THE EFFECT OF THE INQUIRY TRAINING MODEL ON WORK, ENERGY, AND SIMPLE MACHINE TOPICS IN HOTS LITERACY GRADE VIII AT SMPN 27 MEDAN

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ABSTRACT

This research aims to determine the effect of the Inquiry Training model on students' Higher-Order Thinking Skills (HOTS) literacy, specifically in the context of Work, Energy, and Simple Machine topics at SMPN 27 Medan. The research is driven by two specific objectives: (1) to assess whether the application of the Inquiry Training model influences students' HOTS literacy compared to the expository model, and (2) to identify which category of HOTS literacy is most developed through the Inquiry Training model. This Research Uses Quasi-Experimental method with a two-group pretest-posttest design. The sampling technique uses random sampling. The research sample consisted of two classes, namely class VIII-3 use inquiry Training model and VIII-2 use expository model, each class consisted of 31 students. Data were collected using pretest and posttest assessments of 20 multiple-choice questions designed to measure HOTS literacy across cognitive domains (C4, C5, and C6). The N-gain for the experiment class was 75.45%, and 45.22% in the control class. In the t test calculation, the calculated t_{count} was 3.89, with t_{table} 2.001. The experiment class demonstrated the highest improvement in the cognitive domain of evaluation reasoning (C6), with N gain of 96%. The findings suggest that the Inquiry Training model effectively enhances students' HOTS literacy, particularly in science subjects, work, energy, and simple machines.

Keywords: HOTS Literacy, Inquiry Training Model, Quasi-Experimental, Science Education.

INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual, religious strength, self-control, personality, intelligence, noble morals, and skills needed by themselves, society, nation, and state (Undang-Undang No.20 tahun 2003). The National Education System Law provides direction that the goal of education is to realize the process of developing students who are not only intellectual but also have character and expands its noble values in line with the development of the times (Lestari and Projosantoso, 2016).

The Program for International Student Assessment (PISA) 2018 results show that Indonesian students' reading, science, and mathematics abilities still need improvement. This is evident from the average score achieved by Indonesian students, which is far below the average score set by the Organization for Economic Co-operation and Development (OECD). Science subjects are among the most crucial topics in 2013 curriculum. Based on the

Regulation of the Minister of National Education (Depdiknas) Number 22 of 2006, the goal of learning science is to develop knowledge and understanding of science concepts that are useful and applicable in everyday life. In the 21st century, students must have high intellectual abilities, be able to analyze problems correctly and have several skills, including higher-order thinking skills. By having high order thinking skills, students are expected to be able to compete in the future and also solve problems that occur in everyday life.

Based on the initial observation data of researchers at SMPN 27 Medan in the form of interviews with science teachers, student learning activities in science subjects are still low, which can lead to expected learning outcomes; many class VIII students still do not fulfil the KKM, which is 75. The data shows that students' science learning outcomes still need to be improved. Students in SMPN 27 Medan still need to understand the importance of learning, which can be seen from students' enthusiasm for learning. When the teacher explains the lesson, the students are less interested because the knowledge is less varied, whereas applied teaching is still teacher-centred. Students' lack of interest can be seen during the teaching and learning.

Based on the background description above, the researcher is interested in researching "The Effect of Inquiry Training Learning Model on Work, Energy, and Simple Machine Topics in HOTS Literacy Grade VIII at SMPN 27 Medan." This research aims to determine the effect of the Inquiry Training model on students' Higher-Order Thinking Skills (HOTS) literacy, specifically in the context of Work, Energy, and Simple Machine topics at SMPN 27 Medan.

RESEARCH METHOD

Research Time and Location

This research was conducted at SMP N-27 Medan, located at Jl. Pancing Pasar IV No.2, Kenangan baru, Kec. Percut Sei Tuan, Deli Serdang Regency, North Sumatra 20241. The research was carried out in the odd semester in 2024/2025

Types of Research

The method used in this quasi-experimental research design provides an inquiry training learning model on work, energy, and simple machine topics.

Research Design

The research design in this study was carried out with a quantitative approach. The method used is Pretest-Posttest Control Group Design, carried out in class VIII SMP N-27 Medan with a sample of two categories: a control class and an experiment class. The experiment class in this study was taught using the inquiry training learning model. In

contrast, the control class was the class that was conducted without using the expository model.

Data Collection Techniques

Data collection methods in research aim to reveal facts about the research variables. The data collected in this study is valid in measuring the test's contents on work, energy and simple machine topics. This research is quantitative research with data collection tools in the form of multiple-choice tests. Higher-order thinking tests were given before and after the treatment.

Research Procedure

Preparation Stage

1. Request permission from the school regarding research activities
2. Carry out observations at SMP N-27 Medan
3. Develop a lesson plan (RPP) and work, energy, and simple machine topics that are adjusted to the indicators of the inquiry training learning stages.
4. Develop a research instrument, namely an objective test on simple machine topics with an assessment sheet for students' higher-order thinking skills totalling 25 questions before being validated.
5. Conduct content validity on multiple choice test instruments to expert validator lecturers to measure the device's validity.
6. Conduct testing of test instruments to students outside the research sample to determine test validity, discriminating power, level of difficulty, and reliability of the questions given to students as samples.
7. Determine control and experimental classes.

Implementation Stage

1. Give a pretest carried out at the beginning of learning.
2. Give treatment to the experiment class with the Inquiry training model
3. Give a posttest at the end of the learning process to measure the high-level thinking skills of the sample class students after being given treatment.

Final Stage

1. Analyze student learning outcomes data work, energy, and simple machine topics through the Inquiry training model.
2. Perform statistical analysis tests, especially normality tests and homogeneity tests on pretest, posttest, and n-gain data to determine the normality and homogeneity of a data.
3. Seeing whether the student's pretest is higher than the KKM, namely 0.7 or 70%.

4. Applying the t-test statistical test to test whether the post-test results affect students' higher-order thinking skills.

RESULT AND DISCUSSION

Before conducting the research, the researcher prepared a research instrument: a HOTS-Literacy test consisting of 25 multiple-choice questions with four options. The 25 questions represent each aspect of high-level thinking skills. Before being used, the instrument was validated by an expert validator, a lecturer in the Physics Education Faculty of Mathematics and Natural Science (Unimed). After the instrument was declared valid by the expert validator, it was tested on 31 students in grades VIII-9 at SMPN 27 Medan. The distribution of the test instrument trial results can be seen in. This test instrument trial was conducted to determine the validity, reliability, level of difficulty, and discrimination of the test instrument and the result from validity test showed that out of 25 questions, 20 were valid, and 5 were invalid. The reliability test using Kuder Richardson 21 (KR-21) shows this test instrument is reliable with $r_{count} = 0.860$, where $r_{table} = 0.374$. From the difficulty level shown Based on the calculation of the 20 questions, 17 questions are categorized as medium, and 3 questions are classified as easy. And then the ability of a question to differentiate between high-ability students and low-ability students can be measured by the Distinguishing Ability test. The results of the calculation of Distinguishing Ability and with the help of the calculation table show that out of 20 questions, 5 questions are categorized as sufficient, 6 questions are good, and 9 questions are excellent

The results of the calculation of the normality test of the pretest and posttest of students' HOTS-Literacy abilities (Appendix11-14) using the Chi-Square Test with a significance level of 5% ($\alpha = 0.05$), with the criteria of the Chi-Square value (X2)count < Chi-Square (X2) table. From Table 1, it is known that the HOTS-Literacy pretest and posttest data of students are normally distributed because the Chi-Square (X2) count < Chi-Square (X2) table.

Table 1. Normality Test HOTS-Literacy Result

Class		X^2_{count}	X^2_{table}	α	Category
Experiment	Pretest	6,49	11,07	0,05	Normally distributed
	Posttest	1,73	11,07	0,05	Normally distributed
Control	Pretest	6.49	11,07	0,05	Normally distributed
	Posttest	2,56	11,07	0,05	Normally distributed

A homogeneity test is conducted to determine whether or not the data used is homogeneous. This test is conducted by calculating the standard deviation and variance of the sample. The results of calculating the standard deviation and sample data of the HOTS Literacy pretest and posttest of students can be seen in the following table. Based on Table 2.

below, the pretest f count value is 1.11, the posttest f count is 1.72, and the f table is 1.84, meaning that the students' HOTS Literacy data is homogeneous.

Table 2. Homogeneity Data HOTS-Literacy

	Standar Deviasi	**Varians**	**Kesimpulan**
Pretest Control	10.93	119.57	Homogeneous
Pretest experiment	11.51	132.37	Homogeneous
Posttest Control	9.74	94.78	Homogeneous
Posttest experiment	7.42	55	Homogeneous

After it is known that the data is normally distributed and homogeneous, a hypothesis test can be carried out using the t-test; this hypothesis test is carried out to determine whether the hypothesis is accepted or rejected, with the criteria if $t_{count} > t_{table}$, then the alternative hypothesis (Ha) is accepted. The null hypothesis (Ho) is rejected. If, $t_{count} \leq t_{table}$, then H0 is accepted with degrees of freedom (dK) = n-1 and $\alpha = 0.05$. The results of the hypothesis test analysis can be seen in Table 3.

Table 3. T-test

t-Test: Two-Sample Assuming Equal Variances			
		Exp. Class	*Ctr. Class*
	Mean	40.97	39.35484
	Variance	132.37	119.5699
	Observations	31.00	31
	Pooled Variance	125.97	
	Hypothesised Mean Difference	0.00	
	df/dk	60.00	
T_{count}	t Stat	0.57	
	P(T<=t) one-tail	0.29	
T_{table}	t Critical one-tail	1.67	
	P(T<=t) two-tail	0.57	
T_{table}	t Critical two-tail	2.00	

The learning outcome test was used to determine the effect of the Inquiry Training model on students' HOTS-Literacy abilities. The learning outcome test was then analyzed using gain, and then, to choose the increase, the N-Gain formula was used. After the data was tabulated, the average, standard deviation and variance of the HOTS-Literacy pretest and posttest data were obtained in Table 4.

Table 4. Pretest and Posttest Data HOTS-Literacy

Group	*Pretest*	*Posttest*	N	N-gain	Category
Exp. class	43,06	86,94	31	0,77	High
Ctr. class	40.00	67,58	31	0,44	Medium

Based on the table of the average HOTS-Literacy pretest scores obtained by students of 58.281, after being given the Inquiry Training learning model treatment, the n-gain score results from the average pretest and post-test scores were 77.76%. And ths table below show N-gain score for each cognitive aspect and the higher one is C4 reasoning.

CONCLUSION

There is an influence of the use of the inquiry training learning model on students' HOTS literacy in the material of energy business and simple machines at SMP Negeri 27 Medan. It can be seen from the acquisition of the T-value of 3.8916 with t table = 2.001. So that ha is accepted and h0 is rejected, this is reinforced by the N-gain test of the two classes where the experimental class value of 77,76% and the control class 44.22%. The use of the inquiry training model is better than the use of the conventional model, as evidenced by the increase in students' HOTS literacy. And the cognitive aspect of HOTS literacy that is most developed in the experimental class, taught with the inquiry training model on work, energy and simple machines is C4 reasoning with 87 N-gain skor.

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