The Effect of Discovery Learning Model on Students' Science Literacy

Agus Budi Darma Wijaya*, Baiq Azmi Sukroyanti & Lovy Herayanti
Physics Education Study Program, Universitas Pendidikan Mandalika, Indonesia
*Corresponding Author: agusbudidarmawijaya@gmail.com

Abstract - *The purpose of this research is to determine the influence of the discovery learning model on students' science literacy. This study used a quasi-experimental research design. The population of this study consisted of all students in grade X IPA (Natural Sciences) at Senior High School 1 Sukamulia, which consisted of two classes. The sample for this study was the students of X IPA 1 as the experimental group and X IPA 2 as the control group. Based on the analysis of pretest data, the average score for the experimental group was 37.70 and the control group was 31.41. The results of the posttest showed that the average score for the experimental group was 81.90 and the control group was 76.19. The research results using the one-tailed critical t-test obtained a calculated t-value of 2.16 and a critical t-value of 1.67 at a significance level of 5%. Therefore, the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected. It can be concluded that there is an influence of the Discovery Learning Model on students' science literacy.*

INTRODUCTION

This research aims to determine the influence of the discovery learning model on students' science literacy. The type of research used is quasi-experimental research. The population in this study consisted of all students in grade X IPA (Natural Sciences) at Senior High School 1 Sukamulia, which consisted of two classes. The sample for this study was the students of X IPA 1 as the experimental group and X IPA 2 as the control group. Based on the analysis of pretest data, the average score for the experimental group was 37.70 and the control group was 31.41. The results of the posttest showed that the average score for the experimental group was 81.90 and the control group was 76.19. The research results using the one-tailed critical t-test obtained a calculated t-value of 2.16 and a critical t-value of 1.67 at a significance level of 5%. Therefore, the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected. It can be concluded that there is an influence of the Discovery Learning Model on students' science literacy.

Education aims to improve the quality of human resources. Education can enhance the abilities of individuals as preparation for their future (Andesta et al., 2021). Education is closely related to the learning process. Learning is a system consisting of various components. The main components of learning are students who are positioned as learning subjects and teachers as facilitators of learning (Syukur & Makleat, 2021). Teachers, as facilitators of learning, play a role in creating an enjoyable learning atmosphere. A pleasant atmosphere in the learning process has a positive impact on learning outcomes (Ali & Setiani, 2018).

Physics education is a branch of natural science and technology subjects that are essential to be learned at every level of education, covering knowledge, attitudes, and thinking skills through direct interaction with learning resources designed in the learning activities (Lidiana et al., (2018); Nur et al., (2020)). According to Aulia et al.

(2022), physics learning is a learning process in which students have the choice to directly encounter the material being studied, learn how to connect the knowledge and information they possess in a functional and imaginative way.

One of the measurements that need to be developed in physics learning is science literacy. Science literacy is an understanding of science and its application, a person's ability to apply scientific knowledge to solve problems, critical thinking skills related to science, an individual's ease in learning scientific knowledge, as well as interest and curiosity in scientific knowledge (Mahmud & Prasetyo, 2020).

Science literacy is important for students to understand the environment, economy, and issues in modern society. Science literacy can overcome the lack of awareness of the actual role of science in society. Science literacy is present to shape thinking patterns, behavior, and build the character of individuals to care for and be responsible for themselves, society, and the development of natural science (Toharudin, 2016; Zulaiha & Kusuma, 2021).

Based on the interview conducted by the researcher with a physics teacher on September 3, 2022, at SMAN 1 Sukamulia, East Lombok, the teaching methods used in the school generally include lecturing and giving assignments. Most students rely on memorizing the information provided by the teacher without engaging in the process of discovering knowledge themselves through a series of scientific processes related to science literacy aspects. As a result, students tend to be passive in learning, have difficulty understanding the material, and are unable to solve problems when given. The lack of science literacy among students at SMAN 1 Sukamulia in physics learning and the ability to think in making decisions regarding physics understanding and competence.

Difficulty in understanding these aspects can affect students' learning outcomes, hence the need for a more varied learning model that can improve students' science literacy.

One of the learning models that can be applied is the Discovery Learning model. Discovery learning is based on inquiry-based, constructivist, and learning theory principles (Nurhadi & Alfitry, 2020). In the Discovery Learning model, teachers assign tasks and guide students to discover solutions to given problems (Fatihah et al., 2020). Thus, this learning model trains students to learn independently (Yuliana, 2018). The implementation of the Discovery Learning model can transform the learning atmosphere into an engaging one, as passive students become more active (Aprilia et al., 2020). The Discovery Learning model has a basic strategy pattern that can be classified into four learning stages: problem identification, hypothesis formulation, data collection and processing, and conclusion formulation (Yunus et al., 2021). The advantages of this model are that it helps improve students' cognitive and skills development, allows students to develop independently, makes learning enjoyable as students are directly involved in conducting research, and instills confidence in students (Yuliana, 2018).

RESEARCH METHODS

The research design used in this study is an experimental research design conducted using the Pretest-Posttest Control Group Design (Sugiyono, 2012), as shown in the following Table 1.

Table 1. Research Design

Group	Pretest	Treatment	Post-test
Experiment	O_1	X_1	O_2
Control	O_1	X_2	O_2

Description:
O_1 = Pretest given before the treatment
O_2 = Posttest given after the treatment
X_1 = Implementation of experimental group with Discovery Learning model.
X_2 = Implementation of control group with conventional teaching.

In this study, the treatment given to the experimental group was the implementation of the discovery learning model, while the control group did not receive the discovery learning model. At the end of the study, a posttest was conducted to obtain the final data on students' science literacy in both classes. The instrument used in this research was a questionnaire on students' science literacy. The data obtained from this instrument will be analyzed quantitatively to determine whether there is an influence of the discovery learning model on students' science literacy using a hypothesis test (t-test) for two independent samples assuming equal variance.

RESULTS AND DISCUSSION
Results
1. Pretest-Posttest Data of Science Literacy for Experimental and Control Classes

This research was conducted to determine the influence of science literacy of students taught with the Discovery Learning model. Initial data were obtained from the pretest scores administered before the treatment. The pretest was conducted to assess the initial abilities of students from both samples. The test consisted of essay questions on the topic of momentum and impulse. The results of the pretest can be seen in the following Table 2.

Table 2. The Data of Pre test for both Group

Group	Amount	Max	Min	Mean
Experiment	30	50	15	37,70
Control	27	46	15	31,41

Based on the above table, it is known that the maximum score in the experimental class is 50, the minimum score is 15, and the average score is 37.70. Meanwhile, the maximum score in the control class is 46, the minimum score is 15, and the average score is 31.41. Therefore, it can be concluded that the pretest scores for both the experimental and control classes are still relatively low or below the minimum passing criteria (KKM).

The posttest results, or the final test, were given to both samples after the treatment. The experimental class was treated with the Discovery Learning model, while the control class was treated with the conventional learning model. The posttest consisted of essay questions on the topic of momentum and impulse. The students' posttest results can be seen in the following Table 3.

Table 3. The Data of Post-test for both Group

Group	Amount	Max	Min	Mean
Experiment	30	98	67	81,90
Control	27	95	65	76,19

Based on the above table, it can be seen that the maximum score in the experimental class after being treated with the Discovery Learning model is 98, and the minimum score is 67, with an average score of 81.90. Meanwhile, for the scores in the control class treated with the conventional learning model, the maximum score is 95, the minimum score is 65, and the average score is 76.19. This is because the experimental class has the advantage of using the Discovery Learning model in the teaching and learning activities, while the control class does not use the Discovery Learning model. The difference in average scores between the experimental and control classes occurs because the use of the

Discovery Learning model in the teaching and learning activities demands students to be serious and actively engaged in the learning process.

2. (t-test) Data on Science Literacy in the Experimental and Control Classes

The results of testing the distribution of posttest data in the experimental and control classes indicate a normal distribution. Therefore, to test the hypothesis in this study, a t-test is conducted to determine the difference in science literacy achievement between the experimental class, where the Discovery Learning model was used, and the control class, where the conventional method was used. The data on the effect of the Discovery Learning model on students' science literacy abilities are presented in the following Table 4.

Table 4. Hypothesis Test (t-test)

Group	Mean	t_{count}	t_{table}	Criteria
Experiment	81,90	2,16	1,67	Ha accepted
Control	76,19			Ho rejected

The data analysis using the two-sample t-test assuming equal variances resulted in a t-statistic (t-test) value of 2.16 and a critical t-value (one-tail) of 1.67. From the analysis, it can be concluded that there is a difference in the improvement of students' conceptual mastery between the control class and the experimental class. This conclusion is supported by the average posttest scores, with the experimental class having an average score of 81.90 and the control class having an average score of 76.19.

Discussion

The implementation of the discovery learning model in Class X IPA 1 (experimental class) at SMAN 1 Sukamulia

helps students to be more actively involved during the learning process. Students who were initially passive become more enthusiastic about learning and actively participate in physics lessons. They are no longer hesitant to express their answers when the teacher asks questions. With the implementation of the discovery learning model in the experimental class, students not only listen to the teacher's explanations but also understand the physics concepts accurately. Therefore, scientific literacy in classroom learning is essential for every student as they benefit from their involvement in the learning process.

The data analysis using the two-sample t-test assuming equal variances resulted in a t-statistic (t-test) value of 2.16 and a critical t-value (one-tail) of 1.67. From the analysis, it can be concluded that there is a difference in the improvement of students' conceptual mastery between the control class and the experimental class. This conclusion is supported by the average posttest scores, with the experimental class having an average score of 81.90 and the control class having an average score of 76.19. Therefore, it can be inferred that the implementation of the Discovery Learning model has an influence on improving students' scientific literacy at Senior High School 1 Sukamulia. Thus, the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected.

This is further supported by observational data. The research used observation sheets to assess the implementation of learning and student activities as supporting data related to the learning model used. The observations were conducted three times throughout the research, and the average scores for the implementation of learning and student activities in both the experimental and control classes showed improvement in the

third meeting, with all activities reaching good and very good criteria. Although the implementation of learning and student activities improved in both classes, the experimental class showed better performance than the control class (Ilahi et al., 2022). Based on the results of the scientific literacy test, each aspect showed different levels of improvement. This indicates that the implementation of the Discovery Learning model has an impact on improving students' scientific literacy.

CONCLUSION

Based on the results and analysis conducted, it can be concluded that the Discovery Learning model improves students' scientific literacy at Senior High School 1 Sukamulia in the academic year 2022/2023. This can be seen from the pretest scores, where the experimental class had a mean score of 37.70 and the control class had a mean score of 31.41, indicating that both classes had low initial scores. However, after the treatment, the average scores significantly increased, with the experimental class obtaining an average score of 81.90 and the control class obtaining an average score of 76.19.

The data analysis using the two-sample t-test assuming equal variances resulted in a t-statistic (t-test) value of 2.16 and a critical t-value (one-tail) of 1.67. From the analysis, it can be concluded that the calculated t-value is greater than the critical t-value. Therefore, it can be inferred that the implementation of the Discovery Learning model has a significant impact on improving students' scientific literacy at Senior High School 1 Sukamulia. Thus, the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected.

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