ability of Students of SD Negeri 101947 Tanjung Buluh T.A 2022/2023".

2. RESEARCH METHODOLOGY

This type of research is quantitative research. This research was carried out at the 101947 Tanjung Buluh State Elementary School, Perbaungan District, Serdang Bedagai Regency for three months, starting in February 2023 and ending in April 2023. Samples were taken from all students totaling 50 students. Consisting of one class (IV) that will be used as a subject in this

study, namely class IV A as many as 23 students and IV B a total of 27 students using saturated samples.

This research instrument uses two types of tests, namely the preliminary test (pre-test) and the follow-up test (post-test). The purpose of a pre-test, or initial test, is to gauge a student's current skill level before introducing new material. Post-tests (also known as "final exams") are given to students at the end of a unit of study to measure their growth in students' critical thinking skills. The hypothesis test in this study is a T test to compare an average of two samples to determine whether an assumption is true or not across the larger population. To analyze the research data using the IBM SPSS Statistic Version 28 application.

3. RESULTS AND DISCUSSION

The students' test scores (before and after the intervention) provided data for this study. The experimental class and the control group were each given the same amount of background information at the

beginning. Then the teacher provides procedures that have previously been proven to be effective through the use of scientific learning models in experimental classes and through more conventional methods in control classes. Checking test scores after students have completed a course is a good way to gauge their critical thinking skills.

Test questions are used for data collection. Researchers have validated tests that will be used to assess students' critical thinking skills before starting the research. After that, we run a hypothesis test to make sure everything is as it should be before proceeding to the reliability, normality, and homogeneity checks.

1. Data Pretest

Pretest questions were distributed to students in the experimental class on February 7, 2023 and the control class in February 2023 which was given before being given treatment. Here are some figures from the pretest given to the control and experimental groups.

Tabel 4.1
Data Pretest

No	Interval	Pretest			
		Eksperimen		Kontrol	
		F	%	f	%
1.	90 – 100	3	13,04	2	7,4
2.	80 – 89	5	21,7	2	7,4
3.	70 – 79	5	21,7	4	14,8
4.	60 – 69	5	21,7	7	25,9
5.	50 – 59	3	13,04	7	25,9
6.	40 – 49	2	8,7	5	18,5
Jumlah		23	100	27	100
Rata-Rata		67,39		58,89	

From the table above, the students' pretest scores are still low with low average scores, namely, the experimental class is 67.39 and the control class is 58.89. This happened because the students of the two

classes were still experiencing undiagnosed conditions or treatment regarding science learning materials about changes in the form of objects.

2. Posttest Data

Posttest questions were distributed to students in the experimental class on February 8, 2023 and the control class in February 2023 which was given after the

treatment. The data obtained at the time of posttest increased in the control and experimental classes as follows:

Table 4.2
Data Posttest

No	Interval	Posttest			
		Eksperimen		Kontrol	
		F	%	F	%

1.	90 – 100	7	30,4	4	14,8
2.	80 – 89	7	30,4	6	22,2
3.	70 – 79	8	34,7	10	37
4.	60 – 69	1	4,3	7	25,9
5.	50 – 59	0	0	0	0
6.	40 – 49	0	0	0	0
Jumlah		23	100	27	100
Rata-Rata		80,43		72,96	

The average of the experimental class was 80.43 while the average of the control class was 72.96, indicating that the scientific learning model was influential. This happened because previously all students in both classes had been presented with science material that discussed changes in the form of objects.

3. Validity Test

To determine the validity of the questions asked, the research instrument must be able to reveal data from relevant variables. If the calculation value is greater than the rtable, in this case 0.433, then the instrument is said to be reliable. The rtable values are derived from the r-value distribution table for a significance level of 0.05 and a sample size of N = 15.

The 15 validity tests were obtained

from the multiple-sorting question items on the test sheet. This test sheet has been tested on 24 grade V students at SD Negeri 101947 Tanjung Buluh. Then the results of the validity test conducted based on the results of the validity test output using the IBM SPSS Statistic 28 application, there are ten valid questions, while five are invalid. The researcher also selected 10 appropriate questions to be used as research instrument questions.

Table 4.3
Validity Results

No Soal	rhitung	Rtabel	Keterangan
1	0,705	0,433	Valid
2	0,195	0,433	Tidak Valid
3	0,705	0,433	Valid
4	0,553	0,433	Valid
5	0,705	0,433	Valid
6	0,584	0,433	Valid
7	0,529	0,433	Valid
8	0,661	0,433	Valid
9	-0,020	0,433	Tidak Valid
10	0,284	0,433	Tidak Valid
11	0,000	0,433	Tidak Valid
12	0,690	0,433	Valid
13	0,591	0,433	Valid
14	0,463	0,433	Valid
15	0,350	0,433	Tidak Valid

Based on the calculations made, the output reveals that 1, 3, 4, 5, 6, 7, 8, 12, 13, and 14 are all valid question items. Meanwhile, items that are known to be

invalid so that they cannot assess students' critical thinking skills are not included in the assessment. The attached file contains SPSS Statistics 28 calculation data for correct and

incorrect questions.

4. Reliability Test

Items are first entered through a series of validity tests, then reliability tests. The goal is to find out whether the

measuring tool can be relied on as a reliable data collection tool or not. The IBM SPSS Statistics 28 application was used to test the reliability of these questions, and the results are as follows:

Table 4.4
Reliability Test Results

Cronbach's Alpha	Part 1	Value	0.833
		N of Items	5 ^a
	Part 2	Value	0.650
		N of Items	5 ^b
Total N of Items			10
Correlation Between Forms			0.604
Spearman-Brown Coefficient	Equal Length		0.753
	Unequal Length		0.753
Guttman Split-Half Coefficient			0.746
a. The items are: Soal1, Soal3, Soal4, Soal5, Soal6.			
b. The items are: Soal7, Soal8, Soal12, Soal13, Soal14.			

From the table, the reliability value is 0.746 which means that this research instrument is reliable with a high level of realism because it is in the range of 0.61-0.80. So that it is eligible for further testing.

5. Prerequisite Test

After obtaining data on the test scores of the control class and the experimental class, to find out whether the application of the scientific learning model has an effect or not on the critical thinking ability of both classes, it is necessary to identify baseline assessments. Homogeneity and normality tests are prerequisites, both of which must be passed before the

hypothesis can be tested. The normality test is the main requirement for parametric statistical analysis, if the data is not distributed normally, the analysis continues with non-parametric analysis. The following are the results of the prerequisite test using the IBM SPSS Statistic 28 application.

1. Test Normality

The normality test is used to check whether the data collected from the two samples follows the normal distribution. The Kolmogorov-Smirnov and Shapiro-Wilk normality tests were used in this investigation using IBM SPSS Statistic 28 which can be seen in the following table:

Tabel 4.5
Kolmogorov-Smirnov & Shapiro-Wilk Test Results

Tests of Normality							
Kelas		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
Pembela-jaran Saintifik	Pre Test Ekspe-rimen	0,145	23	.200*	0,938	23	0,163
	Post Test Ekspe-rimen	0,210	23	0,010	0,881	23	0,010
	Pre Test Kontrol	0,174	27	0,036	0,913	27	0,027

	Post Test Kontrol	0,236	27	0,000	0,885	27	0,006
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

If the significance level is greater than 0.05, we can conclude that the data follows a normal distribution and draw conclusions from the test. Instead, abnormal data is indicated by sig. 0.05. Based on the table above, it can be seen that the significance of the two types of tests used does not meet the criteria of normal distribution. In the Kolmogorov-Smirnov Test, only the pre-test significance of the experiment met the criteria of normal distribution. Meanwhile, in the Shapiro-Wilk

test, none of them met the criteria for normal distribution.

1. Homogeneity Test

Once it has been established that the sample follows a normal distribution, a homogeneity test can be performed to determine whether the data collected on students' critical thinking skills have the same features (homogeneous). Homogeneity test statistics are generated by *IBM SPSS Statistics 28*.

Tabel 4.5
Hasil Uji Homogenitas

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Kemam-puan Berpikir Kritis	Based on Mean	1.297	3	96	0.280
	Based on Median	1.304	3	96	0.278
	Based on Median and with adjusted df	1.304	3	93.156	0.278
	Based on trimmed mean	1.375	3	96	0.255

In the normality test table, the significance value indicates whether the data follows the normal distribution or not. The data are considered non-homogeneous if the significance value is less than 0.05, and conversely homogeneous. The level of significance, measured by Levene's statistics, is greater than 0.05, indicating that the data is reliable.

1. Test Hypothesis

The statistical significance of the mean difference between two unpaired samples can be determined by testing the null hypothesis. To see if students' critical thinking had improved, the experimental group and the control group were given a post-test and compared; if the p-value is less than 0.05, the group is considered significantly different; otherwise, no difference was found.

Tabel 4.6
Hasil Posttest Kelas Eksperimen dan Kontrol

No	Kelas	N	Mean	Std. deviaton	Std. Error Mean
1	Eksperimen	23	80.43	11.862	2.473
2	Kontrol	27	72.96	11.030	2.123

Based on these data, the mean or average of the experimental group was 80.43, while the control group was 72.96. As a result, it can be said that overall, the experimental group outperformed the control group in terms of average scores. to actually test the hypothesis. The hypothesis tested was H_1 = significant difference in values

between the experimental and control groups. H_0 shows a lack of visible differences between experimental and control means. H_1 is accepted if there is a statistically significant difference between the mean of the experimental and control groups ($t_{hitung} > t_{tabel}$ atau sig (2 - tailed) $< 0,05$).

Tabel 4.7
Results of the Experimental and Control Class Posttest t-Test

Data	t_{hitung}	t_{tabel}	Sig. (2 tailed)	Information
Posttest Kelas Eksperimen dan Kontrol	2,306	2,0106	0,025	H_1 diterima

Based on the table above, the results of the analysis of the T test show that the tcal value is $2.306 > 2.0106$ which leads them to the conclusion that H_1 is accepted and H_0 is rejected. So H_1 is accepted and H_0 is rejected, with a sig value (2-tailed) of $0.025 < 0.05$. This means that the scientific learning model has an effect on the critical thinking of grade IV students of SD Negeri 101947 Tanjung Buluh.

4. CONCLUSION

Based on the results of the research that has been presented, it was obtained that students' critical thinking ability by using a scientific learning model on material that changes the form of objects in the experimental class, namely class IVA SD Negeri 101947 Tanjung Buluh obtained an average score of 67.39 and after receiving treatment it became 80.43.

Based on the results and discussion of the research, it can be concluded that there is a significant influence on the Scientific Approach on the critical thinking ability of grade IV students of SD Negeri 101947 Tanjung Buluh. This can be seen from the difference in critical thinking skills of the experimental class and the control class. The average posttest score of the experimental class was 80.43 while the control class was 72.96. Based on the results of the hypothesis test, it was obtained $t_{hitung} = 2,306 > t_{tabel} = 2,0106$ which means that there is a significant influence and H_1 Accepted. So, it can be concluded that the Scientific Approach is effectively used in learning IPA to improve students' critical thinking skills at SD Negeri 101947 Tanjung Buluh.

REFERENCES

Abdullah, R. S. (2014). *Pembelajaran*

- Saintifik Untuk Implementasi Kurikulum 2013*. Jakarta. Bumi Aksara
- Akbar, K. (2015). *Kurikulum 2013 Dengan Pendekatan Scientific Dalam Pembelajaran Matematika*, Makalah yang disampaikan dalam E-Training Terstruktur P4TK Matematika.
- Akbar, S. (2015). *Instrumen Perangkat Pembelajaran*. Bandung. Remaja Rosdakarya
- Arikunto, S. (2015). *Dasar-Dasar Evaluasi Pendidikan*, Jakarta. Bumi Aksara.
- A. Wahab, J. (2013). *Belajar dan Pembelajaran SAINS*, Bandung. Pustaka Reka Cipta.
- Daryanto. (2014). *Pendekatan Pembelajaran Saintifik Kurikulum 2013*, Yogyakarta. Gava Media.
- Deti, A. (2019). Peningkatan Kemampuan Berpikir Kritis Siswa Dengan Pendekatan Inquiry/Discovery, *Jurnal Euclid*, No. 1, Vol 3: 3
- Huda, M. (2013). *Model-Model Pengajaran dan Pembelajaran*. Yogyakarta. Pustaka Pelajar.
- Hosnan. (2014). *Pendekatan Saintifik dan Kontekstual dalam Pembelajaran Abad 21*. Bogor. Ghalia Indonesia.
- Jufri, A. W. (2013). *Belajar dan Pembelajaran SAINS*, Bandung. Pustaka Reka Cipta
- Kemendikbud. (2013). *Permendikbud Nomor 81A Tahun 2013 tentang implementasi Kurikulum dan Pedoman Umum Pembelajaran*. Jakarta. Kementerian Pendidikan dan Kebudayaan RI
- Komalasari, K. (2013). *Pembelajaran Kontekstual Konsep dan Aplikasi*, Bandung. Refika Aditama.
- Majid, N. K. (2015). *Pengaruh Penerapan Metode The Power of Two Terhadap Kecakapan Berpikir Kritis Siswa Pada*

- Mata Pelajaran PAI di SMK TARUNA Balen, Bojonegoro*, Skripsi Pendidikan Agama Islam UIN Sunan Ampel Surabaya.
- Nurdia, Z. (2012). *Kemampuan Berpikir Kritis Siswa pada Pembelajaran Materi Pengelolaan Lingkungan dengan Pendekatan Keterampilan Proses Sains*, Skripsi Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Semarang, Semarang.
- Permendikbud No. 103, (2014). *tentang Pembelajaran Pada Pendidikan Dasar Dan Pendidikan Menengah*. Jakarta. Kemendikbud.
- Pateliya, Y. P. (2013). *An Introduction to Modern Models of Teaching*. [Online]. *International Journal for Research in Education Volume 2, Issue 2*.
- Rhosalia, L. A. (2017). *Pendekatan Saintifik (Scientific Approach) Dalam Pembelajaran Tematik Terpadu Kurikulum 2013 Versi 2016*. JTIEE. Volume 1 No.1.
- Rusman, (2015). *Pembelajaran Tematik Terpadu Teori Praktik dan Penilaian*, Jakarta. RajaGrafindo Persada.
- Sani, R. A. (2014). *Pembelajaran Saintifik Untuk Implementasi Kurikulum 2013*, Jakarta. Bumi Aksara.
- Sudijono, A. (2014). *Pengantar Evaluasi Pendidikan*. Jakarta. Raja Grafindo Persada.
- Susanto, A. (2013). *Teori Belajar dan Pembelajaran di Sekolah Dasar*. Jakarta. Kencana Prenada Media Group.
- Sujana, N. (2014). *Penelitian Hasil Proses Belajar Mengajar*, Bandung. Remaja Rosdakarya.
- Suprijono, A. (2016). *Model-Model Pembelajaran Emansipatoris*, Yogyakarta. Pustaka Pelajar.
- Surya, M. (2015). *Strategi Kognitif dalam Proses Pembelajaran*, Bandung. Alfabeta.
- Utari,. (2017). *Analisis Faktor Yang Mempengaruhi Kemampuan Berpikir Kritis Dalam Pembelajaran Matematika Pada Siswa Sma Gajah Mada T.P 2016/2017*, Skripsi Universitas Muhammadiyah Sumatera Utara Medan.
- Zaluchu, S. E. (2018). *Sistematika Dan Analisis Data Riset Kuantitatif* (Edisi 3), Semarang. Golden Gate Publishing Semarang.

