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The Effectiveness of Project-Based Learning Models to Stimulate Students' Higher Thinking Ability in High School Sociology Learning

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ABSTRACT
This article aims to explain the effectiveness of implementing the project-based learning model along with the questions generated to stimulate the growth of students' high order thinking skills. This study is interesting because it shows evidence that the project learning model has a syntax that can foster students' critical thinking, creative and problem-solving skills. The research procedure was carried out following the flow of quantitative research with an experimental type (pretest-posttest control group design). The research sample was 154 social science students in class XI SMAN 2, SMAN 5 and SMAN 7 Padang. The research instrument is in the form of multiple-choice questions. To analyze the data carried out using the T-test and Analysis of Variance. To determine the effect of implementing the PjBL learning model on the HOTS ability of students in one school, it was analyzed using a t-test with two samples, while analysis of variance was used to determine differences in effectiveness in three schools. The results showed that applying the PjBL learning model to sociology learning in high school was proven to be effective in stimulating the growth of students' higher-order thinking skills.

Keywords: *Effectiveness, HOTS, Project based Learning Model, Sociology Learning.*

1. INTRODUCTION

The educational process helps students develop thinking skills to answer the challenges of everyday life [1]. Thinking skills are skills that a person has to use his intelligence to solve problems. All individuals need good thinking skills to overcome complex social problems in social life and find solutions. Thinking skills are an essential aspect of the educational process, especially in the 21st century [2]. Thinking skills can also affect students' learning ability, speed, and efficiency of learning.

Thinking skills enable students to solve learning problems, develop competitive thinking, and develop intellectually, helping to prevent misunderstandings [3]. Students must have thinking skills ranging from low thinking skills (LOTS) to high thinking skills (HOTS) because the development of students' thinking skills can help them find solutions to problems in everyday life creatively and innovatively [4]. In addition, well-honed HOTS skills will allow students to be competitive in social life and the world of work, especially in facing the millennium era [5]. Therefore Miri, David and Uri said that HOTS needs to be taught continuously to achieve success [6].

Theoretically, previous experts and researchers revealed different indicators of HOTS. For example, based on Anderson's revised Bloom level, the HOTS indicator is a thinking skill at the levels of analyzing, evaluating and creating [6]; [7]. Marzano revealed that the HOTS indicators consist of comparing, classifying, inductive thinking, deductive thinking, analyzing errors, building support, analyzing perspectives, abstracting, making decisions, investigating, solving problems, practising discovering and making discoveries [8]. Meanwhile, Agustina and Dwikantoro wrote that the indicators of HOTS are creative thinking and problem solving [9].

Research conducted by Saido identified that most students in secondary schools need to improve HOTS because students' thinking skills are still at the LOTS level, especially at the synthesis and evaluation skills stage [7]. At the same time, HOTS skills are needed to

increase students' creativity in science. Several previous studies also revealed problems in the implementation of HOTS in the social science learning process. For example: (1) Based on some literature, it is known that teaching HOTS skills in social studies learning is still problematic and has not been successful, because based on an analysis of some previous literature, there is no agreement on experts who say that teachers have succeeded in developing students' thinking skills in schools [10]; (2) HOTS still cannot be trained to students in school well in the learning process [11]; (3) Students have difficulty in building HOTS level questions [5].

The 2013 curriculum implements the national education plan that encourages the emergence of student competencies to compete in the 21st century by prioritizing literacy skills, intellectual competencies (HOTS) and students' communication skills. The emphasis of 21st-century learning is to provide learning experiences for students to carry out literacy from various sources, think analytically, cooperate, and collaborate in finding solutions to various problems. The Sociology subject in SMA aims to develop intellectual competence (HOTS) of students so that they can understand, apply, analyze factual, conceptual, procedural, and metacognitive knowledge, then process, reason, and present in the concrete and abstract realms. [12].

The Regulation of the Minister of Education of the Republic of Indonesia No. 24 of 2016 states that HOTS is important to be developed in high school sociology learning because Sociology is a perspective that examines the social context in which humans live and influence society [13]. Therefore, in teaching sociology, students need to be accustomed to constructing concepts about the material from contextual phenomena that occur in their environment to train students' HOTS development. However, Sociology learning in high school has not been able to explain, analyze and understand the social context in society [14]. This inability results in the low thinking skills of students, especially in the process of observing, analyzing, and responding to problems in society.

The problem of the low thinking skills of students in Sociology learning is caused by two things, namely problems in the Sociology learning process and problems in Sociology textbooks [15]. First, the problems in the Sociology learning process include: (a) most of the Sociology learning processes provide moral, normative, and ethical doctrines that study Sociology subjects, (b) Sociology materials are widely explained in textbooks as teachers are less precise in developing Sociology concepts and Sociological theory with the social context of student life.

The next problem is in high school students' sociology books. The problems with textbooks are: (1) the formulation of the objectives of a book is often ambiguous and inaccurate [14], (2) many materials in books have a biased view of social structure and society, only described as structures with emphasis on values, norms and social order. (3) the material regarding the role of actors theoretically and empirically is dry so that the Sociology material becomes bland and not contextual rooted in strong indigenization in the Indonesian context. According to the 2013 curriculum requires a learning process and learning materials to encourage them to acquire HOTS and contextual skills.

Based on the explanation above, it can be identified that: (a) one of the general goals of education is to develop students' thinking skills which include LOTS, MOTS and HOTS skills. However, some teachers think that developing HOTS can only be done for students with high academic achievement, (b) the level of mastery of the student's HOTS level and the implementation of HOTS in social science learning is still experiencing problems, even though HOTS is needed by students to achieve success in education and enter the world of work, and (c) The implementation of the 2013 curriculum in Sociology learning, especially the development of student HOTS has not been implemented optimally because of the problems that occur in the learning process and textbooks. Therefore, it is important to design and implement Sociology learning using a learning model that provides a learning experience to students so that they are able to stimulate the development of students' HOTS abilities.

In Permendikbud RI Number 22 of 2016, it has been emphasized that learning can be designed and implemented using a learning approach that enables students to produce and communicate project-based work contextually, both individually and in groups. Mitrevski added that the project-based learning model (PjBL) could result in students learning actively, forming a collaboration between students in seeking and building their knowledge [16]. The characteristics of the PjBL model, according to Thomas, can involve students

in the investigation, problem-solving, and meaningful task activities so that students can work independently or in groups in constructing their knowledge and produce authentic products [17]. The PjBL model focuses more on the construction of concepts from facts around students' lives so that they can have a learning experience; the teacher acts as a facilitator who presents a stimulus regarding phenomena related to the material to be studied, asks questions, facilitates students in designing projects, implements projects that are by the material. Furthermore, the time that has been set so that authentic learning becomes efficient meaningful and can increase student creativity [18];[19]. Based on the expert's statement above, it can be concluded that the PjBL learning model has a syntax that can provide a learning experience for students so that their HOTS abilities can be developed.

This article is the result of a study that will explain the effectiveness of implementing the PjBL model in stimulating students' HOTS abilities so that they can provide a foundation for teachers and education experts in developing HOTS-based Sociology learning.

2. RESEARCH METHODOLOGY

An experimental method with pretest-posttest control group design. This design is appropriate to measure the effectiveness of the PjBL model in stimulating students' HOTS abilities because it can test differences in the quality of student learning outcomes in the experimental and control groups. The sample in this study amounted to 154 people, consisting of 81 students in the experimental group, participants in HOTS learning and 73 students in the control group.

The quality of student learning outcomes is measured through tests with HOTS questions that integrate critical thinking, creative thinking and problem-solving skills. Test questions are given at the beginning of learning before the PjBL model, and project assignments are designed so that students can carry out learning activities that can stimulate their HOTS. In this case, the research instrument was distributed directly to students in class XI IPS, the experimental group and the control group at the test schools, namely SMAN 2, SMAN 5 and SMAN 7 Padang.

Technical analysis of the data was carried out in two ways, namely using the T-test and Analysis of Variance. The t-test technique of two related samples was carried out to determine the effect of the treatment given in the research process at one school, while the analysis of variance test technique was used to test the differences in the data obtained at three schools. The results of the t-test and Anova, which are the basis for making decisions about the effectiveness of the PjBL model, can stimulate students' higher-order thinking skills.

3. RESEARCH RESULT AND DISCUSSION

The research activity on the effectiveness of the PjBL model in stimulating students' HOTS skills was carried out in three schools in the city of Padang, namely SMAN 2 Padang, SMAN 5 Padang and SMAN 7 Padang. Through a quasi-experimental design, the data collection process lasted six meetings, with each meeting for 4 hours of lessons. In this phase, sociology learning takes place following the PjBL model syntax, which consists of (1) determining basic questions, (2) designing the project, (3) developing a project implementation schedule, (4) monitoring project implementation and progress, (5) evaluating results, (6) evaluate the experience.

At the beginning of the meeting, a pre-test was conducted by giving 25 HOTS questions to determine the initial condition of the students' abilities in the treatment class and the control class to ensure that students in both classes had relatively the same abilities. Then learning is carried out by applying learning tools and assignments according to the PjBL model that can provide a learning experience for students and stimulate their HOTS abilities; after that, a post-test is carried out at the end of the learning process.

The HOTS item analysis test was designed and tested on 30 student respondents outside the sample from class XI IPS which were chosen randomly from the three schools. Of the 25 questions that were tested, five questions were invalid because they had a calculated r-value (Sig-2 tailed) less than 0.3, namely questions no. 7, 8.14, 18 and 21. So there were 20 valid questions. The HOTS evaluation questions were also tested for their level of difficulty. By calculating the average obtained, the level of difficulty of the HOTS items that have been tested can be estimated. The results of the analysis show that the average value is in the interval 0.633 - 0.966, the HOTS evaluation questions have a moderate and accessible level of difficulty. Furthermore, the researchers analyzed Cronbach's Alpha with a result of 0.415, which can be interpreted with a sufficient reliability value.

Table 1 Summary of Schools and Number of Students in Research

No	School	Class		Total
		Experiment Class	Control Class	
1	SMA N 2 Padang	30	28	58
2	SMA N 7 Padang	32	29	61
3	SMA N 5 Padang	19	16	35
	Amount	81	73	154

3.1. Data Analysis of HOTS Question Pre Test Results in the Experimental Class and Control Class

At the beginning of this meeting, a preliminary assessment was carried out to determine the initial condition of the students' abilities in the experimental class and control class. This ensures that the two classes have relatively the same ability and that there is no significant difference. The following are the results of the independent t-test of the student's condition as measured by the HOTS test in the treatment class and the control class.

The results of the student's initial ability test from the experimental results at SMA N 2, SMA N 7, and SMA N 5 Padang show that t count is less than t and the p-value is above the 5% level, which means there is no significant difference between the results. Pretest for students in the treatment class and control class. The results of the data analysis of student's initial abilities for all test school classes showed that there was no significant difference between the pretest scores in the experimental class and the control class, so the initial hypothesis before this research was conducted was that each class had the same initial ability and six class meets the comparison requirements.

Below are the results of the independent test of the student status of the HOTS test measured in the treatment class and the control class.

Table 2 Data Analysis of Pre Test Results of HOTS Questions in the Treatment Class and Control Class

	Independent Sample Test								
	Levene's Test for Equality of variances		t-test for equality of means						
	F	Sig	t	df	Sig (2-tailed)	Mean diff	Std error	95% confidence interval of diff	
								Lower	Upper
SMAN 2 Padang	40	0,000	0,946	56	0,348	1,926	2,03	-2,15	6,00
			0,97	38,58	0,338	1,926	1,99	-2,02	5,94
SMAN 7 Padang	4,7	0,0034	0,439	59	0,663	0,661	1,51	-2,35	3,67
			0,447	55,2	0,657	0,661	1,48	-2,30	3,62
SMAN 5 Padang	1,6	0,211	0,014	35	0,989	0,016	1,21	-2,43	2,46
			0,014	32	0,989	0,016	1,17	-2,36	2,39

The researcher then applied the PjBL model to sociology learning for six meetings in the experimental class and ended with giving questions that had been designed to stimulate students' HOTS. At the end of the lesson, a post-test was conducted to determine the final condition of the students' abilities in the treatment class and control class. This is to ensure that the two classes have significantly different abilities after treatment in the treatment class.

3.2. Data Analysis of Post Test Results of HOTS Questions in the Treatment Class and Control Class

The implementation of the t-test for the post-test scores of HOTS questions in the experimental class and control class to see whether there are differences in the conditions of the experimental class and control class students in the three test schools.

The following are the results of the different tests from the post-test score data of students in the

experimental and control classes, which were analyzed through the t-test (unrelated samples).

Table 3 Data Analysis of Post Test Results of HOTS Questions in Treatment Class and Class

	Levene's Test for Equality of variances		t-test for equality of means					95% confidence interval of the diff	
	F	Sig	t	df	Sig (2-tailed)	Mean diff	Std error diff	Lower	Upper
SMAN 2 Padang	16,79	0	4,056	56	0,000	8,44	2,08	4,27	12,61
			4,14	43,95	0,000	8,44	2,08	4,33	12,55
SMAN 7 Padang	2,053	0,157	3,401	59	0,001	5,39	1,58	2,22	8,555
			3,458	55,8	0,001	5,39	1,55	2,27	8,506
SMAN 5 Padang	11,240	0,002	4,881	30	0,000	6,13	1,25	3,56	8,688
			4,881	20,96	0,000	6,13	1,25	3,52	8,735

The average value of the HOTS test results in the treatment class is greater than the HOTS test results in the control class, indicating that the average HOTS test results in the treatment class are better than the control class. This shows that t arithmetic is more significant than t table. The significance value of the p-value is smaller at the 5% significance level, which means a very significant difference between the results HOTS post test in the treatment class and control class.

3.3. Data analysis Paired T-Test HOTS Question Test for Treatment Class Trial Project Based Learning Model in Treatment Class

The results of the post-test score analysis at the three pilot schools showed that the t count was more significant than the t table and the significance value of the p-value was smaller at the 5% significance level, which means that there is a very significant difference between the results of the HOTS post-test in the treatment class, and control class. This shows that the average HOTS test results in the treatment class are better than the control class.

The results of the paired t-test analysis on the pre-test and post-test scores of students' HOTS questions in the experimental class in the three test schools showed that the t-count was more significant than the t-table, and the significance value of the p-value was less than the 5% significance level, which means that there is a difference which is signed between the results of the pre-test and post-test HOTS questions of students in the experimental class. The results of the paired t-test analysis on the pre-test and post-test scores of students' HOTS questions can be seen in the following table.

Table 4 Paired T-Test Test Results for Treatment Class HOTS Questions at Three Trial Schools

Paired Sampel Test							
	Mean	Std. Dev	Std. error	95% confidence interval of the diff	t	df	Sig (2-tailed)

				mean	Lower	upper			
SMAN 2 Padang	Pretest Post-test Treatment Class	-7,833	5,434	0,99	-9,86	-5,80	-7,896	28	0
SMAN 7 Padang		-6,65	3,395	0,60	-7,88	-5,43	-11,092	30	0
SMAN 5 Padang		-6,684	2,906	0,66	-8,008	-5,28	-10,023	17	0

3.4. ANOVA Test Value of Post Test HOTS Questions for Treatment Class and Control Class in Three Schools

The Anova statistical test aims to determine which classes have different HOTS abilities of students after the PjBL model trial.

The results of the homogeneity of variance test with Levene's statistic showed the value of sig. 0.038 0.05. This means that changes in students' HOTS abilities after testing the PjBL model have the same or homogeneous variance. From the Anova test results show the test results F = 11.762 with sig. = 0.000. Refers to the test criteria if the value of sig. > then it means that there is no difference between the variables. If the value of sig. < means that there is a difference between the variables [20]. Statistical test results show that sig. = 0.000 < = 0.05 so it can be concluded that there is a significant difference in the results of the students' HOTS ability test after the PjBL learning model treatment in high school in the three schools where the model was tested.

Statistical tests through quasi-experimental research data analysis of the PjBL learning model using the SPSS program have provided a reasonably clear picture of differences in the HOTS abilities of students in high school sociology learning after receiving learning using the PjBL model. So that the results of this trial can be used as material for consideration so that teachers can use it in providing learning that can grow and improve the high-level thinking skills of high school students. In addition, teachers can also adjust the model to the conditions and situations of existing students and schools because the PjBL model, assignments and HOTS questions that are designed are expected to be flexible/easy to adapt in their use in the field. The research process to test the effectiveness of the PjBL model in high school sociology subjects, especially class XI, resulted in the primary data that students' HOTS abilities increased before and after quasi-experimental activities. The Results of The ANOVA Test on The Results of the HOTS Post-Test Questions can be seen in the following table.

Table 5 The Results of The ANOVA Test on The Results of the HOTS Post-Test Questions on Trials in Three High Schools with The SPSS Program

Descriptives								
Learning Achievement (post-test scores on HOTS questions for all treatment class)								
	N	Mean	Std Dev	Std Error	95% confidence interval for means		Min	Max
					Lower Bound	Upper Bound		
SMAN 2 Padang	30	78,867	9,9	1,8	75	83	60	93

SMAN 7 Padang	32	72,161	7,1	1,27	70	75	54	86
SMAN 5 Padang	19	68,263	4,6	1,06	66	70	62	78
	80	73,75	8,8	0,99	72	76	54	93
Test of homogenity of variances			ANOVA					
Learning achievements			Learning achievements					
Levene Statistic	df1	df2	Sig		Sum of Square	df	Mean of Square	F
7,887	2	78	0,04	Betweem group	1436	2	718	12
				Within group	4699	78	61	
				Total	6135	80		

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The results showed three main obstacles in the implementation of HOTS, namely, differences in student levels, class size, number of students, and teachers' understanding of HOTS and its application [21]. One of the strategies used in the HOTS learning model test activity is brainstorming to stimulate students to express their creative ideas [22]. The development of higher-order thinking skills shows that the application of HOTS learning can train generations that reach their full potential, are ready to accept change, can communicate and work as a team, and can reflect and be themselves. Able to innovate and create something new [23]. The learning covered the entire series of teaching and learning processes, including HOTS-based assessments that can effectively improve their ability to think critically. It is undeniable that his thinking ability will also influence a person's competence. HOTS learning activities are well done and oriented towards improving higher-order thinking skills integrated with other skills. These skills are needed in the 21st century. [24]

4. CONCLUSION

Applying the values of project-based learning in sociology learning in secondary schools has been shown to have a positive impact on students' higher order thinking skills in terms of critical thinking, creative thinking and problem solving. The project-based learning model that has been implemented and has been integrated with the HOTS questions can still be developed to produce greater effectiveness.

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