

## THE EFFECT OF THE GENERATIVE LEARNING MODEL ON THE STUDENT CRITICAL THINKING ABILITY IN ENVIRONMENTAL CONSERVATION TOPIC

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**Abstract:** The low level of students' critical thinking ability makes students need help understanding science concepts. The application of an interactive learning model can be a solution to this problem. This research aims to analyze the effect of the Generative learning model on the critical thinking ability of 7<sup>th</sup> graders in Environmental conservation Materials. The research method used is the Quasy Experiment method carried out in class VII junior high school SMP Mutiara Insani Tangerang. Students' critical thinking abilities are measured by a written test instrument in the form of essay questions made according to indicators of critical thinking ability that have been adjusted as many as ten questions tested for validity and reliability. The selected experimental class comes from a population that is normally distributed, has a homogeneous variance, and has the same mean. The research results show that the experimental class with the Generative Learning model and the control class with the Discovery Learning model are normally distributed. Hypothesis testing is done by t-test, and the significance level is based on the results of the Posttest; there is a significant influence of the Generative Learning learning model on the critical thinking ability of class VII students. In conclusion, the Generative Learning Learning Model affects the Critical Thinking Ability of 7<sup>th</sup> graders Students in Environmental Conservation material.

**Keywords:** *Critical Thinking Ability, Generative Learning, Environmental Conservation, Integrated Science*

### INTRODUCTION

Critical thinking ability is important because this ability can support student learning activities. Critical thinking can give students a better understanding of learning material, make students have high curiosity, be good at problem analysis, and be open to new thoughts. In the future, this critical thinking ability will be very applicable in students' lives, especially when finding solutions to problems around them is easy. By thinking critically, students will get used to being able to solve their problems and make decisions wisely. According to Putra [1], critical thinking ability is a thinking process skill that enables a person to assess or explore the data, presumptions, and arguments that challenge the beliefs of others. Students' critical thinking ability must be developed to play a crucial role in guaranteeing the success of their academic endeavors [2]. Students should learn science to develop their problem-solving abilities. By practicing critical thinking techniques, one might enhance their problem-solving ability [3]. Making decisions on what should be trusted and done is the essential center of thinking, which is logical and reasonable [4].

In reality, there are still some issues with critical thinking ability in one of the junior high schools in Tangerang. The issues revealed that students' critical thinking still needs to be improved. It is evident in the aptitude of students who struggle with problem-solving ability[5]. Students struggle to argue and communicate their viewpoints clearly, even during class discussions. Students need help to justify an argument and make conclusions from a discussion for subsequent discussion questions. Students could

also not reply to the teacher's instructions or solve the science problems and questions where another group's Critical thinking ability is required since science content requires additional reason. [6]

Based on the findings of the observations, it is clear that educators' learning strategies now have yet to help students practice their critical thinking ability. Instead, using the learning model and method can cause students to become disinterested and passive in their studies. Students' critical thinking and conceptual understanding could be much higher in learning science. The poor value of student learning outcomes serves as proof of this. Learning outcomes impact students' capacity for critical thinking and conceptual mastery [7].

Another cause of problems encountered in junior high schools in Tangerang is the need for more diversity in the selection of learning models and methods, and students get bored of the same pattern quickly. Teachers' learning model tends to be teacher-centered and not active learning because it only uses the discourse method. In learning, there is no habituation for students to be critical, such as only sticking to one book source, not getting used to students asking questions, or finding problems at the beginning of learning. In addition, the evaluation instrument developed by the teacher at school is also less relevant because it still needs low-knowledge questions with a low-level question category with C1-C3 cognitive categories, so it cannot encourage students to think critically [8].

Models can improve students' critical thinking ability by choosing the right learning model and following the competency achievement index.

The model of generative learning is one of them. Finding a solution utilizing the generative learning model will be simpler because it is possible to carry out structured activities that allow students to learn during practical fieldwork. Because they enable students to learn through inquiry, critical thinking abilities are crucial to the learning process [9].

According to Bustami et al., critical thinking ability in contextual learning produces higher test scores than ordinary learning [10]. In line with that, Kiswadi et al. said that implementing contextual learning in physics subjects improved students' critical thinking ability and creativity[11]. So the teacher needs to choose a learning model suitable for material applicable to everyday life so that students get an active and real learning experience. Based on the description above, this study aimed to analyze the effect of the Generative Learning Learning Model on the critical thinking ability of Class VII Junior High School students in the concept of Environmental Conservation. It is appropriate for developing students' critical thinking skills [12].

## RESEARCH METHODS

This research was conducted using a quantitative approach to the experimental method. With a research design in the form of a quasi-experimental posttest-only control group design.[13] The research design uses two classes, where the experimental class will use the generative learning model. In contrast, the other class, the other one is the control class, will use the learning model used in schools, namely discovery learning, where X1 is denoted as the experimental class with the generative learning model. At the same time, X2 is defined as the control class with the discovery learning model. The subject of this research was conducted in class VII students, as many as 44 students. The research location chosen in this study was SMP Mutiara Insani Medang. The research was carried out in 2023. The data collection technique used was a written test method with description questions and observation sheets to implement learning. The instruments used in this study included interview guide instruments, students' critical thinking ability test instruments, observation sheets, and also learning device validation questionnaire sheets.

The data obtained in this study will be validated and analyzed using validity, reliability, discriminatory power, and difficulty by using SPSS 22 software. And the hypothesis testing will be carried out after the prerequisite test to compare the average variables of the two samples. In this study, the hypothesis was tested using SPSS 22 software with the Independent Sample Test, which aims to test the difference in the mean of the two groups and the effect of the independent variables on the dependent variable. An Independent T-Test is done if the data is normal and homogeneous. And also, do the N-Gain

test and effect size to test the effectiveness of the learning models used in this study.

The critical thinking test developed refers to critical thinking indicators developed by Ennis [14]. Criteria for students' critical thinking, according to Karim [15], are presented in Table 1.

Table 1. Score categories of students' critical thinking ability

Scale	Criteria
$81.25 < x \leq 100$	Very high
$71.50 < x \leq 81.25$	High
$62.50 < x \leq 71.50$	Medium
$43.75 < x \leq 62.50$	Low
$0 < x \leq 43.75$	Very low

## RESULTS AND DISCUSSION

### Posttest Analysis Results of Students' Critical Thinking Ability

The research results were obtained from the posttest scores of students in the experimental and control classes. Student scores will be analyzed using SPSS version 22. The following is the student posttest results:

Table 2. Statistic data of the posttest score of the experimental and control class

Statistic	Experiment	Control
Number of samples	22	22
Ideal score	100	100
Maximum score	92	89
Minimum score	57	54
Range	35	35
Average	81.86	74
SD	10.95	10.53
Variance	120.10	111.01

And here is the following distribution of students' score obtained from the experimental and control classes in the category.

Table 2 shows that in the control class with a total sample of 22 students, the distribution of posttest scores was obtained by 7 students in the very high category, 12 students in the high category, 3 students in the medium category. The control class received an average score of 74 points. The control class had the lowest and highest scores, respectively, 54 and 89. In addition, the average value after this treatment was in the high category. The graphical presentation shows that the control class experienced differences and increased scores. It starts from the very low category before treatment to the average high category. However, the mean scores of the two groups were similar and remained in the very low category, indicating that the posttest data distribution of the two groups was similar.

Figure 1 and Table 2 show that in the experimental class with a total sample of 22 students,

the posttest score distribution obtained was 15 students in the very high category, 3 students in the high category, 4 students in the medium category. The average score was 81.86. The experimental class had the lowest score of 57 and the highest score of 92. Many students began to understand the concept and could answer critical thinking questions after being treated twice with the Generative Learning model. In addition, the average value after this treatment is in a very high category. The graphic presentation shows that this experimental class has experienced changes and increases in value. Starting from the very low category before treatment until the average reaches the very high category.

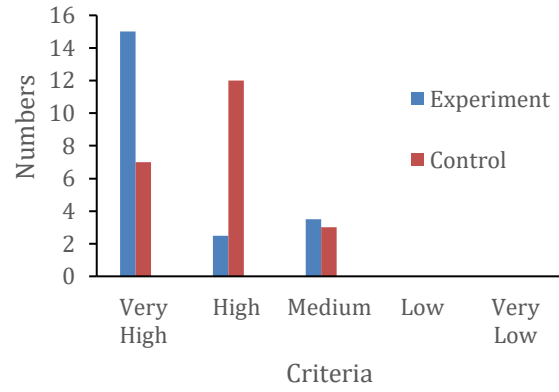


Figure 1. Posttest Score Distribution

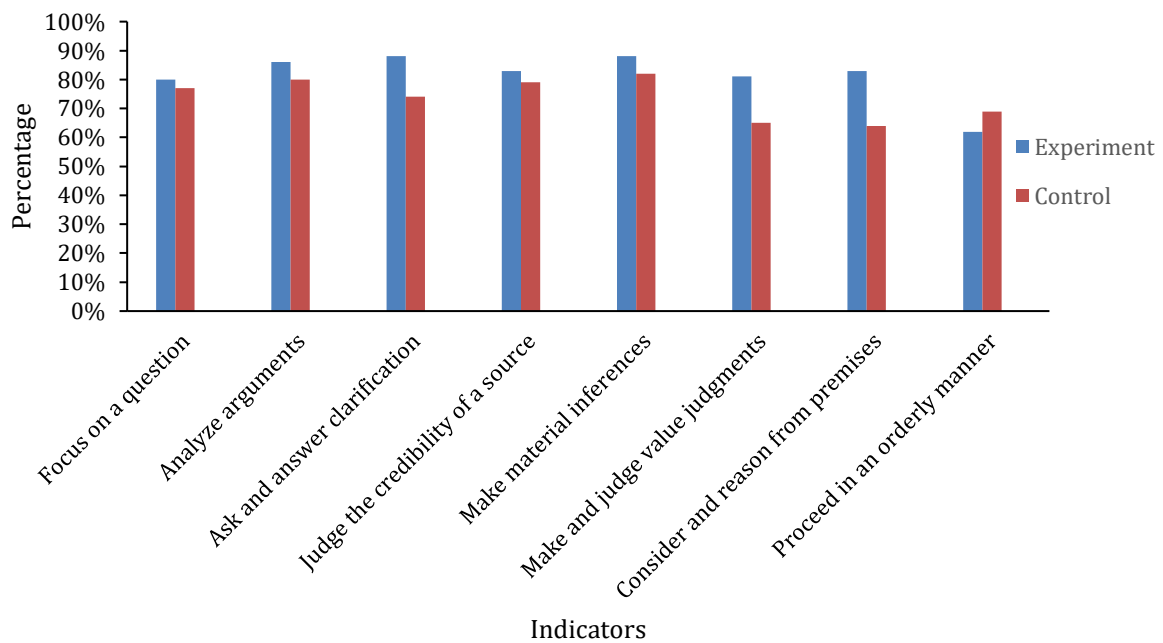


Figure 2. Student Achievement of Critical Thinking Ability Indicators

The information regarding the graphs of student achievement shown above was compiled using Ennis' markers of students' critical thinking ability. Based on the graph above, it is clear that the experimental class has a significant score percentage of students who are proficient in each of the determined indicators of critical thinking ability. As with the focus indicators on questions, 80% in the experiment and 77% in control, that means students have been able to do so, where students can formulate problems from the given discourse and also provide simple explanations. Students being able to formulate problems or find problems from the existing discourse is very important because, with this indicator, students are expected to be sensitive to environmental conservation issues. Students learn how to apply the concepts they learn in class to the context of their daily life. Students can also draw connections between science and technology and useful and

practical classroom instruction. Learning science has the goal of fostering a connection between society and science and technology as one of its dimensions [16].

Furthermore, on the argument analysis indicator, 86% in the experiment and 80% in control, students can analyze and provide arguments on the problems that occur, where when giving arguments, students are required to think critically. It means that students are getting used to being critical in conveying arguments and responsible for their opinions. Students become accustomed to giving assessments and analyzing problems that occur. With this, students can distinguish facts and assess an outcome to hone their critical thinking ability. Analyzing also means students are critical in reading information. Students are expected to engage in critical reading to learn as much as possible about the subject matter or concept they are studying. The tasks involved in critical

reading include comprehending texts by identifying facts and interpreting what has been read [17].

The asking and answering indicator for clarification scored 88% in the experiment and 74% in control, where students could ask questions and answer clarifications from the discourse given in detail and critically. This indicator gets a high score because students begin to know which actions are right and which are not and provide clarification of differences of opinion from existing sources. Students will be sensitive to change and critical of it. With these, students can evaluate the facts and information they find.

The indicator assessing the source's credibility gets 83% in the experiment and 79% in control, where students can judge whether a discourse is true or not and provide action from that source. It means that here there are critical abilities that students apply in their social science disciplines, such as determining the accuracy of sources and information found and distinguishing relevant information, facts, or statements. By thinking critically, students can distinguish between opinions and facts. Especially information and views were obtained from the digital world. It is possible that the answers given by each individual can generate curiosity about the truth of the matter.

Furthermore, the indicator for making conclusions gets 88% in the experiment class and 82% in the control class, meaning that students can conclude carefully from discussing the problems given. Conclusions are made briefly, clearly, and logically using facts, characteristics, and relationships in the existing problems. Students are expected to be accustomed to concluding using logic so that the conclusions are appropriate. The procedure aids in the growth of students' critical thinking abilities. Because reading requires analysis and judgment to select the appropriate material, so it can enhance cognitive abilities [18].

On the indicator of making and assessing an assessment, a score of 81% in the experiment class and 65% in the control class means that students can determine values and attitudes towards the actions that will be taken to solve the pollution problems that occur. With this, students can get clear statements with good information and consider the possibility of the assessment given.

The indicator considering the premise and giving reasons gets 83% in the experiment and 64% in the control class, meaning that students can consider the truth of the discourse and give reasons if they agree or disagree with it. With this, students can consider existing statements and assumptions while still being based on relevant information and being open when providing valid reasons and evidence.

The last indicator, the indicator processing systematically, gets 62% in the experiment and 69% in control, which means this value is lower than the other indicators. It happens caused by students who

are less systematic thinking because they have yet to have a full learning experience. It is necessary to retrain students' critical thinking ability with a systematic pattern so that students are accustomed to having the awareness that all things are interconnected in a series so that students' knowledge is constructed sequentially and intact. When identifying what needs to be done, critical thinking abilities are reflective and logical thinking abilities [19].

### **The Effect of Generative Learning on Student's Critical Thinking Skills**

The Generative Learning model is very suitable and contextual for environmental conservation, affecting the improvement of students' critical thinking ability. By looking at the stages of learning in Generative Learning, students can participate more actively and explore the learning process, producing real experiences. Students participate actively in the process of observing, focusing on problems, challenging problems, and implementing strategies that have been set to solve problems. For students to succeed in lifelong learning, they must have strong scientific literacy and critical thinking abilities [20].

Generative learning affects students' thinking ability supported by the stages of learning. Indicators focusing on questions and making and assessing student assessments can increase because it is supported by the exploratory stage of the Generative Learning syntax, where students can explore their knowledge with a strong memory and express ideas and formulate problems according to the problems given.

The indicators process systematically and consider and give reasons, ask and answer clarifications, and assess the credibility of these sources supported by student activities in the focusing syntax where students are used to understanding the context of existing problems and coherently process them to find good solutions.

Another indicator that gets good results is the indicator of argument analysis and making conclusions where students are facilitated at the challenge and application stages because, at this stage, students are free to express opinions, discuss and provide other critical considerations of ideas to other students.

According to observations during learning, syntax influences students' critical thinking ability the most. It is especially true in the problem-focusing stage of students, where they use their knowledge and experience to generate new knowledge through problem discovery and analysis. Next is the challenge stage, where students will conduct discussion activities involving the same subject matter to solve the problem. At this difficult stage, it will teach students that they all have the same task to solve the problem. With activities like this, students can think

further to improve their ability to analyze, interpret, and solve problems.

The effect of mutually supportive learning implementation conditions can be achieved with the help of this generative learning model, where students work in groups to work together to solve problems. Students will develop curiosity, take initiative, analyze, and talk to each other in groups. Students will form positive habits by helping and supporting one another.

The generative learning model positively affects students' critical thinking ability. This model teaches students to assess, evaluate, and make decisions based on previously processed information. Thus, students will acquire consistent thinking ability because they will be accustomed to exploring and exploring the relationship between ideas and facts related to this lesson.

Generative learning concentrates on enhancing the human intrinsic urge to comprehend the surroundings through exploration and organization to gain knowledge, identify their issues, and look for solutions. The generative learning approach also helps students to explore their knowledge and think creatively. This instruction focuses on making an effort to actively integrate new content with the students' existing schema [21-22]

### Analysis of Validation for Critical Thinking Test Instrument

#### a.) Normality Test

The Kolmogorov–Smirnov test was carried out in the SPSS 22 program to determine whether the sample population is normally distributed. Posttest results of both experimental and control classes were tested with a significant level of 95% ( $\alpha = 0.05$ ). Here is the result of the Normality Test for the Experiment and control class.

Table 3. Normality Test Score

Normality Score	
Experiment	Control
0.2	0.2

The result shows that the normality test data made using the Kolmogorov–Smirnov Test in SPSS 22 found the same value in the experimental and control classes, namely with Sig. of 0.2. Because  $r_{\text{count}} 0.2 > r_{\text{table}} 0.05$ . The results of both the experimental and control class samples show that  $r_{\text{count}}$  is greater than the  $r_{\text{table}}$ , so  $H_0$  is accepted. It indicates that the sample is from a population with a normal distribution and can be tested for homogeneity.

#### b.) Homogeneity Test

The homogeneity test was carried out in the SPSS 22 program to determine whether the

sample population was homogeneous. The results are considered normal. Posttest results of both experimental and control classes were tested with a significant level of 95% ( $\alpha = 0.05$ ). Here is the result of the Homogeneity test for the experiment and control class.

Table 4. Homogeneity Test Score

Homogeneity Score	
Experiment	Control
0.001	0.001

The table shows that the homogeneity test produces a Sig value of 0.001, which means 0.001 is less than 0.05. According to the homogeneity test criteria, the table count shows that the data from the learning model has homogeneous data.

#### c.) Independent Samples T Test

The T-Test was used to calculate the effect. The calculated data show that the sample population is normally distributed and homogeneous; therefore, to analyze the two different groups. Complete data is available in Class Sig. The tailed sig 2 table value exceeds  $\alpha$  (0.05). Here is the result of the T-Test in the experiment and control class.

Table 5. T-Test Score

T-Test Score	
Experiment	Control
0.006	0.007

The table above shows that the hypothesis with an independent T sample test, namely  $H_1$ , is accepted, or  $H_0$ , is rejected. It shows the r-value of Sig (2-tailed) count is 0.006  $< r$  Table, so it can be concluded that  $H_0$  is rejected. Thus, there is an effect of generative learning on the critical thinking ability of Class VII students in environmental Conservation material.

#### d.) N-Gain Test

The n-Gain Test was used to determine how much the generative learning model improves students' critical thinking ability in the experimental and control classes. The following table shows data analysis on improving students' critical thinking abilities.

Table 6. N-Gain Test Score

N-Gain Score	
Experiment	Control
66.21%	47.12%

The N-Gain score for the experiment class is 66.21% converted into an effective category; this indicates that students have better critical thinking ability in the experimental class after applying the generative learning model. Students' critical thinking abilities were significantly improved, with an increase of 66.21%, supported by contextual material and the right model syntax. This learning has a positive impact, and student outcomes improve. In addition, it affects the relationship and the expected output per the initial learning objectives. However, the control class has an N-Gain of 47.12%, indicating less effectiveness. As a result, students have better critical thinking abilities but still need to improve. It is because students are getting bored with the same learning methods that educators have applied for years. Discovery learning with the help of media types will be easier, especially in large classes.

#### e.) Effect Size

Table 7. Effect Size Score

Effect Size Score
D = 0.733

Based on the data, the effect size score was 0.733. With 0,733, which is means in the medium effect category. It means that the experimental class treated with the Generative Learning model had a medium effect on their critical thinking ability. It is consistent with other data obtained, which shows that students showed increased scores on their critical thinking ability tests and that their learning habits had a positive effect.

If it is associated with the results of the N-Gain test, the results are further strengthened. These results indicate that the generative learning model effectively improves students' ability to think critically. In addition, it correlates with the results of hypothesis testing, which shows that this generative learning model improves students' ability to think critically about environmental conservation topics.

#### Analysis research Hypothesis test

The analysis and hypothesis test findings show that the hypothesis with an independent samples T-test significantly affects the critical thinking ability of 7<sup>th</sup> graders students using the generative learning model. According to the study's findings, the experimental class' score is always higher than the control class.' There is a significant difference in scores between the experimental and control class. The number shows how the two learning models have

different effects, additionally concerning how each paradigm affects students' capacity for critical thinking ability.

Students are guided to be able to discover their concepts as evidence for the claims they make during the generative learning model phase, and during the phase where they look back, the teachers confirm the concepts they have discovered when they are told how to apply them so they can use the right concept when answering questions [23].

When the Generative Learning model has a higher average score, it means that the model and its content have been adapted to student's needs to help them develop critical thinking abilities. In other words, the experimental class significantly affects students' capacity for critical thinking ability. According to the  $\text{count}$  value of Sig (2-tailed), which is  $0.006 < 0.05$ ,  $H_1$  is accepted while  $H_0$  is rejected. Therefore, this study shows the impact of the generative learning model on 7<sup>th</sup> graders' critical thinking ability in environmental conservation materials.

#### CONCLUSION

Based on the results of the research, there is an effect of the Generative Learning model on the critical thinking ability of 7<sup>th</sup> graders Junior High School students in the material of Environmental Conservation. This conclusion is based on the results of hypothesis testing and the results of the analysis of differences in the results of students' critical thinking ability tests in the experimental and control classes. The results of the hypothesis testing were carried out using SPSS software version 22 and obtained Sig. i.e.  $0.006 < 0.05$  so  $H_0$  is rejected  $H_1$  is accepted. The learning syntax in the Generative Learning model has the potential to affect a positive impact on the critical thinking ability of 7<sup>th</sup> graders students. Students can actively participate in the learning process, especially when it's energetic and engaging and allows for problem-solving. Students are expected to think critically and methodically when solving problems and actively participate in group projects to gather and process information, solve problems through discussion, and consistently deliver presentation outcomes.

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