THE APPLICATION OF THE PROBLEM-BASED LEARNING TEACHING MODEL IN IMPROVING STUDENTS' ABILITY TO SOLVE HIGHER ORDER THINKING SKILLS QUESTIONS

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Abstract

This study aimed to determine the increase in the ability to solve Higher Order Thinking Skills (HOTS) questions in the economics subject. This quantitative study employs a pre-experimental design with a pretest-posttest control group design. The instrument in this study used economic HOTS questions in the form of 15 multiple choice questions to determine the increase in ability to solve HOTS questions with the application of the Problem-Based Learning teaching model. It is known that the pre-test distribution data analysis obtained a mean of 58.64. In contrast, the post-test after being given a stimulus or treatment with the HOTS approach obtained a mean of 86.70, resulting in an increase in the results of the HOTS post-test after applying the Problem-Based Learning teaching model. There is a significant difference through the results of the students' pre-test and post-test, as evidenced by the $t_{\text{-test}}$ obtained $t_{\text{-count}} > t_{\text{-table}}$ (6.855 > 1.675) and the Wilcoxon Sign rank test, which produces a value (asym.sig.(2-tailed)) is 0.000 <0.05. Then, the results of hypothesis H_0 are rejected, and H_1 is accepted. It can be concluded that there is an effect after applying the Problem-Based Learning teaching model in increasing the ability to solve HOTS questions.

INTRODUCTION

Education is an effort so that humans can develop their potential through a learning process or in other ways that are known and recognized by society. Ngalimun (2017) states that education should be obtained early, from primary to secondary, and at a higher

level. Therefore the Indonesian government must be able to provide the best education for Indonesia's next generation and pay attention to the quality of education in Indonesia.

However, based on the facts, Indonesia's education quality still needs to improve. Based on a survey of the secondary education system by the Program for International Student Assessment (PISA) in 2019, Indonesia occupies a low position, namely position 74 out of 79 other countries in the survey. With this in mind, the Indonesian government continues to distribute education to improve the quality of education and determine the nation's progress. The progress of a nation can determine the quality of education of the nation and state. The need for more quality education in Indonesia will keep the nation caught up. One of the essential things in knowing the quality of education is looking at the teaching and learning process while at school.

One way to improve the quality of education in Indonesia is by applying various learning models, one of which is the Problem-Based Learning teaching model. Rimini (2020) states that the Problem-Based Learning teaching model is a teaching model that has long been developed by experts in order to instill habits in students so that they always solve a problem. According to Lider (2022), Problem-Based Learning is part of curriculum development in order to develop students' skills in solving a problem and to help students gain knowledge to improve the evaluation or assessment of student learning.

This application model generally begins with a problem that students must resolve. These problems can come from teachers or students. Students will focus on learning about these problems and learn from scientific theory and methods to solve problems. Problem-based learning can be applied through individual activities, not only through group activities. The application of this model depends on the objectives of the learning to be taught and the material to be taught by the teacher. If the material to be taught is felt to require deep thought, then the learning should be done through group activities.

At this time, reforms in the world of education have implemented a learning evaluation that is oriented toward HOTS. Students are encouraged to develop their higher-order thinking skills, especially in solving questions based on higher-order thinking skills or what is often called HOTS questions. Tanujaya (2021) states that with a learning evaluation that is oriented toward HOTS, students are not only required to memorize but also to train higher-order thinking skills, such as students' ability to analyze, evaluate and be creative.

According to Fanani (2018), characteristics of higher-order thinking skills include critical thinking and creative thinking. This thinking ability is a fundamental ability that can encourage a person to see a problem from various perspectives and look for alternative solutions to produce new products that provide benefits to sustain his life.

Learning that involves a high level of thinking (HOTS) is essential in the era of the industrial revolution 4.0 as it is today. Helmawati (2019) explains that higher-order thinking skills are thought processes that require students to process existing information and can produce new understandings and create new ones in certain ways. In addition, Agustin (2021) states that learning and learning assessment based on higher-order thinking skills is highly recommended for use in quality educational processes.

Furthermore, in the current era of the industrial revolution 4.0, quick and accurate analysis and decision-making skills are urgently needed to be able to adapt to changes in Science and Technology and to be able to solve very complex problems. Amir (2015) states that implementing learning by applying the Problem-Based Learning teaching model improves students' abilities, especially in solving questions. These questions are also expected to improve the quality of education so that they can compete in the current era of the 4.0 industrial revolution.

Based on the results of observations made by researchers while carrying out the program of School Field Introduction at SMAS Al-Huda Pekanbaru, some students still experience difficulties in solving economic questions, especially questions that are HOTS. In economics learning, students are required to be able to develop thinking skills and be able to solve a problem, especially in working on HOTS questions. Where during the work on these questions, students are required to think at a higher level.

Based on the results of interviews conducted by researchers with one of the economics teachers at SMAS Al-Huda Pekanbaru, it is clear that not all of the teachers at the school apply the Problem-Based Learning teaching model. In addition, the teachers at the school have not used evaluation in the form of assessments using HOTS questions. Therefore, a teacher must improve his students' ability to solve HOTS questions because these questions often arise when students participate in competitions such as the Olympics, competitions, or tests to enter college.

The results of this study are likely to be useful for the development of science, especially the use of the Problem-Based Learning teaching model and also assessment instruments in the form of HOTS questions. While practically, this research is expected to be useful for students. With this research, students can improve their understanding of economics and build a positive spirit in studying economics.

METHODOLOGY

The type of research used is experimental research. As defined by Sugiyono (2019), the experimental research method can be used by researchers in conducting an experiment to compare the independent variables with the dependent variable. This study uses a quasi-experimental research design which consists of a pretest-posttest control group

design (Widoyoko, 2020). According to Jakni (2016), this design involved two class groups, namely the experimental class group and the control class group, which were randomly selected. The experimental class group was given treatment using the Problem-Based Learning teaching model, and the class group control was not given that treatment.

This research was carried out at SMAS Al-Huda Pekanbaru in the 2022/2023 academic year, which is in line with the odd semester. The time of implementation of this research for three months. The research time started from September to December 2022 from carrying out the program of School Field Introduction, making observations during teaching, and asking permission from the school until the research process is complete. The population of this study was all students of class XI in the odd semester of SMAS Al-Huda Pekanbaru in the academic year 2022/2023, which consisted of three classes, namely class XI Science, XI Social A, and XI Social B. The total number of students in class XI SMAS Al-Huda Pekanbaru was 89 students. As there were only two social studies majors classes, the researchers took two classes to serve as research samples, namely class XI IPS A with 27 students and class XI IPS B with 27 students (54 students in total).

The data collection technique was carried out using observation instruments of teacher activity which were given an assessment by the economics teacher, and test instruments in the form of pre-tests and post-tests conducted by students. The research procedure consisted of three stages, starting from the first stage, namely preparation by compiling learning tools such as syllabus, lesson plans, worksheets, learning media, and evaluation in the form of HOTS questions, then the second stage was the implementation of the stages carried out in class, namely implementation in the experimental and control classes for four meetings, and the third stage is the reporting stage by reporting the results of the research to the lecturer. The data analysis technique used was descriptive statistical data analysis and inferential statistical data analysis using the SPSS for Windows version 22 program to process the pre-test and post-test results by using 15 questions of HOTS belonging to the C4 to C6 level with inflation material. Test results based on HOTS in the form of multiple choice questions of 15 questions are then analyzed descriptively. The data was obtained based on the results of the pre-test and post-test on students after working on a test based on Higher Order Thinking Skill (HOTS). Then the results of the acquisition of the pre-test and post-test that had been done by the students would be analyzed in order to find out the score of students before and after being given a treatment where the data is processed using the help of the SPSS for Windows version 22. In order to get a clear picture of the results of tests based on Higher Order Thinking Skill (HOTS) that has been done by students, then The pre-test and post-test data are processed using descriptive and categorizing statistical data analysis.

FINDING AND DISCUSSION

Descriptive Statistics Data Analysis Results

a. Description of Pre-Test Based HOTS Results in Experimental Class (XI Social B)

Based on the results of the pre-test based on students' HOTS question before being given treatment or before applying the Problem-Based Learning teaching model in the experimental class, namely class XI Social B SMAS Al-Huda Pekanbaru, the data obtained collected through the test instrument. Data from the pre-test results in the experimental class (XI Social B) can be seen in Table 1 as follows:

Table 1. Description of Experimental Class Pre-test Results

	N	Range	Minimum	Maximum
Experimental class (Pre-test)	27	40	40	80
Valid N (listwise)	27			

From the results of the analysis in Table 1, the average value of the results of the pre-test scores in the experimental class of students in the experimental class before the application of the Problem-Based Learning teaching model was 58.48, while the lowest score was obtained by students is 40 and the highest score obtained by students is 80. The categorization of pre-test results in the experimental class is shown in Table 2 as follows:

Table 2. Categorization of Pre-test Results for HOTS Experimental Class Questions

Intervals	Predicate	Frequency	Percentage (%)
90-100	A	0	0%
80-89	B	1	03,71%
70-79	C	6	22,22%
<70	D	20	74,07%
	Amount	27	100%

Based on the data in Table 2, it can be concluded that the pre-test results of experimental class students used a test instrument with an "A" predicate of 0 or 0%, a "B" predicate of 1 or 03.71%, a "C" predicate of 6 or 22.22%, and the title "D" as much as 20 or 74.07%. Judging from the results of the existing percentages, it can be said that the level of ability in solving HOTS questions before the application of the Problem-Based Learning (PBL) teaching model was still in the low category.

Table 3. Description of Completeness of Experimental Class Economics Learning Outcomes

Score	Categorization	Frequency	Percentage (%)
0≤ x < 70	Not Completed	20	74,07%
70 ≤ x ≤ 100	Complete	7	25,93%

Table 3 is associated with the indicators of the criteria for the completeness of the learning outcomes of students determined by research, namely the number of students who achieve or exceed the KKM score (70), which is greater than or equal to 70%, it means that the ability to solve HOTS question of students in the experimental class, namely class XI Social B SMAS Al-Huda Pekanbaru, did not meet the classical learning completeness criteria because students who completed only 25.93% ≤ 70%.

b. Description of Pre-Test Based on HOTS Results in Control Class (XI Social A)

Based on the results of the pre-test based on students' HOTS questions, students after learning using conventional learning models in the control class, obtained data collected through instrument tests. Data from the pre-test results in the control class, namely class XI Social A SMAS Al-Huda Pekanbaru, can be seen in Table 4 as follows:

Table 4. Description of Control Class Pre-test Results

	N	Range	Minimum	Maximum
Control Class (Pre-test)	27	47	33	80
Valid N (listwise)	27			

Based on the results of data analysis in Table 4, the average value obtained from the pre-test results of students in the control class using the application of conventional learning models is 56.70, while the lowest score obtained by students is 33, and the highest score obtained by students is 80. The categorization of pre-test results in the control class is seen in Table 5 as follows:

Table 5. Categorization of Pre-test Results for Control Class HOTS Questions

Intervals	Predicate	Frequency	Percentage(%)
90-100	A	0	0%
80-89	B	1	03,71%
70-79	C	5	18,52%
<70	D	21	77,77%
	Amount	27	100%

Table 5 shows that the pre-test results of students in the control class used a test instrument with the predicate "A" of 0 or 0%, the predicate "B" of 1 or 03.71%, the

predicate "C" as much as 5 or 18.52%, and the predicate "D" as much as 21 or 77.77%. Judging from the results of the existing percentages, it can be said that the level of ability in solving the HOTS question of students in the control class is still classified as in the low category.

Table 6. Description of Completeness of Control Class Economics Learning Outcomes

Score	Categorization	Frequency	Percentage (%)
$0 \leq x < 70$	Not Completed	21	77,77%
$70 \leq x \leq 100$	Complete	6	22,23%

Table 6 is associated with the indicators of the completeness criteria for student learning outcomes determined by the study, namely the number of students who achieve or exceed the KKM score (70), which is greater than or equal to 70%. It means that HOTS students in the experimental class SMAS Al-Huda Pekanbaru did not meet the classical learning outcomes completeness criteria because students who completed only 22.23% ≤ 70%.

c. Description of Post-Test Based on HOTS Results in Experimental Class (XI Social B)

Based on the post-test results based on students' HOTS question after being given treatment or after applying the Problem-Based Learning teaching model in the experimental class, namely class XI Social B SMAS Al-Huda Pekanbaru, the data obtained was collected through instrument tests. Data from the post-test results in the experimental class, namely class XI Social B SMAS Al-Huda Pekanbaru can be seen in Table 7 as follows:

Table 7. Description of Experimental Class Post-test Results

	N	Range	Minimum	Maximum
Experimental Class (Post-test)	27	34	66	100
Valid N (listwise)	27			

From the results of data analysis in Table 7, the average value of the post-test results in the experimental class was obtained, namely students in class XI Social B SMAS Al-Huda Pekanbaru after applying the Problem-Based Learning teaching model, which was 86.70, while the lowest score was obtained by students was 66 and the highest score obtained by students was 100. The post-test categorization results in the experimental class can be seen in Table 8 as follows:

Table 8. Categorization of Post-test Results for HOTS (HOTS) Experimental Class Questions

Intervals	Predicate	Frequency	Percentage (%)
90-100	A	9	33,33%
80-89	B	16	59,25%
70-79	C	1	03,71%
<70	D	1	03,71%
	Amount	27	100%

Based on the data that can be seen in Table 8, it can be concluded that the results of the post-test in the experimental class using the test instrument "A" predicate was 9 or 33.33%, the predicate "B" was 16 or 59.25%, the predicate "C" as much as 1 or 03.71%, and the predicate "D" as much as 1 or 03.71%. Judging from the results of the existing proportions, it can be said that the level of ability in solving HOTS questions of students in the experimental class after applying the Problem-Based Learning teaching model belongs to the very high category.

Table 9. Description of Completeness of Experimental Class Economics Learning Outcomes

Score	Categorization	Frequency	Percentage (%)
$0 \leq x < 70$	Not Completed	1	03,71%
$70 \leq x \leq 100$	Complete	26	96,29%

If Table 9 is associated with the indicators of the criteria for the completeness of the learning outcomes of students determined by the research, namely the number of students who achieve or exceed the KKM score (70), which is greater than or equal to 70%, it means that the ability to solve HOTS question students in the experimental class, namely class XI Social B, have fulfilled the classical learning achievement criteria because students who complete 96.29% ≥ 70%.

d. Description of Post-Test Based on HOTS Results in Control Class (XI Social A)

Based on the results of the post-test based on students' HOTS questions, students after using conventional learning models or learning that are normally used by teachers at school, including examples such as the lecture method, in the control class, namely class XI Social A SMAS Al-Huda Pekanbaru, then obtained data collected through test instruments. Data from the post test results in the control class, namely class XI Social A SMAS Al-Huda Pekanbaru can be seen in Table 10 as follows:

Table 10. Description of Control Class Post-test Results

	N	Range	Minimum	Maximum
Control Class (Post-test)	27	46	40	86
Valid N (listwise)	27			

From the results of the analysis in Table 10, the average value of the post-test results in the control class, namely class XI Social A SMAS Al-Huda Pekanbaru, obtained a value of 62.11, while the lowest score obtained by students was 46, and the highest value was obtained by students is 86. The categorization of the results of the control class post-test is seen in Table 11 as follows:

Table 11. Categorization of Post-test Results for Control Class HOTS Questions

Intervals	Predicate	Frequency	Percentage (%)
90-100	A	0	0%
80-89	B	5	18,52%
70-79	C	10	37,04%
<70	D	12	44,44%
	Amount	27	100%

Based on the data that can be seen in Table 11, it can be concluded that the results of the post-test in the experimental class, namely class XI Social A SMAS Al-Huda Pekanbaru, used a test instrument with an "A" predicate of 0 or 0%, a "B" predicate. 5 or 18.52%, "C" predicate 10 or 37.04%, and "D" predicate 12 or 44.44%. Judging from the results of the existing proportions, it can be said that the level of ability to solve the HOTS question of students in the control class is still in the high category.

Table 12. Description of Completeness of Control Class Economics Learning Outcomes

Skor	Categorization	Frequency	Percentage (%)
$0 \leq x < 70$	Not Completed	12	44,44%
$70 \leq x \leq 100$	Complete	15	55,56%

If Table 12 is associated with the indicators of the criteria for completeness of the results of the students determined by the research, namely the number of students who achieve or exceed the KKM score (70), which is greater than or equal to 70%, it means that the ability to solve HOTS question of students in the control class, namely class XI Social A SMAS Al-Huda Pekanbaru, did not meet the classical learning completeness criteria because only 55.56% ≤ 70% completed students.

Analysis Prerequisite Test

1. Normality Test

The normality test is carried out to ensure that the variables being compared on average follow a normal distribution or distribution. In this study, the normality test technique used was the one-sample Kolmogorov-Smirnov test, which is a two-tailed test conducted by comparing the significance of the test results (p-value) with the significance level. The purpose of the normality test is to prove that the sample has been taken proportionally from the population and that the variables studied meet the normal distribution criteria. If the results obtained are greater than the significant level, then the distribution of the research data is normal. Calculation of the normality test in this study can be seen in Table 13 as follows:

Table 13. Kolmogorov Smirnov Normality Test and Shapiro Wilk Test

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
Questions HOTS	Pre-test of Experimental class	.183	27	.021	.902	27	.015
	Post-test of Experimental class	.202	27	.006	.871	27	.005
	Pre-test of Control Class	.179	27	.026	.959	27	.356
	Post-test of Control Class	.201	27	.007	.930	27	.069

Based on the output above, it is known that the significant value (sig) for all data is good for the Kolmogorov-Smirnov normality test and the Shapiro-Wilk test > 0.05, which means that the research data is normally distributed.

2. Homogeneity Test

Homogeneity calculations can be performed to find out whether the data has a homogeneous variance or not. Homogeneous data is also a requirement before analysis with parametric statistics. The results of the homogeneity test calculations in this study can be seen in Table 14 as follows:

Table 14. Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Results of HOTS Questions	Based on Mean	.041	1	52	.841
	Based on Median	.037	1	52	.848
	Based on the Median and with adjusted df	.037	1	46.375	.848
	Based on trimmed mean	.016	1	52	.900

Based on the output above, it is known that the significant value (sig) for homogeneity data is known to be 0.841, so 0.841 > 0.05, it means that the research data is homogeneous.

3. Hypothesis Test

After the prerequisite tests were carried out, namely the normality test and homogeneity test, then the hypothesis was tested using an independent sample t-test with the help of the SPSS for Windows version 22 program, which can be seen in Table 15 as follows:

Table 15. Description of Completeness of Control Class Economics Learning Outcomes

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
The score of HOTS Questions	Equal variances assumed	.041	.841	**6.855**	52	**.000**	18.630
	Equal variances are not assumed.			6.855	51.670	.000	18.630

To determine the value of the t table by finding the t table using the t distribution table with a significant level α = 0.05 and d.b = N-2 = 54-2 = 52, then obtained t 0.05 = 1.675. After obtaining t count 6,855 t table = 1,675, t count > t table or 6,855 > 1,675 is obtained, then based on the basis of decision making through a comparison of the value of t count with t table, so it can be concluded that H0 is rejected and H1 is accepted, which means that there is an influence significantly after applying the Problem-Based Learning teaching model in Improving the Ability to Solve HOTS Question for Student SMAS Al-Huda Pekanbaru.

Discussion

The results of observations regarding teacher activity show that the teacher had carried out learning activities by applying the Problem-Based Learning teaching model. Husnidar and Hayati (2021) state that this learning model consists of five phases, namely orienting students to problems, organizing students to learn, guiding individual and group investigations, guiding individual and group investigations, and guiding individual and group investigations. This is in line with the opinion of Rahmayanti (2017), which states that Problem-Based Learning is a teaching that presents various problematic situations that are authentic and functional for students so that these problems can be a springboard for conducting investigations and research. Students also begin to be active and confident in expressing their feelings and opinions after carrying out discussion activities related to

problems given by the teacher and problems submitted by other students. They felt happy and really enjoyed the discussions that were carried out, so they were motivated to take part in the lesson. A fun learning process makes students no longer enter during learning and no longer feel bored or pressured when participating in class learning.

Based on the average score obtained by the researcher from the assessment that was given by the teacher in the implementation of the School Field Introduction activity, namely Mrs. Sata Riani, S.Pd through the teacher activity observation sheet at the starting point in the teacher observation sheet during the implementation of learning, such as deliver material according to the lesson plans, perceptions according to the material, motivate students, convey learning objectives, the average points are 4 and 3 because when the teacher explains to class experiments and controls, the teacher explains well according to the guidebook and the Learning Implementation Plan that exists. However, the way to apply these lessons is different between the experimental and control classes. Where the experimental class applies lessons with the application of a Problem-Based Learning teaching model based on experiments while the teacher's control class applies lessons with conventional learning models. In the experimental class, it can be seen that the implementation of learning carried out by the teacher is put very well into managing inflation learning material by applying the Problem-Based Learning teaching model; the average value obtained is 89%.

Based on these criteria data, it can be said that the teacher has succeeded in implementing the Problem-Based Learning teaching model during the learning process, and in the control class, it can be seen that the implementation of learning is on inflation material with an average value obtained of 53%. Based on these criteria data, it can be said that students are less active during the implementation of learning. With this data, it can be interpreted that the teacher is not effective in teaching material by applying conventional learning models. So the teacher must be able to apply a more active and effective learning model so that students can be motivated to learn. The difference in the average value of the two data in the experimental and control classes, it can be seen that the average value in the experimental class is much better than the control class. So, the Problem-Based Learning teaching model succeeded in making students an active method for learning through the implementation of group work experiments. This is very clear the difference between the two classes.

Based on the value of the descriptive statistical analysis and inferential statistics obtained as well as the results of the observations made, it can be interpreted that there is a significant influence after applying the Problem-Based Learning teaching model in Improving the Ability to Solve HOTS Question for Student SMAS Al-Huda Pekanbaru.

CONCLUSION

Based on all supporting data proving the achievement of learning objectives, it can be concluded that the application of the Problem-Based Learning teaching model in improving the ability to solve HOTS questions for Student SMAS Al-Huda Pekanbaru. Based on the existing findings, it can be concluded that from the research results, in an effort to achieve learning objectives in Economics subjects, the application of the Problem-Based Learning teaching model should be used as an option from several existing methods, considering that this learning model is proven to be effective in improving the ability to solve a problem, one of which is solving HOTS questions through collaboration, discussion, creation, acting actively, exchanging information, expressing opinions, arguing and others. The results of this study indicate that the results of the descriptive statistical analysis from the observations of teacher activities indicate that the teacher has carried out learning activities by applying the Problem-Based Learning teaching model. Based on the results of descriptive statistical analysis from the results of observations of teacher activities. Researchers acting as teachers have carried out learning activities by applying the Problem-Based Learning teaching model, such as conveying material according to the learning implementation plan, apperception in accordance with the material, providing motivation for students, conveying learning objectives, the average point is 4 and 3, due to when the teacher explained to the experimental and control classes, the teacher explained well according to the existing guidebook and lesson plans. Students also begin to be active and confident in expressing their feelings and opinions after carrying out discussion activities related to problems given by the teacher and problems submitted by other students. They felt happy and really enjoyed the discussions that were carried out, so they were motivated to take part in the lesson. A fun learning process makes students no longer enter during learning and no longer feel bored or pressured when participating in class learning. Meanwhile, based on the results of inferential statistical analysis using the independent sample t-test formula, after obtaining the value of $t_{\text{-count}} = 6.855$ and the value of $t_{\text{-table}} = 1.675$. it can be interpreted that $t_{\text{-count}} > t_{\text{-table}}$, meaning that there is a significant effect after applying the Problem-Based Learning (PBL) learning model in improving students' ability to solve HOTS questions.

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