The Influence of the Tri Kaya Parisudha-Based Discovery Learning Model on Science Literacy and Science Learning Outcomes in Junior High School Students

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Abstract: Learning model is a strategy or planning used as a reference in the implementation of the teaching and learning process. One relevant model is Discovery Learning. This study aims to examine the differences in: scientific literacy and science learning outcomes simultaneously, scientific literacy skills, and science learning outcomes between students taught using the Discovery Learning model and those taught using the Tri Kaya Parisudha-based Discovery Learning model. The research employed a quantitative approach with a quasi-experimental method and a Nonequivalent Pretest-Posttest Control Group Design. The subjects were seventh-grade students at SMP Negeri 3 Selemadeg Timur, divided into experimental and control groups. Data collection instruments included a questionnaire to assess scientific literacy and objective tests (pretest and posttest) to measure science learning outcomes. Data were analyzed using MANCOVA. The findings revealed significant differences ($p < 0.05$) between the two groups in all three aspects examined: simultaneous scientific literacy and learning outcomes, scientific literacy alone, and science learning outcomes alone. These results indicate that the Tri Kaya Parisudha-based Discovery Learning model is more effective in enhancing students' scientific literacy and science learning outcomes.

Keywords: Discovery learning; Learning outcomes; Scientific literacy, Tri Kaya Parisudha

Introduction

Natural Sciences (IPA) or science is a discipline that studies natural phenomena and their scientific processes. Science learning plays an important role in all levels of education, from elementary school to college. The role of science in schools is very strategic in forming quality human resources, because through this learning, students can develop knowledge, skills, attitudes, and scientific values that are essential for life. The development of scientific literacy is a crucial aspect in science learning and is an essential skill that students need to have. Scientific literacy is important to instill so that students are able to apply scientific concepts appropriately in real life (Suryani, 2018; Bramastia & Rahayu, 2023). Understanding the importance of scientific literacy will help students realize the goals and benefits of the learning process they are undergoing, thus indirectly contributing to improving their learning outcomes. Learning outcomes are the abilities acquired by students after following the learning process which is assessed based on the achievement of certain criteria (Agusti & Aslam, 2022; De Vries et al., 2022; Schildkamp et al., 2020). In order to achieve learning outcomes that are in line with learning objectives, teachers need to design learning activities that are in accordance with the characteristics of students. Mastery of the material by

students plays an important role in supporting the achievement of optimal learning outcomes.

Facts on the ground show that the level of scientific literacy of students in Indonesia is still relatively low. This is reinforced by the results of the Programme for International Student Assessment (PISA) study, which shows that the scientific literacy scores of Indonesian students from 2000 to 2022 were 393, 395, 393, 383, 382, 403, 396, and 383, respectively. This figure is below the international average of 500, with a global ranking that is also quite low, namely 38, 38, 50, 60, 64, 62, 72, and 69, respectively (Yusmar & Fadilah, 2023). These findings confirm that the scientific literacy of Indonesian students is still below international standards and is an important issue in the world of national education.

The low scientific literacy of students in Indonesia is influenced by several factors. First, students often do not understand the basic concepts of science being taught, but are reluctant to ask because they are afraid of making mistakes that can lead to ridicule from peers, thus negatively impacting their self-confidence (Adi Putra et al., 2020). Second, science learning in schools is generally still carried out conventionally. In addition, the role of teachers is also a significant determining factor. Teachers who rarely train students in solving scientific literacy-based questions make them less accustomed to dealing with scientific problems (Rusilowati et al., 2019; P. N. Putri et al., 2025). If this condition continues to be allowed, it will have implications for low learning outcomes and achievement of learning objectives. Therefore, teachers are required to improve learning strategies so that the science learning process becomes more effective. One of the innovative efforts that have been made to improve scientific literacy and learning outcomes is through the application of appropriate learning models.

The learning model is a strategy or plan used as a reference in the implementation of the teaching and learning process (Chen et al., 2024; Chan, 2023). One relevant model is Discovery Learning, a learning model that emphasizes understanding concepts through the active involvement of students in finding and investigating solutions to a problem, so that the learning outcomes obtained become more meaningful and lasting (Van Alten et al., 2019; Smith et al., 2022). This model is feasible to implement because it allows the management of a classroom environment that encourages active student participation during the learning process. To strengthen character values, Discovery Learning can be integrated with the values of Tri Kaya Parisudha, namely thinking well (manacika), speaking well (wacika), and doing good (kayika). This integration aims not only to activate students cognitively, but also to form ethics in thinking, speaking, and acting. The importance of ethics in instilling student attitudes in education is

urgent, considering the various moral problems that often arise in the school environment, such as lack of politeness in speaking, lack of mutual respect, unpunctuality in attendance, and non-serious behavior in religious activities.

Therefore, the application of a learning model that combines cognitive and ethical aspects is considered important in forming the character and quality of learning of students holistically. Tri Kaya Parisudha is an ethical teaching in Hinduism that teaches the importance of harmony in thinking (manacika), speaking (wacika), and acting (kayika) (Wisarja & Sudarsana, 2023). Although derived from Hindu teachings, the values in Tri Kaya Parisudha are universal so that they are relevant to be taught to students from various religious backgrounds. In addition to playing a role in preserving Balinese local wisdom, the application of these values can also encourage students, including non-Hindus, to learn to uphold ethics and respect others. The integration of the Tri Kaya Parisudha concept in science learning has the potential to strengthen the development of students' knowledge, understanding, and skills in dealing with various scientific problems while still being based on ethical values.

Method

This research is classified as a quasi-experiment with a quantitative approach. The design used is Nonequivalent Pretest-Posttest Control Group Design, which involves two groups, namely the experimental group and the control group. Data collection was carried out using two types of instruments: a questionnaire to measure scientific literacy skills, and an objective test that includes pretest and posttest questions to assess science learning outcomes. This research was conducted at SMP Negeri 3 Selemadeg Timur with participants from class VII students. Class VII A acted as the experimental group, while class VII C as the control group. Each class consisted of 32 students. The scientific literacy questionnaire instrument consisted of 30 statements covering aspects of attitudes towards scientific literacy with indicators such as: support for scientific investigation activities, student beliefs about the science learning process, interest, involvement, and motivation in the field of science, and responsibility for resources and the environment. Meanwhile, the learning outcome test instrument contains 30 multiple-choice questions that test students' understanding of the material "Classification of Living Things".

Result and Discussion

Results

The results of the study are divided into three parts according to the formulation of the problem in this study, namely the differences in scientific literacy skills and science learning outcomes simultaneously in groups of students who are taught using the Discovery Learning learning model with groups of students who are taught using the Discovery Learning learning model Based on Tri Kaya Parisudha, differences in scientific literacy skills in groups of students who are taught using the Discovery Learning learning model with groups of students who are taught using the Discovery Learning learning model Based on Tri Kaya Parisudha, and differences in science learning outcomes in groups of students who are taught using the Discovery Learning learning model with groups of students who are taught using the Discovery Learning learning model Based on Tri Kaya Parisudha. The data on students' scientific literacy were obtained from the results of a questionnaire filled out by students consisting of 30 statements about scientific literacy attitudes. Table 1 shows a descriptive analysis of the pretest and posttest data on scientific literacy in the experimental group and the control group. The data can be seen as follows.

Table 1. Results of Descriptive Analysis of Pretest and Posttest Data on Science Literacy of Students in the Experimental Group and Control Group

Statistics				Group
	Experiment		Control	
	Pretest	Posttest	Pretest	Posttest
Mean	49.25	91.06	49.78	69.23
Std. Deviation	2.985	4.866	3.206	2.678
Maximum	56.00	97.33	56.67	76.67
Minimum	45.33	80.67	44.67	66.00

Based on Table 1, a comparison of the results of the students' science literacy questionnaire between the experimental group and the control group can be seen. Judging from the results of the pretest questionnaire, the science literacy scores for the experimental group ranged from 45.33 to 56.00 with an average of 49.25 and a standard deviation of 2.985. While in the control group, the results of the students' science literacy questionnaire ranged from 44.67 to 56.67 with an average of 49.78 and a standard deviation of 3.206. Meanwhile, judging from the results of the posttest, the science literacy questionnaire scores for students in the experimental group ranged from 80.67 to 97.33 with an average of 91.06 and a standard deviation of 4.866. Meanwhile, for students in the control group, the students' scientific literacy questionnaire scores ranged from 66.00 to 76.67 with an average of 69.23 and a standard deviation of

2.678. Student learning outcome data was obtained from a learning outcome test consisting of 30 multiple-choice questions on the Classification of Living Things material. Table 2 displays a summary of the descriptive analysis of student learning outcome data in the experimental and control groups. The descriptive results of student learning outcome data can be seen in Table 2.

Table 2. Results of Descriptive Analysis of Pretest and Posttest Data on Learning Outcomes of Students in the Experimental and Control Groups

Statistics				Group
	Experiment			Control
	Pretest	Posttest	Pretest	Posttest
Mean	58.02	84.48	51.88	77.19
Std. Deviation	8.503	4.908	7.985	4.722
Maximum	76.67	96.67	73.33	86.67
Minimum	40.00	76.67	36.67	70.00

Based on Table 2, a comparison of student learning outcomes between the experimental group and the control group can be seen. Based on the pretest results, the student learning outcomes for the experimental group ranged from 40.00 to 76.67 with an average of 58.02 and a standard deviation of 8.503. While in the control group, the pretest value of student learning outcomes ranged from 36.67 to 73.33 with an average of 51.88 and a standard deviation of 7.985. Meanwhile, seen from the posttest results, the student learning outcomes for the experimental group ranged from 76.67 to 96.67 with an average of 84.48 and a standard deviation of 4.908. In the control group, the posttest value of student learning outcomes ranged from 70.00 to 86.67 with an average of 77.19 and a standard deviation of 4.722. After all prerequisite tests have been carried out and meet the requirements, the next stage is hypothesis testing. Hypothesis testing is carried out to determine the effect of the Tri Kaya Parisudha-based Discovery Learning model on science literacy and science learning outcomes of junior high school students. The analysis was carried out using a multivariate test with Mancova, and the results are presented as follows.

First Hypothesis Test

A summary of the results of the Multivariate Tests is shown in the following table 3. Based on the results of the Multivariate Tests, the significance value of Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root was 0.000 <0.05 (less than 0.05). Which means that the learning model given to the two groups has a significant impact on scientific literacy and learning outcomes. So that the hypothesis (H1) proposed in this study is accepted so that it can be concluded that there is a difference in scientific literacy and science learning outcomes simultaneously in the group of

students who are taught using the Discovery Learning learning model with the group of students who are taught using the Discovery Learning learning model based on Tri Kaya Parisudha. A summary of the results of the second and third hypothesis tests is shown in Table 4.

Table 3. Summary of Multivariate Tests

			Multivariate Tests[a]				
	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	0.997	10933.475[b]	2.000	61.000	0.000	0.997
	Wilks' Lambda	0.003	10933.475[b]	2.000	61.000	0.000	0.997
	Hotelling's Trace	358.475	10933.475[b]	2.000	61.000	0.000	0.997
	Roy's Largest Root	358.475	10933.475[b]	2.000	61.000	0.000	0.997
Method	Pillai's Trace	0.457	25.665[b]	2.000	61.000	0.000	0.457
	Wilks'Lamba	0.543	25.665[b]	2.000	61.000	0.000	0.457
	Hotelling's Trace	0.841	25.665[b]	2.000	61.000	0.000	0.457
	Roy's Largest Root	0.841	25.665[b]	2.000	61.000	0.000	0.457

a.Design: Intercept + K
b.Exact statistic

Table 4. Summary of Tests of Between-Subjects Effects

		Tests of Between-Subjects Effects					
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Science Literacy	779.247[a]	1	779.247	11.734	0.001	0.159
	Learning Outcomes	850.670[b]	1	850.670	36.670	0.000	0.372
Intercept	Science Literacy	190316.244	1	190316.244	2865.885	0.000	0.979
	Learning Outcomes	418177.239	1	418177.239	18026.241	0.000	0.997
K	Science Literacy	779.247	1	779.247	11.734	0.001	0.159
	Learning Outcomes	850.670	1	850,670	36.670	0.000	0.372
Error	Science Literacy	4117.265	62	66.408			
	Learning Outcomes	1438.291	62	23.198			
Total	Science Literacy	195212.756	64				
	Learning Outcomes	420466.201	64				
Corrected Total	Science Literacy	4896.512	63				
	Learning Outcomes	2288.962	63				

a. R Squared = .159 (Adjusted R Squared = .146)
b. R Squared = .372 (Adjusted R Squared = .362)

Second Hypothesis Test

Based on the Tests of Between-Subjects Effects table, the F value is 11.734 and the significance value of scientific literacy in the Corrected Model column is 0.001 <0.05 (less than 0.05). So it can be concluded that the null hypothesis (H0) is rejected and the Alternative hypothesis (Ha) is accepted. So it can be concluded that there is a difference in scientific literacy in the group of students who are taught using the Discovery Learning learning model with the group of students who are taught using the Discovery Learning learning model based on Tri Kaya Parisudha.

Third Hypothesis Test

A summary of the results of the third hypothesis test is shown in table 4. Based on the Tests of Between-Subjects Effects table, the F value is 36.670 and the significance value of learning outcomes in the Corrected Model column is 0.000 <0.05 (less than 0.05). So it can be concluded that the null hypothesis (H0) is rejected and the Alternative hypothesis (Ha) is accepted. So it can be

concluded that there is a difference in science learning outcomes in the group of students who are taught using the Discovery Learning learning model with the group of students who are taught using the Discovery Learning learning model based on Tri Kaya Parisudha

Discussion

The learning model plays an important role in the success of the learning process. One effective model is the Discovery Learning model based on Tri Kaya Parisudha. The Discovery Learning model is a learning approach that encourages students to actively seek and find knowledge independently through the investigation process, so that the information obtained tends to be more embedded in memory and is not easily forgotten (Becker & Gijsenberg, 2023). On the other hand, Tri Kaya Parisudha refers to three noble behaviors that are sanctified, namely thinking, saying, and doing good. The combination of these two concepts in learning is able to create an active and independent learning

atmosphere, while at the same time instilling positive values in students (Winangun et al., 2021). The Discovery Learning learning model has been shown to have a positive impact on the science learning process. Research conducted by Puspitasari et al. (2019) and Laili et al. (2024), showed that the application of this model was able to increase the level of student activity and participation during teaching and learning activities (Emi, 2022; Márquez et al., 2023).

In addition, the application of the Tri Kaya Parisudha values also made a significant contribution to improving learning outcomes. Wahyuni et al. (2022), revealed that the integration of Tri Kaya Parisudha values in the Discovery Learning model had an effect on increasing science knowledge competencies (Putri & Wiarta, 2023). Furthermore, research by Koten et al. (2024), showed that the use of the Discovery Learning model also significantly encouraged an increase in students' scientific literacy skills. Based on the results of the data analysis, the Discovery Learning learning model based on tri kaya parisudha has a good influence on scientific literacy and learning outcomes. Simultaneously Ayuningsih et al. (2023), this learning model on two main variables (scientific literacy and learning outcomes) can be seen from the results of the multivariate test. The results of the analysis using Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root are $0.000 < 0.05$ (less than 0.05) which means that there is a significant influence simultaneously. Based on the analysis of the second hypothesis test, the F value was 11.734 and the significance value of scientific literacy in the Corrected Model column was $0.001 < 0.05$ (less than 0.05). So it can be concluded that the null hypothesis (H0) is rejected and the Alternative hypothesis (Ha) is accepted. Finally, in the third analysis, the F value was 36.670 and the significance value of learning outcomes in the Corrected Model column was $0.000 < 0.05$ (less than 0.05). So it can be concluded that the null hypothesis (H0) is rejected and the Alternative hypothesis (Ha) is accepted.

Based on the results of the analysis, it means that the learning model given to the two groups has a significant impact on scientific literacy and learning outcomes (Febianti & Sukmawati, 2024). Scientific literacy refers to a person's ability to utilize their scientific knowledge to identify problems, draw conclusions based on evidence, and respond to scientific issues logically and appropriately so that they can make decisions related to the environment rationally and validly (Dawson et al., 2024). In this study, the aspect of scientific literacy that is focused on is the attitude aspect, which includes support for scientific investigation activities, self-confidence, interest in science, and a sense of responsibility for the environment and natural resources. Attitude towards science is an important

component that students must have so that they are able to adapt to various problems related to science and technology (Wicaksono & Korom, 2023). In this case, the application of the Discovery Learning learning model based on Tri Kaya Parisudha is considered effective in encouraging increased scientific literacy of students, especially in the attitude aspect. The attitude aspect in scientific literacy is the most relevant component to be linked to the values of Tri Kaya Parisudha, because this concept not only encourages the development of intellectual intelligence, but also forms ethics in students.

In addition to functioning as a basis for the formation of ethics, Tri Kaya Parisudha also plays a role in improving learning outcomes. This is in line with the findings of research conducted by Sukadana et al. (2020) and Andi Suryawan et al. (2024), which stated that Tri Kaya Parisudha-based learning has a significant effect on improving students' science knowledge competencies. The results of the research analysis showed that students in the experimental class who were taught using the Tri Kaya Parisudha-based Discovery Learning model experienced a more significant increase in scientific literacy compared to students in the control class who only used the conventional Discovery Learning model. The data obtained showed that the average post-test score for scientific literacy in the experimental class reached 91.06, much higher than the control class which only obtained an average score of 69.23. This finding indicates that the Tri Kaya Parisudha-based Discovery Learning model is more effective in developing aspects of scientific literacy attitudes (Wardhani et al., 2024). This is because the model not only focuses on increasing intellectual intelligence, but also instills ethical awareness, responsibility, and moral values in the application of science (Tan & Maravilla, 2024; Bowen, 2024). Thus, it can be concluded that the learning model used in this study makes a positive contribution to increasing students' scientific literacy. Learning outcomes are the result of an interaction between learning and teaching (Variani & Gede Agung, 2020).

Student learning outcomes are measured from the understanding they have mastered after participating in learning with the Tri Kaya Parisudha-based Discovery Learning model (Judijanto et al., 2024). In this study, the increase in learning outcomes can be seen from the posttest results showing that students in the experimental class obtained an average score of 84.48, higher than the control class which only reached 77.19. This confirms that this learning model is effective in significantly improving learning outcomes. Suparmi et al. (2024), in their research stated that the integration of Tri Kaya Parisudha values into learning based on the Discovery Learning model had a positive impact on

students' mastery of science knowledge (Artawan et al., 2020), also stated that the Discovery Learning model encourages students to draw conclusions based on their own experiences and observations (Muhali & Sukaisih, 2023; Ungirwalu et al., 2025).

When this model is combined with the values of Tri Kaya Parisudha, students are not only invited to be active in the learning process, but are also instilled with ethical attitudes in thinking, speaking, and acting. This is because the Tri Kaya Parisudha-based Discovery Learning model emphasizes meaningful learning through solving real problems that allow students to gain direct experience. In line with the opinion of Aldalur et al. (2023), the use of this model is able to shift learning that was previously centered on teachers to focus on students (Katawazai, 2021), thus encouraging their active involvement in the process of discovery, problem solving, and information processing through group work under the guidance of teachers.

Conclusion

Based on the results of the study, it can be concluded that the implementation of the Discovery Learning learning model based on Tri Kaya Parisudha simultaneously has a significant effect on improving scientific literacy and student learning outcomes compared to the Discovery Learning model. This model has proven to be more effective in improving scientific literacy, especially in the attitude aspect, where students in the experimental group showed more systematic development compared to the control group. In addition, the Discovery Learning learning model based on Tri Kaya Parisudha also had a significant positive impact on student learning outcomes. Students in the experimental group were able to demonstrate a deeper understanding of concepts and skills in applying theory to real contexts, resulting in higher learning outcomes compared to students in the control group.

Author Contributions
K.L.W searched for data, analyzed data, and wrote the manuscript; P.A reviewed the manuscript; I.N.T reviewed the manuscript. All authors have approved the published manuscript.

Conflicts of Interest
The author declares no conflict of interest in writing this article.

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