

# Students' Scientific Attitude in Science Learning Using Discovery Learning-Based Environmental Pollution Digital Book

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**Abstract:** The composition of the contents of the digital book is adjusted to the syntax of the discovery learning model. The results of the study were to determine the effect on students' scientific attitudes in learning science. The research method is Quasi-Experimental Design using The Posttest-only control group design. The subjects of this study were students of class VII MTs. Maarif Ambulu. Data collection methods are observation methods and questionnaire methods. Data analysis of the scientific attitude observation method used a t-test, student scientific attitude questionnaire method and scientific performance observation method used descriptive analysis. Based on the results of the t-test analysis, it is known that there is an influence on students' scientific attitudes in learning science by using discovery learning based on environmental pollution digital books. Based on the results, the average value of the experimental class was 80.50 with very good criteria and the control class was 69.67 with good criteria.

**Keywords:** Scientific attitude; Digital book; Science Learning

## Introduction

Efforts to increase student awareness of the environment are through education by preserving and improving the natural environment which is integrated into the curriculum in science learning materials (Fitriati et al., 2019). Science learning displays problems in the surrounding environment, one example is the problem of environmental pollution (Novayani et al., 2015). That way, in environmental pollution material, science learning can instill a scientific attitude. Science learning has the aim that students gain an experience through planning and carrying out scientific performance activities to form scientific attitudes and increase awareness for the maintenance and preservation of the environment and natural resources so that scientific attitudes are characteristics that must be possessed when students learn science (Hendracipta et al., 2016).

Scientific attitudes are used from learning that is obtained based on experience, learning, and problem

identification. The appropriate learning model is discovery learning because it can influence the results of students' scientific attitudes to improve students' abilities and achieve learning (Asmarani et al., 2017). By (Novayani et al., 2015) showed the effect of the discovery learning model which resulted in the value of students' critical thinking skills on environmental pollution material. In addition, according to (Patrianingsih et al., 2016) the scientific attitude of students whose learning uses the discovery learning model is in a very good category. Based on the results (Rosmah et al., 2018) teachers need a learning model so that students can work on learning problems to compile their knowledge, develop inquiry, and high thinking skills, develop independence, and confidence, and be able to use their skills to work together to solve problems.

Teachers need media that can present interesting material and the development of learning models in Biology learning, one of which is discovery. It is necessary to integrate the discovery learning model with

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media to be applied to environmental pollution material. One of the media that can be integrated is using digital books or e-books. E-books will be effective if applied with discovery learning-based learning. In designing e-books, the character of students must be considered (Putri & Festiyed, 2019). E-books or digital books are learning tools that are systematically arranged so that students can learn independently using the language they understand. this digital book is equipped with images and videos through electronic devices (Mulyar et al., 2018). (Budiarti et al., 2017) found that learning outcomes were influenced by interactive ebooks equipped with a discovery learning model with. By (Handoko et al., 2016) the development of a biology learning module based on discovery learning has characteristics that prioritize group cooperation obtained results worth using and can strengthen three aspects, namely knowledge, skills, and social.

From the description above, it is necessary to conduct research using discovery learning-based digital book media to assess the scientific attitude toward environmental pollution material. The difference with previous research is that the composition of the contents of the digital book is equipped with the steps of the discovery learning model. It is expected that the results of this study will determine the effect of using discovery learning-based environmental pollution digital books in science learning on students' scientific attitudes.

**Method**

The research method used in this research is Quasi-Experimental Design. This study was conducted to compare the experimental class and the control class. The research design applied was The Posttest-only control group design. The experimental class used discovery learning-based digital book multimedia, but the control class did not use media but used the discovery learning model. The subjects in this study were seventh-grade students of MTs. Maarif Ambulu, taking two classes that will be used as sample classes, namely class VII A is the experimental class and class VII B is the control class.

The research data collection methods are the observation method and questionnaire method. The observation method was used to observe students' scientific attitudes during learning activities in each class. Additional data to complement aspects of scientific attitude assessment that cannot be obtained from the observation method, the questionnaire method is used which is given at the end of the meeting. While other data is data on scientific performance ability from observations. Scientific performance data is used to

determine the impact of scientific attitudes on scientific performance results in experimental classes.

Data analysis of the scientific attitude observation method in this study is quantitative data analysis by testing the hypothesis. Previously, the homogeneity test will be carried out first, namely to determine whether the two classes are homogeneous or inhomogeneous, then the normality test is used to determine whether the two classes are normally distributed or not. If the resulting data is normally distributed and homogeneous, then proceed with hypothesis testing using the t-test. For data analysis, the student scientific attitude questionnaire method and scientific performance observation method were analyzed using descriptive analysis. The data obtained were then analyzed descriptively, the results of which will be interpreted with the following criteria.

**Table 1.** Criteria for Scientific Attitude and Scientific Performance

Interval (100)	Criteria
80 < score ≤ 100	Very good
60 < score ≤ 80	Good
40 < score ≤ 60	Simply
20 < score ≤ 40	Less Good

**Result and Discussion**

This study used two classes as research subjects, namely class VIIA as the experimental class and class VIIB as the control class. The experimental class used digital book media on environmental pollution material based on discovery learning while the control class without media only used the discovery learning model.

*Student Scientific Attitude Observation Results*

Data from observations during the learning process obtained scientific attitude values. The initial tests carried out were normality and homogeneity tests which obtained the following results.

**Table 2.** Analysis Results of Normality and Homogeneity Tests

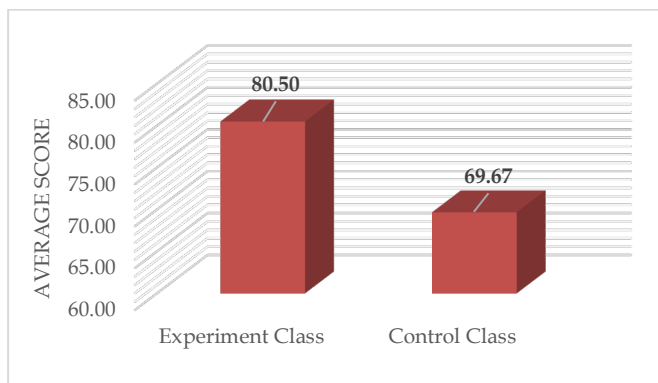
Class	Normality	Homogeneity	Summary
Class Experiment	0.097	0.100	Homogeneous and Normal
Class Control	0.035	0.100	Homogeneous and Normal

The results of the data analysis showed that both classes were normal and homogeneous, so proceed with the parametric test, namely the t-test with the following results.

**Table 3.** T-test Analysis Results

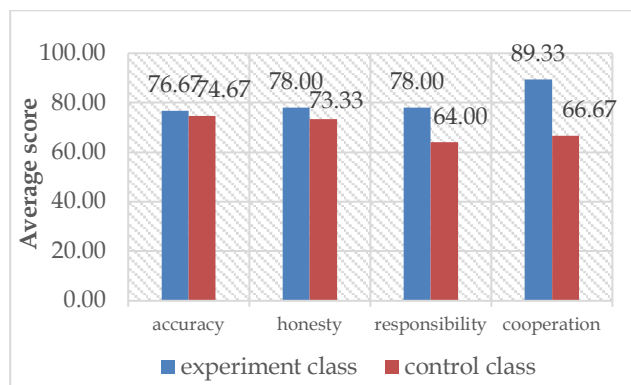
T-test	Summary
0.007	There is a significant influence

Based on the results of the t-test analysis, it was found that  $H_0$  was rejected and  $H_a$  was accepted. These results indicate that there is an influence on students' scientific attitudes in science learning using discovery learning-based digital books on environmental pollution. A scientific attitude in studying science is very useful for building student character (Rosmah et al., 2018). The value of scientific attitudes between the two classes based on the average score obtained the following results.



**Figure 1:** Scientific Attitude Value of Observation Results

Based on the scientific attitude value of the observation results, the average score of the experimental class was 80.50 and the control class was 69.67. So that the scientific attitude value of the experimental class is higher than the control class. The value of the scientific attitude of the experimental class has very good criteria, good criteria in the control class. The scientific attitude value from the observation of the experimental class has very good criteria because it uses a digital book based on the discovery learning model. Based on (Budiarti et al., 2017) the use of e-books with a scientific discovery learning approach invites students to understand the concept of meaning and linkage through a process that leads to conclusions. Concepts are found and not presented at the end, but students are asked to identify what students want to know so that information searches are carried out then students organize and construct what is known to be understood in the final form. According to that (Capriconia & Mufit, 2022) students' attitudes correlate with students' conceptual understanding, Because overcoming students' understanding also overcomes the difficulties faced by students (Jamaludin and Batlolona, 2021).



**Figure 2:** Value of Scientific Attitude Aspects of Observation Results

Based on the observation results, the average score of the value of scientific attitude aspects, namely student accuracy in the experimental class is higher than the control class, which is 76.67 while the control class is 74.67. The aspect of accuracy is one of the indicators of scientific attitudes which is also influential.

Indicators of conscientiousness are the accuracy of the implementation of observation activities by the steps of the procedure, measurement activities, and activities to record data from observations (Ulva et al., 2015).

In the aspect of honesty, the average score of scientific attitudes in the experimental class was 78.00 and in the control class was 73.33. The scientific attitude indicators were also higher in the experimental class than in the control class from the aspect of honesty.

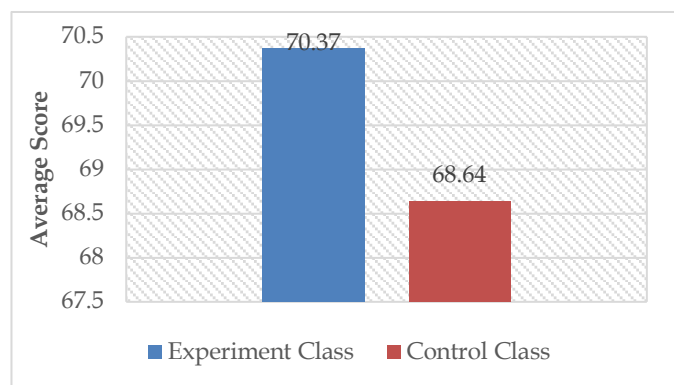
The honesty aspect is a characteristic that is needed when working in groups on observation activities and experimental activities. Evidence of honesty is if students do not manipulate data and do not cheat (Hindarto et al., 2013). While the average score of the scientific attitude value of the responsibility aspect obtained by the experimental class was 78.00 and the control class was 64.00.

In the aspect of cooperation, the average score of scientific attitudes obtained by the experimental class was 89.33 and the control class was 66.67. Scientific attitudes in the form of cooperation are shown in the form of respecting opinions and getting advice from other group members, then showing an attitude that is not self-righteous, helping if there are group members who are having difficulty, discussing when there are problems in a group (Ulva et al., 2015).

So, from the four aspects including accuracy, honesty, responsibility, and cooperation, the average score of scientific attitudes in the experimental class was higher than the control class. Some of the things that cause human attitudes and opinions on natural activities are scientific attitudes consisting of attitudes of curiosity, respect for facts, and critical thinking attitudes toward

students, attitudes toward students finding and student creativity, attitudes toward cooperation, open-minded attitudes, attitudes toward cooperation, diligence, and sensitivity to the environment (Saputi & Wilujeng, 2016). The application of the assessment for the learning-based discovery learning model can improve science learning outcomes, scientific attitudes, and respond scientific attitude scores (Hariawan, 2022). Discovery Learning is the process of discovering and identifying oneself (Restu & Syukur, 2021).

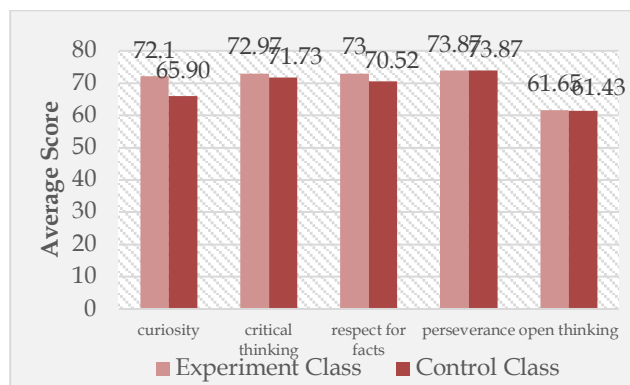
*Results of the Student Scientific Attitude Questionnaire*



**Figure 3:** Scientific Attitude Questionnaire Results

Based on the questionnaire results' scientific attitude value, the experimental class average score was 70.37 and the control class was 68.64. So that the scientific attitude value of the experimental class is higher than the control class. Scientific attitudes in experimental and control classes with good category scientific attitude criteria. The scientific attitude value from the observation results of both classes has good criteria because both use the discovery learning model on environmental pollution material. Implement the integration of environmental issues as an initial problem to explore the problem-solving process of high school students and propose the concept of solving environmental problems that affect higher environmental literacy scores (Yeh et al., 2021).

In science learning, students are taught to respect and maintain nature. The application of a learning method applied by the teacher when delivering environmental pollution material will greatly influence and improve students' attitudes towards environmental care in the form of environment-based learning. Environment-based learning methods because this method utilizes the surrounding nature as a learning resource that has an attitude of caring for the surrounding environment (Fitriati et al., 2019)



**Figure 4:** Value of the Scientific Attitude Aspect of the Questionnaire Results

Based on the results of the questionnaire, the average score of the value of the scientific attitude of students on the aspect of curiosity in the experimental class was 72.1 with good criteria and the control class was 65.90 with good criteria. The scientific attitude value of curiosity in the experimental class was 6.2 higher than in the control class. Curiosity is an aspect of scientific attitude that students must have, so a learning model is needed to improve it (Kencana et al., 2022).

In the aspect of critical thinking, the average score of scientific attitudes in the experimental class was 72.97 with good criteria and the control class was 71.73 with good criteria. This means that the use of discovery learning-based digital books can affect scientific attitudes, namely curiosity and critical thinking. By the opinion (Novayani et al., 2015) conveyed that the application of discovery learning there is a significant influence on the ability of critical thinking skills of junior high school students. (Jannah & Atmojo, 2022) shows that forms of digital media innovation in empowering 21<sup>st</sup>-century critical thinking skills in Natural Science learning. While the average score of scientific attitudes in the aspect of respect for facts, the results obtained in the experimental class were 73.00 with good criteria higher than the control class of 70.52 with good criteria. the use of digital books equipped with discovery learning, affects the scientific attitude of students. This is to the results of the research (Widiadnyana et al., 2014) concluded that students who applied the discovery learning model here in scientific attitudes compared to students who used the direct teaching model with an average s with very good categories in the curiosity aspect and respect for facts aspect.

In the aspect of open thinking, the average score of scientific attitude values obtained by the experimental class was 61.65 with good criteria and the control class was 61.43 with good criteria. The scientific attitude of students is obtained if they are open-minded, including in the good category during practicum activities (Eka

Sari et al., 2020). Of the four aspects consisting of curiosity, critical thinking, respect for facts, and open-mindedness, the average score of the experimental class was higher than the control class. In the aspect of perseverance, the average score of the experimental class and control class both amounted to 73.87 with good criteria. A scientific attitude is an attitude of being able to accept other people's opinions properly and correctly, acting in solving a problem systematically through scientific steps that do not know despair and with perseverance and openness (Ulfa, 2018).

#### Student Scientific Performance Results

A higher scientific attitude in the experimental class than in the control class obtained a good scientific performance value, which was indicated by the average value in the experimental class as follows.

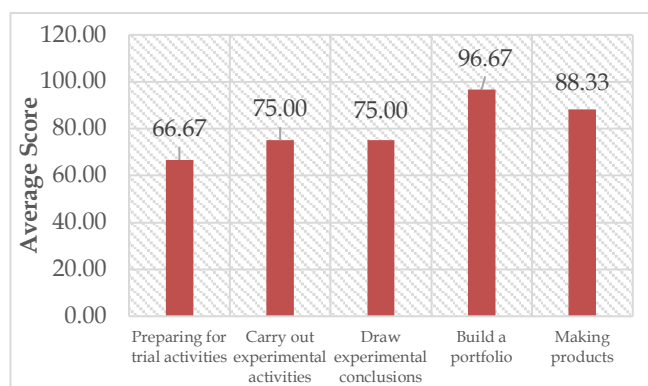


Figure 5: Scientific Performance Result Score

Based on the results of scientific performance, it was found that in the activity of preparing experimental activities 66.67 with good criteria, and in the activity of carrying out experiments and drawing experimental conclusions, the results were 75.00 with good criteria. Providing opportunities for students to organize tasks independently and report how the work process is done can instill honesty in students.

Based on scientific attitudes, namely respect for good facts, students can distinguish facts and opinions. This is a form of respect for the facts that appear in experimental activities, so students write according to what is obtained in experiments (Widiadnyana et al., 2014). Problem-solving laboratory work is effective in increasing scientific activity and attitude (Hadiati et al., 2019). This scientific attitude affects students' scientific performance in practicum. Scientific performance in practicum-based learning also improves the ability of science process skills with high criteria and scientific attitudes with very high criteria (Nasution et al., 2014).

In the activity of compiling portfolios, the average score of students is 96.67 with very good criteria.

Portfolios increase learner engagement in the learning process and promote self-reflection (Wang & He, 2020). In the learning process, one of the assessment instruments is a portfolio, but teachers rarely apply it. The reason is that the form of the portfolio is still widely unknown by teachers, so its use is not maximized and the stages of implementation of this portfolio assessment are still not running as they should. Thus it can be concluded that portfolio assessment instruments can be developed and used for measuring students' scientific attitudes and students' critical thinking skills (Mediartika & Aznam, 2018). While the activity of making products obtained an average score of 88.33 with very good criteria. Science is knowledge related to natural phenomena and events through a series of scientific processes built on scientific attitudes whose results are realized as scientific products consisting of concepts, laws, and theories (Wahyuningsih et al., 2016). There is a moderate relationship between scientific attitudes and student learning styles. In science learning, must pay attention to learning styles (Nugraha et al., 2020). Effective science learning is learning to build process skills and scientific attitudes so that habits of applying scientific work are formed when discovering concepts from science products. Scientific performance and scientific attitudes must be used both to produce scientific findings that are beneficial to life (Siska & Jumadi, 2015). Student attitudes are a key element to encourage more and better learning which improves their performance (Ruiz-Jiménez et al., 2022). In addition, learning science using a digital book on environmental pollution based on discovery learning can also increase students' attitudes to pay more attention to environmental protection. By (Asi et al., 2021) the use of interactive e-books is effective in improving students' environmental care attitudes

## Conclusion

The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section. The results of this study are the results of the t-test analysis obtained  $H_0$  is rejected and  $H_a$  is accepted. These results can be interpreted if there is an influence on the scientific attitudes of students in science learning using discovery learning-based environmental pollution digital books. Based on the scientific attitude value of the observation results, the average score in the experimental class was 80.50 with very good criteria and the control class was 69.67 with good criteria. Of the four aspects of scientific attitude observation data including accuracy, honesty,

responsibility, and cooperation, the average score of scientific attitudes in the experimental class was higher than the control class. While from the results of the scientific attitude questionnaire, four aspects were obtained, namely curiosity, critical thinking, respect for facts, and open-mindedness, the average score of the experimental class was higher than the control class. Experimental classes that have higher scientific attitude scores than control classes, result in good scientific performance scores as well, indicated by the results of student scientific performance obtained by the average score in the experimental class obtained good and very good criteria.

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