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The Effect of Predict Observe Explaint (POE) Learning Model on Competency Process Standards

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ABSTRACT

In the process of learning the underlying mathematical concepts in students, it is often the case that the process stabdards of students mathematical competence have not been completed. Mathematics has a standard mathematical process, namely problem solving, reasoning, communication, connection, and representation. This type of research is a quasi experimental research using posttest only control design which aims to determine whether there is an effect of the Predict Observe Explaint (POE) learning model on the standard process of mathematics competence of grade V students of MIM Petambakan, Banjarnegara. Hypothesis testing in this study used a t-test which was preceded by a normality test using the kolmogrov-smirnov test and homogeneity test using Levene's test. The test was conducted using SPSS 22 with a significance level of 5%. Based on the results of statistical analysis, it is obtained that there is a positive and insignificant influence between the Predict Observe Explaint (POE) learning model on the standard process of mathematics competence in class V MIM Petambakan with a sig value of 0.923>0.05 and beta standard coefficient 0.919.

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1. INTRODUCTION

Education is an important thing in human social life. Education is also a measure of the progress of a nation and state. Mathematics learning is an integral part of the education system in schools and is provided from primary education to secondary education, even in higher education. Mathematics is important for the progress of science and technology, therefore, it needs to be studied since elementary school. In Indonesia, the aim of learning mathematics in schools is to develop logical, analytical, systematic, critical and creative thinking skills. This research aims to analyze the influence of the *Predict Observe Explain* (POE) learning model on mathematics competency process standards. Apart from that, the *Predict Observe Explain* (POE) learning model can also sharpen thinking patterns and improve student learning outcomes. The experience gained can develop knowledge [1].

[1] Alfiyanti, I. F., Jatmiko, B., & Wasis. (2020). The Effectiveness of Predict Observe Explain (POE) Model with PhET to Improve Critical Thinking Skills of Senior High School Students. *Studies in Learning and Teaching*, *1*(2). https://doi.org/10.46627/silet.v1i2.34.

In the aspect of the ability to recognize students' initial potential regarding mathematics, it is often overlooked, especially in developing teaching methods and teaching materials [2]. Mathematics has an abstract object of study. Therefore, many students have difficulty understanding mathematics. In the process of learning the underlying mathematical concepts in children, children do not always develop as they should because each child experiences further growth and development [3].

Mathematics is a logical science regarding shape, arrangement, quantity, concepts that are interconnected with each other in large numbers which are divided into three areas or fields, namely algebra, analysis and geometry [4]. Understanding mathematics is an active process, to understand a theory we have to explore and manipulate it at various levels, from various points of view. We gain an understanding of a rule (procedure), theorem, postulate, theory through tests using relevant examples both analytically and numerically. Changing some of the prerequisites of theorems, postulates, theories and testing them again with several examples to see whether the theorems, postulates and theories are still valid or not, then using the ponent mode the testing continues for generalization. Sometimes we have to trace the theorems, postulates, theories against the topography [5]. Mathematics has standard mathematical processes, namely the ability to solve problems (*problem solving*), the ability to argue or reason (*reasioning*), the ability to communicate (*communication*), the ability to make connections (*connection*), and the ability to represent (*representation*). According to NCTM (1989:1), this ability is a standard competency in mathematical processes that must be mastered by students. With standard mathematical process competencies, students can represent them in everyday life. The five standard mathematical process competency abilities are the basis of mathematics in everyday life.

Problem solving as a goal concerns the reasons why mathematics is taught. In this interpretation, problem solving is free from problems, procedures, methods or special content. The main consideration is how to solve the problem which is the reason why mathematics is taught. Problem solving as a process is an activity that prioritizes the importance of procedures, strategic steps taken by students in solving problems and ultimately being able to find answers to questions, not just the answers themselves [6].

The ability to argue is important for students to develop because it aims for students to be able to convey their opinions rationally, logically and mathematically. Scientific argumentation is a strategy that can be used to convince others that the problem-solving solutions offered in problem-based learning are the result of critical thinking and supported by credible evidence [7]. Argumentation ability is a form of rhetoric that seeks to influence the attitudes and opinions of other people, which based on *Toulmin's Argument Pattern* includes six basic elements, namely *claim, data, warrant, backing, qualifier, and rebuttal*.

Mathematical communication skills are a requirement for solving problems, meaning that if students cannot communicate well to interpret mathematical problems and concepts, then they cannot solve these problems well [8]. Usually these communication skills have not yet appeared in students.

Mathematical connection ability is the ability to link mathematical concepts both between concepts in mathematics itself and linking mathematical concepts with concepts in other fields [9]. According to Jihad, mathematical connections are an activity that includes the following: 1) Looking for relationships between various representations of concepts and procedures. 2) Understand the relationship between mathematical topics. 3) Using mathematics in other fields of study or everyday life. 4) Understand equivalent representations of the same concept. 5) Looking for connections from one procedure to another procedure in an equivalent representation. 6) Using connections between mathematics topics, and between mathematics topics and other topics [10].

Representation is something that cannot be separated in mathematics learning. Even though it is not explicitly stated in the objectives of mathematics learning in Indonesia, the importance of representation is implicitly seen

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in the objectives of mathematical problem solving and mathematical communication, because to solve mathematical problems, the ability to create mathematical models and interpret the solution is required, which is an indicator of representation. Representation is a model or form used to represent a situation or problem in order to make it easier to find a solution [11].

Based on interviews with MI Muhammadiyah Petambakan teachers, learning activities, especially mathematics learning, still do not use varied learning models, so the teaching and learning process is less effective. Learning still uses conventional learning. A learning model that can provide students with the opportunity to develop their creativity and knowledge is a learning model based on constructivism theory. Practical activities can provide opportunities for students to engage in authentic scientific practice, so that students can develop science skills, and data and communicate scientific content. Apart from that, the *Predict Observe Explain* (POE) learning model can also sharpen thinking patterns and improve student learning outcomes. The experience gained can develop students' basic abilities to be creative, active and skilled in thinking and acquiring knowledge [12].

One learning model based on constructivism theory is the *Predict Observe Explain* (POE) learning model. *The Predict Observe Explain* (POE) learning strategy is learning that can make students think critically in exploring their own knowledge [13]. According to Suparno the *Predict, Observe, Explain (POE)* learning model is a learning model that consists of 3 activity steps, namely prediction or making predictions, observation or observing, and explanation or providing explanations [14]. Students are able to develop their knowledge with scientific evidence by using the POE (*Predict-Observe-Explaint*) learning model which is expected to improve understanding of concepts and skills in the mathematics learning process. The POE model provides opportunities for students to produce their own conceptual knowledge through reconciliation and negotiation between initial knowledge and new knowledge.

This is supported by previous research such as research from Mirta which is based on the results of a needs analysis which includes student analysis and analysis of class X material at SMAN 1 Banguntapan. The quality of the POE-based physics practicum guidebook based on the assessment of material experts, graphics experts and physics teachers is in the Very Good (SB) category. The average score obtained was 3.74; 3.67; and 3.69. The students' response to the *Predict Observe Explain* (POE) based physics practicum guidebook was Agree (S). The average score obtained in the limited trial was 0.94 and the average score in the extensive trial was 0.99. Based on the implementation of the physics practical guidebook, overall it was carried out well. The physics practicum guidebook developed can be used by students as a guide for class X physics practicum activities at SMAN 1 Banguntapan [15].

Who stated that the application of the predict observe explain learning model equipped with *drill and practice* based student worksheets in the Mechanical Earth Moving course, in the 2019/2020 academic year can increase student learning activity and achievement. As well as research from [16] which states that the application of *the Predict Observe Explain* (POE) Model has been proven to have an influence in improving students' science process skills in human digestion material. In addition, the science process skills taught using the POE model are higher than conventional learning. Thus, the POE model can be recommended in facilitating and improving students' science process skills in the human digestive system. *The Predict Observe Explain* (POE) model makes teachers become facilitators and stimulates students to be more active in authentic learning, so that students can develop science skills and be involved collaboratively in designing, collecting data, interpreting data, and communicating scientific content.

2. METHODS

This research was carried out at MI Muhammadiyah Petambakan in the second semester of the 2023/2024 academic year. This research is a quantitative research with a *quasi experiment model* using *a posttest only control design*. The experimental class uses the *Predict Observe Explain (POE)* learning model , while the control class uses a conventional learning model, namely lectures and assignments.

The population in this study were all MI Muhammadiyah Petambakan students for the 2023/2024 academic year. The sampling technique was carried out using *cluster random sampling* . The samples in this research were class VB, totaling 15 students, as the experimental class and class VA, totaling 16 students, as the control class.

The independent variable (Y) in this research is the *Predict Observe Explain* (POE) learning model with the dependent variable (X) in this research being the standard competency process which consists of the ability to

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solve problems (*problem solving*), the ability to argue or reason (*reationing*), the ability communication , the ability to make connections *and the* ability to *represent* . Hypothesis testing in this study used the t-test, which was preceded by a normality test using the Kolmogorov-Smirnov test and a homogeneity test using Levene's test. Testing was carried out using SPSS 22 with a significance level of 5%.

3. RESULT AND DISCUSSION

This Before knowing the effect of *the Predict Observe Explain* (POE) learning model on the standard mathematics competency process, a requirements test is carried out first to find out whether the data is normal or abnormal and homogeneous or inhomogeneous. Pretest and posttest data in the experimental class and control class were analyzed using the Kolmogorov-Smirnov normality test with the help of the SPSS IBM Statistics 22 program. The following test results were obtained:

Table 1. Normality Test Standard Test of Mathematical Competency Process

Tests of Normality

		Kolmogorov-Smirnov [a]			Shapiro-Wilk		
	Class	Statistics	Df	Sig.	Statistics	Df	Sig.
Mathematics Test Results	Class A	,215	16	,047	,860	16	.019
	Class B	,201	15	.106	,871	15	,034

a. Lilliefors Significance Correction

Based on the results above, the data is declared normal because it has a significance value greater than 0.05, namely 0.019 and 0.034. Next, a homogeneity test was carried out to find out whether the experimental class and control class had homogeneous variants or not. In this study, the homogeneity test used *Levene Statistics* with the help of the IBM SPSS 22 Statistics analysis program. The results are as follows:

Table 2. Homogeneity Test of Standard Mathematical Competency Process Test

Test of Homogeneity of Variances

Mathematics Test Results

Levene Statistics	df1	df2	Sig.
4,795	1	29	,037

Based on the data above, it can be concluded that the data is homogeneous because the significance value is 0.037, which is <0.05. After carrying out the prerequisite tests and the data has been declared normal and homogeneous, a hypothesis is then carried out using regression analysis which is presented as follows:

Table 3. Regression Analysis Results of *the Predict Observe Explain* (POE) Learning Model on Mathematical Competency Process Standards

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	Q	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.226	.581		-.389	.700
	problem solving	.976	.109	.919	8.985	.000
	Reasoning	-.015	.156	-.011	-.098	.923
	Comunication	.081	.157	.054	.518	.609
	Connection	.057	.127	.036	.449	.657
	Representation	.030	.119	.022	.253	.802

a. Dependent Variable: Model POE

Testing the influence of *the Predict Observe Explain* (POE) learning model on mathematics competency process standards. The coefficient of direct influence of *Predict Observe Explain* (POE) learning on mathematics competency process standards was measured through hypothesis testing using individual parameter significance tests or t tests. The t test was carried out to test whether the independent variables partially had a real effect on the dependent variable or not. The degree of significance used is 0.05. If the significant value is smaller than the degree of confidence then we accept the alternative hypothesis, which states that an independent variable partially

influences the dependent variable. Based on the results of the regression analysis in Table 3, the following are obtained:

1. Problem solving abilities (*problem solving*)
   a. Judging from the standard Beta coefficient of 0.919, this means the effect is positive.
   b. Judging from the significance value, sig = 0.000 < 0.05, meaning the effect is significant.
   c. Judging from the calculated t value = 8.985 > t table = 2.045, this means the effect is significant.
2. Reasoning ability (*reasioning*)
   a. Judging from the standard Beta coefficient -0.011, this means the effect is negative.
   b. Judging from the significance value, sig = 0.923 > 0.05, meaning the effect is not significant.
   c. Judging from the calculated t value = -0.098 < t table = 2.045, this means that the effect is not significant.
3. *Communication* skills
   a. Judging from the standard Beta coefficient of 0.054, this means the effect is positive.
   b. Judging from the significance value, sig = 0.609 > 0.05, meaning the effect is not significant.
   c. Judging from the calculated t value = 0.518 < t table = 2.045, this means that the effect is not significant.
4. Ability to make *connections*
   a. Judging from the standard Beta coefficient of 0.036, this means the effect is positive.
   b. Judging from the significance value, sig = 0.657 > 0.05, meaning the effect is not significant.
   c. Judging from the calculated t value = 0.449 < t table = 2.045, this means that the effect is not significant.
5. *Representational* capabilities
   a. Judging from the standard Beta coefficient of 0.022, this means the effect is positive.
   b. Judging from the significance value, sig = 0.802 > 0.05, meaning the effect is not significant.
   c. Judging from the calculated t value = 0.253 < t table = 2.045, this means that the effect is not significant.

4. CONCLUSION

Based on the analysis and discussion of the results of the research that has been carried out, it can be concluded that:

1. There is a positive influence of using the *Predict Observe Explain* (POE) learning model on the mathematics competency process standards for class V MI Muhammadiyah Petambakan, except for the reasoning ability standards (*reasioning*) which have a negative influence.
2. There is an insignificant effect of the *Predict Observe Explain* (POE) learning model on the mathematics competency process standards for class V MI Muhammadiyah Petambakan, except for problem *solving* ability standards which have a significant influence.
3. When using the *Predict Observe Explain* (POE) learning model, it is recommended to reflect after each lesson. This is intended to identify deficiencies and correct them in the next learning process.

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