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Article

Discovery Learning Model to Improve Critical Thinking Skills of Grade IV Elementary School Students

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ABSTRACT

Quality education requires the development of critical thinking skills, especially at the elementary level. These skills are very important for students to be able to analyze information, solve problems, and make the right decisions. One approach that is considered effective in overcoming this problem is the Discovery Learning learning model. The purpose of this study was to determine the effectiveness of the *discovery learning model* on students' critical thinking skills in grade IV of elementary school. The type of research used was *Pre-Experimental Designs with a one group pretest-posttest* research design. The subjects of the study consisted of 114 students, with a sample of 28 students selected using *purposive sampling techniques*. Data were collected through tests and observations. The instrument tests used were instrument validity and reliability tests. The prerequisite tests used were normality tests and homogeneity tests. Data analysis used effectiveness tests. The results showed that the application of the *discovery learning model* had a positive impact on improving critical thinking skills of grade IV students; there was an increase in learning effectiveness of 40.37%, which was included in the

moderate category; and the *discovery learning model* was able to motivate students to be more active in the learning process.

1. Introduction

Education is a necessity that every individual must obtain to develop potential, character and thinking (Efendi et al., 2023). Clearly education is a conscious and planned effort to create an environment and learning process that allows students to develop their educational potential with the spiritual strength, religion, self-control, personality, skills, intelligence, and morality they need (Gunawan & Nurjaman, 2022).

Currently, there are many new demands that require breakthroughs in thinking, conceptualization and actions. These demands also occur in Indonesian education. According to Lestari, (2018) mentioning the challenges faced in the era of globalization are the quality of education, professionalism of educational personnel, culture or acculturation, learning strategies, management improvements, access to education and the advancement of science and technology. With the development of globalization today, a good supporter is needed, especially for Indonesian education.

In the current era of globalization, the support needed is learning known as 21st century learning. The 21st century is marked as a century with massive changes that were originally aggressive societies towards industrial societies and becoming knowledgeable societies (Yulianti & Wulandari, 2021). According to Nisa et al., (2023), 21st century learning is able to change problems, especially in education with the development of information and technology that can increase the potential of students to be of better quality.

The development of the 21st century as stated by Permendikbud No. 65 of 2013 explains the Learning Process Standards, these standards are outlined in several 21st century principles, one of which is the use of technology and communication to improve the efficiency and effectiveness of learning carried out by students in the learning process. The 21st century skills put forward by the Ministry of Education and Culture formulate that (Kementerian Pendidikan dan Kebudayaan, 2013) the (Rita, 2022) 21st century learning paradigm known as 4C skills becomes 6C, namely emphasizing the abilities of students in critical *thinking*, *creativity*, *collaboration*, *communication*, *character*, and *citizenship*.

As in the research Trisnawati & Sari, (2019) that 21st century skills are important to be mastered by students so that they are able to face life, the world of

work and citizenship. One of the skills that must be mastered by students who become quality human resources is the ability to think critically.

Critical thinking enables someone to solve problems, make decisions, analyze assumptions and conduct scientific research in a focused and clear manner. According to Puspita & Dewi, (2021), critical thinking skills are key for solving problems. Cognitive ability to analyze problems systematically, specifically, differentiate problems in a way of careful and thorough, and find and study information to develop problem solving strategies. This means that critical thinking skills are a process important in everyday life so that every individual is able to resolve or decide a problem related to anything Which must be trusted and what action just which must be done. According to Wayudi et al., (2020) stated that critical thinking skills are very important in various fields, especially in the world of education and everyday life. Critical thinking skills can help individuals to improve their learning abilities, solve problems more effectively, and make wiser decisions (Manurung et al., 2023). With the ability to think critically in students, it will make it easier for them to understand the subject matter being studied.

One of the lessons in elementary school that requires critical thinking skills of students is learning Natural and Social Sciences (IPAS). IPAS learning is a subject that was issued when the school had implemented the independent curriculum. According to Ikhsani & Alfiansyah, (2023), the innovation that emerged after the curriculum change was the emergence of the IPAS subject. IPAS is a combination of natural science (IPA) and social science (IPS) lessons. IPAS learning is designed to help students develop in accordance with the Pancasila profile and foster curiosity about phenomena around humans, understand the universe and its relationship to human life and play an active role in maintaining and protecting the natural and social environment.

Science learning is related to how to find out about nature and society systematically, for that critical thinking skills are needed. As research conducted by Novitasari et al., (2024), states that Science Learning in the independent curriculum guides students to be more critical and develop their abilities so that their learning can be applied in everyday life.

Based on observations that students' ability to think critically about science is still low. The implementation process has not used a learning model that directs students' critical thinking. Then students have not worked on questions with cognitive domains C4, C5 and C6. Students are less active in conveying their ideas. Low learning outcomes in students' critical thinking skills that are not in accordance with the KK TP standards and the observation process is carried out by observing the implementation of each indicator of critical thinking skills by each student.

Based on the problems in above, then alternative efforts are needed to solve learning problems which must be done by implementing learning models. This is in line with Hsu et al., (2022) the opinion that there are four method increase ability

think kritis that is with: (1) model learning certain, (2) giverian task to criticize book, (3) use of stories, and (4) use model question *socrate.*

To solve these learning problems, efforts must be made as an alternative, one way is by planning learning which practice and improve skills critical thinking participants. Learning models are an important component of learning activities. One of the learning models used in 21st century learning is the *discovery learning model.* This is in line with research Suwiti, (2022), which states that the *discovery learning model* is one of the learning models that is suitable for students in the modern era like today. Model *discovery* This *learning is based on the* discovery alone in their knowledge so that students are more active and think critically. In this study, researchers used the *discovery learning model* to increase think critical Because in accordance with excess *discovery learning* is able to train critical thinking processes, helping students to strengthen the concept of self, encourage student involvement in learning, learning situations are more stimulating, students are more active in learning because students think and use their abilities to determine the final result. In line with research Chusni et al., (2021), it is known that *several previous studies have discussed the influence of the Discovery Learning model on critical thinking and science learning outcomes. shows that the Discovery Learning model has a positive effect on improving student learning processes and outcomes, discovery learning can be used to develop students' critical thinking skills and learning with the application of the Discovery Learning model has a positive impact on students' learning outcomes and understanding of learning material*

According to Prasetyo & Kristin, (2020), stating that by considering the components that contribute to encouraging students to learn, *discovery learning* can influence understanding and ability critical thinking participants educate. By using the *discovery learning model,* it will make students be active and independent in finding problems in learning as well as participants being educated to more easily understand learning. While researching Yanti & Wijaya, (2023), model *Discovery Learning* is able to make students learn independently with problems and find solutions on their own which results in improving students' critical thinking. By conducting experiments and the inquiry that participants educate will cause people to want to know and look for more information, students are more active and able to do work groups with their friends well. Similar things were revealed by research Kurniawati et al., (2021), which said that the *discovery learning model* is a process of seeking knowledge carried out by students to find a solution to a problem or fact, in other words, students try to find their own knowledge in order to produce meaningful learning. Model *discovery* This *learning is based on the* discovery alone in their knowledge so that students are more active and think critically.

Research on the discovery learning model has been conducted Almulla, (2023); Anggraeni et al., (2023); Darmayanti et al., (2023); Mahfudz & Sukarno, (2023); Muhammad & Juandi, (2023); Namaziandost et al., (2023); Rahman et al.,

(2023); Yerimadesi et al., (2023); Yuliati & Susianna, (2023); Zulyusri et al., (2023), the similarity of this study with previous studies lies in the recognition that *discovery learning* is effective in improving critical thinking skills. All of these studies highlight the importance of learning steps that allow students to actively seek and solve problems independently. The difference is, this study specifically focuses on science lessons at the elementary school level, especially on the low critical thinking skills at SD Muhammadiyah 1 Bandar Lampung which were found through direct observation. The novelty of this study is the focus on the application of the *discovery learning model* to improve critical thinking skills in science learning for students in elementary schools, by paying attention to the context and needs of the Merdeka curriculum which emphasizes inquiry-based understanding and problem solving. So the purpose of the study is to determine the effectiveness of the *discovery learning model* on critical thinking skills of students in grade IV of elementary school.

2. Method

This study uses a quantitative research type using an experimental approach. The research design uses *Pre Experimental Designs (nondesigns).* This design is a real experiment because there are still external variables that influence the formation of the dependent. According to Ermawati, (2023), the results of the experiment which are dependent variables are not solely influenced by the independent variables. This happens because there are no control variables and the samples are chosen freely. This research uses *a one group pretest-posttest design* where only experimental groups only. In this study, the results of the treatment can be known more accurately, because it can be compared with the conditions before the treatment was given.

The one group pretest-posttest research design can be described as follows.

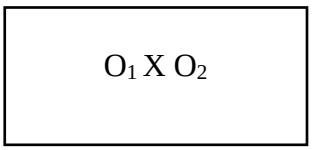

Figure 1. Experimental Design

Information:

O_1 = Test before being given treatment (*Pretest*)

O_2 = Test after being given treatment (*Posttest*)

X = Giving Treatment

The data collection technique in this study used test and non-test instruments. The test instrument is in the form of questions that have been made based on

indicators of critical thinking skills, while for non-tests the researcher used observation techniques, in the form of observations using observation sheets containing the syntax of the discovery learning model. Furthermore, the test instrument was tested first using validity and reliability tests. The population was 114 students with a sample of 28 students. The prerequisite tests used were normality tests and homogeneity tests, to test the increase in the effectiveness of the *discovery* learning model on the critical thinking skills of grade IV students of SD Muhammadiyah 1 Bandar Lampung using the effectiveness calculation test.

3. Results and Discussion

Data collection of activity values in the *discovery learning model* was taken during the learning process for 3 meetings. The results can be seen in table 1 below.

Table 1. Recapitulation of Student Activities

No	Success Rate	Information	Frequency	%
1.	0% < P < 20%	Very Less Active	0	0.00
2.	21% < P < 40%	Less Active	0	0.00
3.	41% < P < 60%	Quite active	1	3,571
4.	61% < P < 80%	Active	18	64.28
5.	81% < P < 100%	Very Active	9	32.14
	Amount		28	100

Based on table 1. above, it shows that the activity of students in the experimental class with the *discovery learning model* is good, this can be seen from the average percentage of student activity showing that there are 0 students in the very inactive and less active categories with a percentage of 0.00%, the fairly active category has 1 student with a percentage of 2.57%, the active category has 18 students with a percentage of 64.28% and the very active category has 9 students with a percentage of 32.14%.

Table 2. Frequency Distribution of *Pretest Scores*

No	Interval Class	Frequency
1.	35 - 43	6

No	Interval Class	Frequency
2.	44 – 52	7
3.	53 – 61	4
4.	62 – 70	5
5.	71 – 79	3
6	80 - 88	3
	Number of students	28
	Average value	57.23
	Standard deviation	14.72
	Not finished	21
	Completed	7
	Percentage of completion	28.57%

Based on table 2. above, it shows that the value interval 35-43 has a frequency of 6 students, the interval 44-52 as many as 7 students, the interval 53-61 as many as 4 students, the interval value 62-70 as many as 5 students, and the interval value 71-79 and interval value 80-81 as many as 3 students. The number of students who meet the KKM 75 is 7 students, while the number of students who do not complete is 21 students with a percentage of completion of 28.57%.

Table 3. Frequency Distribution of *Posttest Scores*

No	Interval Class	Frequency
1.	60 – 66	3
2.	67 – 73	4
3.	74 – 80	5
4.	81 - 94	5
5.	88 – 94	5
6	95 - 100	6
	Number of students	28
	Average value	82.64
	Standard deviation	11.40
	Not finished	7
	Completed	21
	Percentage of completion	75%

Based on table 3. above, shows that the interval value of 60-66 has a frequency of 3 students, the interval of 67-73 has 4 students, the interval of 74-80, the interval value of 95-100 has 6 students. The number of students who meet the KKM 75 is 21

students and those who do not complete are 7 students with a percentage of completion of 75%.

Table 4. Description of Average Pretest and Posttest Results

Mark	KKM	Completed	Not Completed	Lowest Value	The highest score	Average
Pretest	75	7	21	35	85	57.23
Posttest	75	21	7	60	100	82.64

Based on table 4. above, it shows that the description of the average *pretest score* before being given the learning model treatment shows that the *pretest score* has the lowest score of 35 and the highest score of 85 with an average score of 57.23%. The average *posttest score after being given the discovery* learning model shows that the *posttest score* has the lowest score of 60 and the highest score of 100 with an average score of 82.64%. The results of the frequency distribution of the *pretest* and *posttest scores* of the experimental class IV science students can be described in the following bar chart.

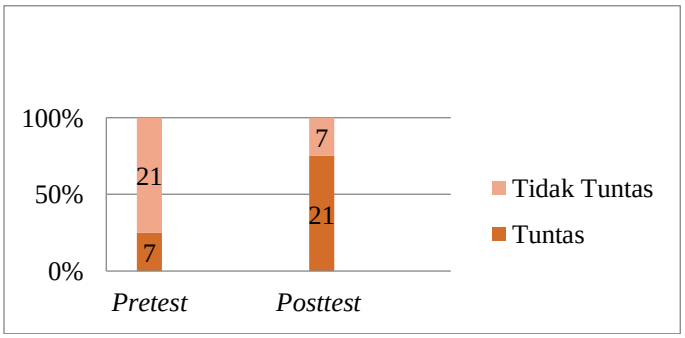

Figure 2. Bar Chart of *Pretest* and *Posttest Values*

After knowing the *pretest* and *posttest scores* in the experimental class, the next step is to find out the effectiveness of using a particular model or treatment in an assessment of students' critical thinking skills using the *N-Gain formula*. The results of the *N-Gain calculation* are then classified into high, medium and low classifications. Here is Table 5. Classification of *N-Gain values* in the experimental class.

Table 5. Results of the N- Gain *Pretest* and *Posttest*

Classification	Information	Average	Conclusion
$g \geq 0.7$	Tall		
$0.3 \leq g \leq 0.7$	Currently	0.64	Effective
$g \leq 0.3$	Low		

Based on table 5. above, it shows that the *N-Gain value in the experimental class is 0.64 with a moderate interpretation. This means that providing discovery* learning model treatment in the experimental class is effective in improving students' critical thinking skills.

The researcher conducted research and delivered materials using the *discovery learning model* in the experimental class, the initial activity began with the researcher giving *pretest questions* to determine the initial test abilities possessed by students. Then the researcher delivered material about the animal life cycle and perfect and imperfect animal metamorphosis. The researcher focused learning on students' critical thinking skills including interpretation, analysis, evaluation, *inference* and explanation. Furthermore, at the end of the learning the researcher gave *posttest questions* to students.

Posttest results, it is known that there was a change in the critical thinking skills of class IV IPS SD Muhammadiyah 1 Bandar Lampung after being given the *discovery learning model.* The changes can be seen in table 6 as follows.

Table 6. Implementation of Critical Thinking Ability Value Acquisition

No	Critical Thinking Indicators	*Pretest*	*Posttest*
1	Interpretation	41.07%	85.71%
2	Analysis	67.85%	83.92%
3	Evaluation	60.71%	78.57%
4	*Inference*	62.5%	76.79%
5	Explanation	69.64%	82.14%

Based on the results of the percentage scores for each indicator of critical thinking ability, there was an increase in values between the pretest and posttest for five indicators, namely Interpretation (Writing what is asked in the question clearly and accurately), Analysis (Writing what must be done to solve the question), Evaluation (Writing the solution to the question), *Inference* (Drawing conclusions from what is asked logically), and Explanation (Giving reasons for the conclusions drawn).

In the interpretation indicator, which measures students' ability to write what is asked clearly and accurately, there was a significant increase from the *pretest value*

of 41.07% to the *posttest value* of 85.71%. This shows an increase in students' ability to provide answers that are in accordance with the questions given. In the analysis indicator, which assesses students' ability to determine the steps needed to solve the problem, there was an increase from 67.85% in *the pretest* to 83.92% in *the posttest*. This increase reflects an increase in students' ability to analyze questions so that they can write more appropriate steps to solve them.

In the evaluation indicator, which measures students' ability to write down the correct solution to the problem, the *pretest score* of 60.71% increased to 78.57% in *the posttest*. This shows that students are better able to check the correctness of the solution to the problem accurately. The *inference indicator*, which measures students' ability to draw logical conclusions from the questions given, increased from 62.5% in *the pretest* to 76.79% in *the posttest*. This increase shows that students are better able to make logical conclusions based on the questions asked. Finally, in the explanation indicator, which assesses students' ability to provide logical reasons for the conclusions drawn, the *pretest score* of 69.64% increased to 82.14% in *the posttest*. The increase in this indicator reflects students' better ability to provide logical and relevant explanations for the questions asked. Overall, the increase in scores on each indicator shows that the learning model used is effective in improving students' critical thinking skills. The following is Figure 3. Classification of *pretest and posttest scores.* Frequency diagram of critical thinking ability categories *pretest* and *posttest* of experimental class.

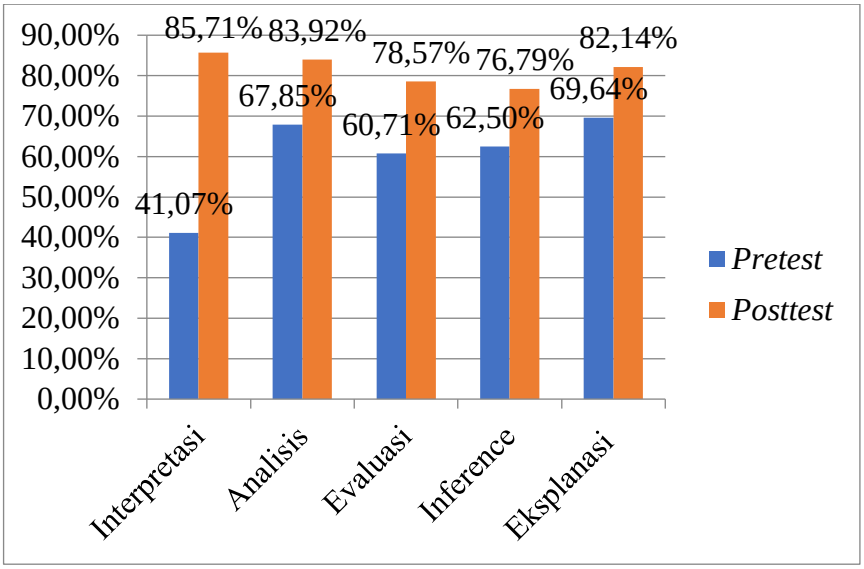

Figure 3. Histogram of Frequency of Critical Thinking Ability *Pretest* and *Posttest*

Research data results were obtained from *pretest* and *posttest scores.* in the experimental class only. The data were processed to determine whether or not there

was significant effectiveness in the application of *discovery learning* on the critical thinking skills of class IV science students of SD Muhammadiyah 1 Bandar Lampung. A complete description of the research data regarding the improvement of students' critical thinking skills can be seen in table 7 below.

Table 7. Description of Research Results

Statistics	***Pretest* Score**	***Posttest* Value**
N	28	28
X Highest	85	100
Lowest X	35	60
Σ	1660	2330
Mean	57.23	82.64
Median	55	75
Mode	50	85 and 90
Standard Deviation	14.72	11.40

Based on table 7. above, it shows that the *pretest* value before the *discovery learning model was applied* with the average value produced in this *pretest value* of 57.23 where there are still many students who have not reached the KKM because the critical thinking skills of students are still low so that they have not been able to answer questions with a high cognitive level accompanied by critical thinking indicators (Interpretation, Analysis, Evaluation, *Inference* and Explanation). After being given the *discovery learning model treatment*, there was a greater increase with the highest average score on this *posttest value of 82.64*. The increase obtained was 82.65 ≥ 57.23 experiencing an increase in effectiveness of 25.42.

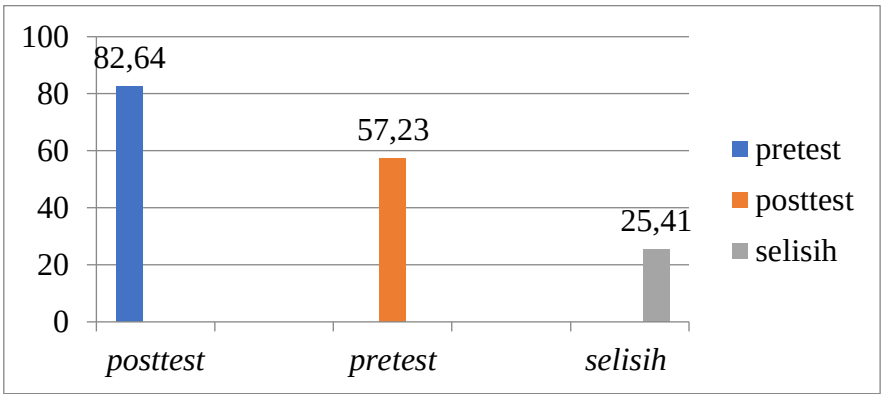

Figure 4. Bar chart of average *pretest* and posttest *values*

Based on the research results, data from critical thinking skills are presented in the form of *pretest* and *posttest* in the experimental class. The average *posttest value* of the Abdullah Bin Abbas class after the *discovery learning model was applied* was 82.64, higher than the average *pretest value* of the Abdullah Bin Abbas class before the *discovery learning model was applied*, which was 57.23.

The normality test is conducted to determine whether the data is normally distributed or not. The data tested for normality are the *pretest* and *posttest data* in the experimental class. The normality test uses the *Chi Square formula* with the *Microsoft Office Excel 2019 program*. The data is said to be normally distributed if $X^2_{the\ calculated} \leq X^2_{table}$ with a significance level α = 0.05 with df = 6-3 = 3. Meanwhile, if $X^2_{count} \geq X^2_{table,}$ then the data is not normally distributed. The recapitulation of *the pretest* and *posttest normality test results* can be seen in table 8 below.

Table 8. *Pretest* and *Posttest* Normality Test

Data	**X^2 count**	**X^2 table**	**Criteria**	**Conclusion**
Pretest	6.062237279	7.81472	$X^2_{count} \leq X^2_{table}$	Normal
Posttest	6.587347479	7.81472	$X^2_{count} \leq X^2_{table}$	Normal

Based on table 8. above, it shows the results of the normality test calculation for *the pretest* obtained $X^2_{count} = 6.06224 \leq X^2_{table}$ 7.81472 means that *the pretest data* is normally distributed. (Appendix 31 150-153). Then the results of the *posttest normality test* obtained $X^2_{count} = 6.58735 \leq X^2_{table} = 7.81472$ means that the *posttest data* is normally distributed.

The homogeneity test is carried out to determine whether the data has the same variance (homogeneous) or not. The data tested for homogeneity are the *pretest* and *posttest data* in the experimental class. The homogeneity test used is the *Fisher Test* or also called the *F- Test* with the *Microsoft Office Excel 2019 program.* Data is declared homogeneous if $F_{count} \leq F_{table}$. F_{table} can be obtained from the dk numerator 28-1 =27 with a significance level of 0.005 or 5%. Meanwhile, if $F_{is\ calculated} \geq F_{table}$, then the data is not homogeneous. The results of the calculation of *pretest* and *posttest homogeneity* in the experimental class can be seen in the following table. The results of the calculation of *pretest* and *posttest homogeneity* in the experimental class can be seen in table 9. below.

Table 9. Data Homogeneity Test *Pretest* and *Posttest*

Information	***Pretest***	***Posttest***
Variance	240,2116	135,582
F_{count}		1,771707
F_{table}		1.904823

Criteria	$1.77170 \leq 1.904823$	
Decision	Homogeneous	Homogeneous

Based on table 9. above, it shows that the *pretest* and *posttest data* are homogeneous, which means that $_{the\ calculated}F \leq F_{\ table\ is\ obtained.}$ This can be seen in the experimental class, *the pretest* and *posttest values* obtained are $_{calculated}F = 1.771707 \leq F_{\ table} = 1.904823$. So the data obtained from the experimental class is homogeneous.

Hypothesis testing is used to test whether there is an increase in the effectiveness of using the *discovery learning model* on the critical thinking skills of science students in grade IV of SD Muhammadiyah 1 Bandar Lampung in the 2023/2024 academic year. This study uses an effectiveness calculation test with the *Microsoft Office Excel 2019 program* which can be seen in table 10 below.

$H_a: \rho \neq 0$ (there is an effect)
$H_o: \rho = 0$ (no) there is an effect)

Table 10. Hypothesis Testing

Information	***Pretest***	***Posttest***
Average	59.2857 1	83.21429
Standard Deviation	14.72	11.40
Min	35	60
Max	85	100
Improvement Results	59.28	83.21

Based on table 10. above, it shows that the value produced from the average *pretest* and *posttest* has increased, it is stated that the calculation results obtained are effective. The calculation results are obtained from the average of the *pretest* value of 59.28 and the average value of the *posttest value* of 83.21. So that it has an increase in effectiveness of 40.37% with a moderate category. This is because in the *discovery learning process* it is quite good, students have begun to understand the questions given well according to the critical thinking indicators. Based on the calculation of effectiveness, it can be concluded that $Ha_{\ is}$ accepted and $Ho_{\ is}$ rejected, meaning that there is an increase in the effectiveness of the *discovery learning model* on the critical thinking skills of class IV IPAs SD Muhammadiyah 1 Bandar Lampung.

Based on the research data, there was a significant increase in students' critical thinking skills after the implementation of the *Discovery Learning learning model* in grade IV of SD Muhammadiyah 1 Bandar Lampung, especially in the subject of

Science. These results were obtained through a comparative analysis of pretest and posttest scores covering five indicators of critical thinking based on Facione's theory, namely interpretation, analysis, evaluation, inference, and explanation. Each indicator showed an increase, especially in the interpretation aspect, which increased by 40.37% and was in the moderate category.

This increase in critical thinking skills is closely related to the characteristics of *Discovery Learning* which encourages active involvement of students in the learning process and discovery of knowledge. As expressed by Chusni et al., (2022), the application of *Discovery Learning* with variations of *multiple representations* can significantly improve students' critical thinking skills in a science learning environment. Discovery Learning is also considered capable of developing students' activeness and independence in finding learning concepts, in line with the opinion Wuda & Anugraheni, (2021) that this model involves students' ability to search for and find something systematically and critically. *The discovery learning model* is better at improving critical thinking skills compared to the inquiry model, as can be seen from the average results produced showing *discovery learning* with a large category (Suryaningrum & Mawardi, 2023).

In addition, the results of the study showed that this learning model, especially when combined with the *Reading, Questioning, and Answering* (RQA) method and media such as animated videos, is more effective in encouraging students to understand complex scientific concepts and develop their ability to critically assess information. The study Hariyanto et al., (2023) confirmed that this learning model showed better results in problem-solving abilities compared to conventional models, improving students' analytical skills and critical thinking abilities.

However, the success of *Discovery Learning* also depends on the context and additional learning support. In a more structured learning environment, students who have better access to supporting materials such as digital-based visualizations and step-by-step exercises tend to achieve higher results in critical thinking. This is in line with findings from a variety of studies, including one reviewed in *the Journal of Educational Sciences* by Manurung & Pappachan, (2025), who found that integrating *Discovery Learning* with technology strengthened students' ability to interpret data and make more logical decisions in science classes.

The improvement of learning outcomes in each critical thinking indicator is supported by various other studies that mention the effectiveness of discovery learning. According to Prasetyo & Kristin, (2020), this model not only facilitates understanding but also hones critical thinking skills through an approach that makes students active and independent.Yuliani et al., (2021) added that discovery learning encourages students to find problems and solutions independently, thus training critical thinking skills and group collaboration. In this study, students appeared more responsive and showed better collaboration skills, in line with the findings Hanifah et al., (2022) who noted that discovery learning increases students' response to new

things, helping them draw conclusions from the learning they do.

The discovery learning model has also been shown to improve learning outcomes and critical thinking skills in a variety of subjects and educational settings. Mustikaningrum et al., (2021) stated that this model is in accordance with current developments and increases student activeness in discovering relevant important concepts. Findings from Ravina et al., (2024) reinforces that critical thinking skills can be significantly improved through discovery learning, which actively involves students in the learning process.

Active student involvement is one of the main aspects developed in the discovery learning model, students are not only encouraged to produce their own conclusions, but also undergo the process of problem solving, discovery, and experimentation. According to Bahtiar & Maimun, (2022) the experimental class, the value is better than the control class because the discovery learning model is more effective in increasing the enthusiasm, independence, and activeness of students in solving problems.

In the research conducted Dumayanti et al., (2022) emphasizes the importance of critical thinking skills trained through careful and logical decision making, especially through a learning process that involves exploration and discussion. Discovery learning is an effective learning model in improving students' critical thinking skills, both in the ability to analyze, interpret, and in the ability to conclude and work collaboratively.

4. Conclusion and Suggestions

The Discovery Learning learning model is effective in improving the critical thinking skills of fourth grade students in the subject of Science at SD Muhammadiyah 1 Bandar Lampung. This study shows that after the implementation of this model, there was an increase in the average score of students' critical thinking skills from 57.23 in *the pretest* to 82.64 in *the posttest*. This increase is also indicated by the results of the N-Gain test of 0.64, which is included in the moderately effective category. The *Discovery Learning* model has been proven to encourage students to be more active and involved in the learning process, increasing critical thinking indicators such as interpretation, analysis, evaluation, inference, and explanation. The increase was seen in the interpretation aspect which rose from 41.07% in the pretest to 85.71% in the posttest. The results of the analysis showed that there was an increase in effectiveness of 40.37%, which indicates that this learning model is effective in creating an interactive learning atmosphere and encouraging students to think actively. From the results of this study, it is recommended that educators apply the discovery learning model in the learning process in schools. The application of this model can not only create a pleasant learning atmosphere, but also encourage students to be more actively involved in learning. Educators are advised to use

learning media, such as videos, and conduct experiments or experiments that are relevant to the subject matter. In this way, students will find it easier to understand and remember the concepts taught, as well as improve their critical thinking skills. In addition, further research can be conducted to explore the application of this learning model at various levels of education or other disciplines to gain broader insights into its effectiveness.

5. Author Contribution

Ardhi Yudhisthira and Sofi Cahya Fitri designed the research, collected data, references, and analyzed the data. Amrina Izzatika, Dayu Rika Perdana, Resti Apriliyani wrote the abstract and discussion sections of the article, analyzed the manuscript and guided and analyzed the writing of the conclusion and suggestion sections of the article.

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