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Implementation of Student Learning Independence in Ethnoscience-Oriented Force Topics Through Problem Based Learning (PBL) Learning Model

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Abstract: This research is motivated by the low independence of science learning of elementary school students. This research aims to determine the effect of the application of the Ethnoscience-Oriented Problem Based Learning (PBL) model on the learning independence of students in class IV Elementary School. The type of research used is Quasi Experimental. The study population was grade IV elementary school students in Gugus IV Padang City T.A 2023/2024. The sampling technique used was simple random sampling obtained at SDN 28 Padang Sarai in class IVB as the experimental class and class IVA as the control class. The instrument used in this research is a questionnaire instrument. Questionnaires are used to measure student learning independence in science learning for grade IV elementary school students. The data analysis technique in this study used an independent sample t test, Based on the results of the study, the results obtained: The significance value of 0.000 < 0.05, then in accordance with the basis for decision making, it is found that H_0 is rejected and H_a is accepted, which means that the learning independence of students in science learning is significantly high which is taught with the PBL Ethnoscience-Oriented learning model compared to conventional learning.

Keywords: Concept Understanding; Ethnoscience; IPA; Learning Independence; Problem Based Learning

Introduction

Science is the science of nature and all the phenomena in it. Science itself studies natural phenomena that are factual, reality, and events, as well as the causal relationships in them (Wisudawati, 2014;). Science leads students to have skills obtained by going through stages in the form of a process of looking at natural and substantial phenomena logically and factually by conducting research, categorizing, through observations, classification, communication, and interpreting data using scientific methods (Karnilawati et al., 2023; Irmawati et al., 2021; Ramdani et al., 2019). Therefore, science learning must prioritize the active involvement of students in their learning where students gain knowledge independently from the learning activities they do.

Sugianto et al. (2020) define learning independence as a learning activity held by every human being in order to move himself through thinking power in order to achieve the direction of the learning. Meanwhile, Naibaho (2019) states that learning independence is part of cognitive learning theory which emphasizes that motivation, behavior and aspects of the learning environment greatly affect student outcomes. Some researchers provide indicators of independence that can be used as a measuring tool in measuring a person's level

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of learning independence. Such as Dharmawati (2021) states that indicators of learning independence include: self-confidence, self-discipline, initiative, responsibility and motivation. Meanwhile, according to Bernadib in Zainun Mu'tadin (2018), students who have learning independence have indicators including having a competitive desire to advance for their own good, being able to make decisions and take the initiative to overcome the problems faced, having confidence in doing their tasks, being responsible for what they do.

However, in the field there are still many science lessons that are textual or tend to memorize. Science learning has not paid attention to social issues that are associated with students' real daily lives, as a result learning is less meaningful. Whereas IPAS is closely related to natural phenomena that should be able to train students to be able to solve a problem experienced daily. In addition, it is not uncommon to find teachers who have not applied a variety of learning models to help students increase their independence through learning that is fun and challenges students to be active (Wulandari, 2015). Science learning often becomes learning content that students don't like, especially in elementary schools. Science lessons are less attractive to students because the subject matter is delivered using the lecture and question and answer method only so it is not fun for students (Taupik & Fitria, 2023).

The same thing was also found by the author when observing learning. Based on observations on July 18-23, 2023 conducted in cluster VI Kec. Koto tangah, Padang City with class IV as the focus of observation, information was obtained that the objectives of science lessons in these schools had not been achieved optimally. The results of interviews with teachers are that students are less enthusiastic and less creative in learning IPAS. Students feel bored and bored quickly during the learning process so that students do not participate in learning thoroughly. Some students tend to be silent when the teacher asks and students do not take the initiative as well as being creative in understanding the problems the teacher gives. Often also when given practice problems, students skip them and choose to see their friends who have finished working on the problems given by the teacher. This proves that students do not have good learning independence.

While the results of interviews with students are that students have difficulty in finding solutions when solving problems. This means that students are less able to understand a concept of the problem. Learners also often wait for answers from their friends because learners have low confidence in their own answers. Another thing that was found was that learners were less interested in discussions because some preferred to remain silent rather than express their opinions or ideas. Learners act as recipients of information only and are rarely given the opportunity to learn independently, because the teacher dominates in the learning process. And students have not been able to solve problems that are different from those exemplified by the teacher. This proves that students' concept understanding is still low, which can be seen from the scores of students who have not reached the learning achievement criteria.

Not only that, in addition to conducting interviews and observations when teachers teach, researchers also provide closed questionnaires to see students' learning independence and understanding of science concepts. The conclusion of the results obtained from the questionnaire is that most students do not like science learning, students are still reluctant to try to find answers when they find difficulties, students have difficulty answering questions given by the teacher, and students need a learning model that helps to understand science concepts.

The Problem Based Learning (PBL) learning model is a learning model that emphasizes students to be autonomous and independent (Ristanto, 2021). The Problem Based Learning (PBL) model is learning that starts with authentic (real) problems that are in accordance with the subject matter so that it can train students to think critically in solving a problem, and can foster students' skills in solving a problem (Zulfa et al., 2023). The problem-based learning model is delivered by presenting a problem, asking questions, facilitating investigation, and opening dialog (Yuristia et al., 2022). Problem Based Learning allows students to exchange information and solve problems Problem Based Learning changes the habits of students, who were originally passive and only received information to be active in seeking information, becoming Self-learners, and problem solvers. Problem Based Learning can also be started by doing group work between learners. learners investigate themselves, find problems, then solve the problem under the guidance of the facilitator, namely the teacher (Nugraha, 2018).

In its application, the Problem Based Learning (PBL) model is ethnoscience-oriented (Rosidah, 2018). The ethnoscience approach is a component of the right method to improve students' academic achievement. The science learning process that successfully combines the cultural aspects of students and the scientific culture in the school environment can optimize their learning process. Ethnoscience is implemented in learning by incorporating the culture that develops in society into science learning. The PBL model is suitable to be oriented with ethnoscience because both intersect with something familiar to students, namely the environment around students. The novelty of this research is that

previous research only investigates the effect of the PBL model with learning independence alone without orienting it with Ethnoscience. The PBL model is suitable for application with an ethnoscience approach because both intersect with something familiar to students, namely the environment around students. The active involvement of students in learning in the application of the Ethnoscience-oriented PBL model will bring up values that will be instilled through experience and a sense of empathy for the environment, thus the teacher not only conveys in theory, but can also transfer what values are taken from learning activities.

Method

The research that the author will carry out is a type of quantitative research. Quantitative research is research that tests objective theories by testing the relationship between variables (Wahidmurni, 2017). This research uses a quasi-experimental research method. Because researchers apply actions in the form of learning methods. Pseudo-experimental research is research that has the aim of finding a causal relationship between two factors that are deliberately caused by the researcher by reducing or eliminating other factors that interfere (Adhi, 2020; Rusydi, 2018).

The population of this research were all grade IV SDN cluster VI Kec. Koto Tangah Padang City in the 2023/2024 academic year. For details in the table below:

Table 1. The population of this research

School Name	Group Study	Number of Students
SDN 27 Anak Air	3	74
SDN 28 Padang Sarai	2	51
SDN 35 Padang Sarai	2	57
SDN 14 Kampung Jambak	1	28
SDN 11 Lubuk Buaya	3	82
SDN 58 Lubuk Buaya	2	52
SDN 02 Lubuk Buaya	3	79

The sampling technique chosen is Simple random sampling. The steps taken in selecting the sample are collecting data on the IPAS scores of fourth grade students of SDN Gugus VI Kec. Koto Tangah Padang city, Calculating the average IPAS score of students who have been collected, Conducting a population normality test using SPSS. Conduct a variance homogeneity test to determine whether the population has a homogeneous variance or not. After obtaining normal and homogeneous data, then draws are made for research schools. By following this technique, the results obtained that the sample used for the experimental class was class IV B SDN 28 Padang Sarai which had 25 students while the control class was class IV A SDN 28 Padang Sarai which had 26 students. This research was conducted from July to October 2023.

The purpose of this study was to see (1) The effect of the ethnoscience-oriented Problem Based Learning (PBL) model on the independence of learning science on the topic of student style in class IV in elementary school. In this study, researchers used a questionnaire to collect data. Respondents are required to respond to or answer a number of questions in the questionnaire (Gainau, 2021). Information in this research is collected through the use of instruments to see how the Ethnoscience-oriented Problem Based Learning (PBL) learning model on the topic of force in science learning affects students' learning independence. The measurement scale used is a Likert scale, according to Sugiyono (2018) the Likert scale is a scale used to measure the attitudes, opinions and perceptions of a person or group of people about social phenomena. in this study to measure student learning independence.

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The quantitative data analysis technique in this study is to use the independent sample t test. Before analyzing the data, a prerequisite test was first carried out, namely the normality and homogeneity tests. To conduct an independent sample t test, the data distribution must be normal and homogeneous (Hidayanti et al., 2019). With the following hypothesis:

H0 : There is no effect of Ethnoscience Oriented Problem Based Learning (PBL) model on the learning independence of IPAS fourth grade elementary school students.

Ha : There is an effect of Ethnoscience Oriented Problem Based Learning (PBL) model on the learning independence of IPAS fourth grade elementary school students.

With the provision that if the significance value < 0.05 then Ha is accepted and H0 is rejected. Which means that there is an effect of the Ethnoscience-Oriented Problem Based Learning (PBL) model on science learning independence and there is an effect of the Ethnoscience-Oriented Problem Based Learning (PBL)

model on understanding the concept of IPAS for grade IV elementary school students.

Result and Discussion

The research instrument that will be used to obtain data will first be tested. This is done to determine the suitability of the instruments that will be used in the research. Instrument trials were given to 23 students in class V of SD 19 Kampung Baru Kota Pariaman and this school is not a research sample, the data is used to obtain results in the instrument testing that will be carried out. The research instrument was tested to determine the quality of the test, namely through testing validity, reliability. In accordance with the decision-making provisions if $r_{count} > r_{table}$ then the statement is declared valid. By looking at the r_{table} if there are 24 respondents with $\alpha = 0.05$, then $r_{table} = 0.404$. From the results of the calculation of the product moment correlation rurmus, the result is that 30 statement items in the questionnaire are declared valid.

After examining the validity test findings, reliability calculations were performed on the test instrument, which was composed of 25 multiple-choice questions. The alpha formula, which describes the degree of reliability of something, was applied in this reliability test. Reliable means dependable and trustworthy. The query is deemed questionably reliable if rcount exceeds r_{table}.

Table 2. Questionnaire Reliability Test

Reliability Statistics	
Cronbach's alpha	N of items
.93	30

Based on the reliability data above, it can be seen from the Cronbach alpha value that the r_{count} > sig. 0.05 at $\alpha = 5\%$ with n = 24 respondents, obtained 0.935 > 0.05 so that the statement is said to be reliable. After the data is known to be valid and reliable, a prerequisite test is carried out, namely the normality test and homogeneity test. The purpose of the normality test is to determine whether the distribution of data in a group of data or variables is normally distributed or not (Nizar, 2016). The homogeneity test aims to see whether the two sample groups have homogeneous variances or not. The following table presents the results of the calculation of the normality test of student learning independence questionnaire data for experimental and control classes.

Table 3. Data Normality Learning Independence Questionnaire

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	class	Statistic	f	ig.	Statistic	f	ig.
Leraning independent	Pretest Experimen class	.22	5	002	.92	5	079′
	Postest Expeerimen class	.20	5	010	.89	5	093′
	Pretest control class	.19	6	015	.93	6	089′
	Postest control class	.15	6	134	.92	6	065′

a. Lilliefors Significance Correction

Based on the table above, the results of the normality test of data before learning in the experimental class obtained a significance of 0.79 or greater than 0.05 (0.79 > 0.05). While the control class normality test results obtained a significance of 0.089 or greater than 0.05 (0.089 > 0.05). So it can be concluded that the questionnaire data value before learning is normally distributed. After the normality test is carried out, the next homogeneity test is carried out. The following table presents the results of the calculation of the homogeneity test of student learning independence questionnaire data for experimental and control classes.

Table 4. Data Normality Learning Independence Questionnaire

Test of Homogeneity of Variances Lerning independent			
Levene Statistic	df1	df2	Sig.
1.138	3	98	.337

Based on the table above, the homogeneity test of student IPAS learning independence questionnaire data before and after learning in experimental and control classes obtained a significance value of 0.337 or greater than 0.05 (0.337 > 0.05), Levene statistic of 1.138, it can be concluded that the science learning independence questionnaire data has the same variant or homogeneous. The research was conducted in SD 2 in two classes, namely experimental and control classes. The experimental class was conducted using the Ethnoscience Oriented Problem Based Learning (PBL) learning model. While in the control class, learning was carried out with a conventional learning model. Before being given the treatment, students in both classes were given a pretest to test students' learning independence before being given the treatment and after being given the treatment students were given a posttest sheet to

measure whether there was a change in students' learning independence after being given the treatment of ethnoscience-oriented learning through Problem Based Learning (PBL) learning. The results of the pretest and posttest in the experimental and control classes are as follows.

The hypothesis in this study is that students with high learning independence have higher concept understanding using the Ethnoscience-Based Problem Based Learning (PBL) model than conventional learning. To answer this hypothesis, t test was conducted using SPSS application with sig. 5 %.

Table 5. Student learning independence score data experimental and control classes

Result	Experiment group		Control group	
	pretest	postest	pretest	postest
Mean	62	83	51	66
Median	60	84	52	64
Mode	56	84	60	64
Std. Dev	8.24	6.5033	7.648	7.1709
Variance	68	42.293	58.49	51.42
Minimum	48	72	36	56
Maximum	76	96	64	80

Table 6. Postest Data t Test Results Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Learning independent	Equal variances assumed	7.91	.007	7.82	49	.000	9.71	1.24	7.21	12.20
	Equal variances not assumed			7.95	31.45	.000	9.71	1.22	7.22	12.2

Based on the data table at the end (postest) above, it is known that the significance value is 0.000 < 0.05, so in accordance with the basis for decision making, it is found that H_0 is rejected and H_a is accepted, which means that there is an effect of using the Ethnoscience-Based Problem Based Learning (PBL) learning model on student learning independence in IPAS subjects on the material of the forces around us in the final data (Postest). High student learning independence has many positive impacts on students. Students with high learning independence have good curiosity, students will continue to explore their competence creatively and actively to find solutions to problems. If student learning independence is high, students will find it easier to do tasks, and make decisions to solve problems.

In PBL model learning activities, many students with high learning independence tend to be more diligent in learning, students begin to understand learning concepts with their own methods. This can be seen from the response of students who are active and immediately work on the assignments given without delaying doing it, students feel happy in discussing and checking back on the tasks that have been done before being collected. In addition, some students who have high learning independence will have a good learning spirit during learning, seen when there is subject matter that has not been understood, students will immediately ask the teacher.

Figure 1. Students conducting the experiment about frictional force

Figure 2. Students conducting the experiment about spring force

In this hypothesis, a questionnaire instrument is used. The questionnaire used consists of 30 statement items to test students' learning independence in learning IPAS force material around us. When comparing the results of the questionnaire calculation before and after learning, it can be shown that students in the experimental class have better learning independence compared to students in the control class. Before participating in learning in the experimental class, the average score of student learning independence was 62 and after participating in learning in the experimental class was 80. Likewise in the control class, before learning in the control class, the average score of student learning independence was 61 and after learning in the control class the average score of student learning independence was 70. This means that the learning independence of students in the experimental class using the ethnoscience-oriented PBL model is better than the learning independence of students in the control class using a conventional learning model.

The results of data analysis are also reinforced by the results of hypothesis testing using the t test on pretest and postest. First, the t test was carried out on the pretest value obtained a significance value of 0.764 > 0.05 (5%). then H0 is accepted and H_a is rejected, which means that there is no effect of using the Ethnoscience-oriented PBL model approach on student learning independence in learning IPAS force material around us on the initial data (pretest). Second, the t test was conducted on the posttest value obtained sig. 0.000 < 0.05 (5%) then in accordance with the basis for decision making it is obtained that H_0 is rejected and Ha is accepted, which means that there is an effect of using the Ethnoscience-oriented Problem Based Learning (PBL) learning model on student learning independence in learning IPAS force material around us in the final data (Postest).

This research reveals that the Ethnoscience-oriented Problem Based Learning (PBL) learning model can affect student learning independence. this is supported by research conducted by Ani Susilowati entitled The Effect of PBL on Elementary Students' Learning Independence. Based on research conducted by Ani (2018) shows that children's bad habits in learning have an impact on low learning achievement. Before the treatment of students who completed only 48%. After treatment using the Problem Based learning model has increased, to 86.96% of students who have above average learning achievement.

This is because the ethnoscience-oriented PBL model has many advantages in its implementation, including involving students in learning activities to work collaboratively with other students, and problems from various sources (Budiyono et al., 2020; Nofziarni et al., 2019). The advantages of Ethnoscience-oriented PBL include motivating students to solve problems in real situations, allowing students to develop their own knowledge through learning activities, focusing learning on problems rather than unrelated material, making students participate in scientific activities through group work, and familiarizing students to use knowledge sources from the library, internet, interviews, and observations. Students said that the ethnoscience-oriented PBL learning model has improved their ability to collaborate in groups, have the confidence to express their opinions, discuss and have better communication skills, and show more critical thinking in just one time (Korpi et al., 2019; Kristinawati et al., 2018; Lee & Blanchard, 2019).

In line with the above statement, during the learning process that took place during the research, students in the experimental class were trained to discuss, convey ideas, understand concepts and practice finding other alternatives to solve problems. Students are also trained to be confident in presenting the results of group discussions in front of other groups in front of the class. In the experimental class, students learn better because this PBL model is student-centered, in accordance with the characteristics of independent learning which helps students learn to find and explore their own thoughts. Students are very enthusiastic about solving problems given by the teacher and in this case the teacher's role is to increase student learning independence as evidenced by the response of students, in order to obtain a good understanding of the concept. This is certainly in line with the indicators of learning independence according to several experts previously described. This means that students' learning independence increases through learning by using the Ethnoscience-oriented Problem Based Learning (PBL) learning model and is better than conventional learning.

Conclusion

Based on the results of research and discussion about the use of ethnoscience-oriented Problem Based Learning (PBL) learning models on student learning independence, it is concluded that there is an effect of using the ethnoscience-oriented Problem Based Learning (PBL) learning model on student learning independence in learning IPAS force material around us in class IV SDN 28 Padang Sarai Kota Padang. Based on the data obtained after the treatment, the t test is then carried out and a significance value of 0.000 < 0.05 is obtained, so in accordance with the basis for decision making, it is found that H0 is rejected and Ha is accepted, which means that there is an effect of using the Ethnoscience-Oriented Problem Based Learning (PBL)

learning model on the independence of IPAS learning on the material of forces around us in the final data (Postest).

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