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Improving Critical Thinking Skills of Geography Students with Spatial-Problem Based Learning (SPBL)

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The 21st century demands that geography students think critically about orientation processes and analyze problems from a spatial perspective. This experiment presents data on how much influence the SPBL model has on critical thinking students of geography. The learning procedure carried out by students is oriented towards spatial problems, then formulates spatial problems, then collects and compiles data/information, then analyzes, discusses the results, ends with building communication. 78 students of the Department of Geography, State University of Malang were the subjects of this study. The critical thinking indicator from Ennis becomes the basis for making test questions for data collection. The use of the Independent sample t-Test with SPSS 23 for data analysis purposes. Based on the research results, it was seen that there was an increase in students' critical thinking after learning with the SPBL model. As many as 25% of students were able to think very critically. However, based on the Gain-Score calculation, it shows effectiveness <40%. Thus, it becomes a recommendation for teachers to apply relevant learning models so that students are more critical and active in the geography learning process. Another suggestion for designers is to further evaluate the effectiveness of the SPBL model so that the quality of this product is better and can have a more significant impact.

Keywords: spatial-problem based learning, critical thinking skill, geography, learning, students

INTRODUCTION

A spatial perspective is a perspective that can be used to view and then solve geographic problems. In its approach, Geography provides an opportunity to study problems from a

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spatial perspective (Yunus, 2008). Therefore, learning by recognizing and solving it with a spatial approach and analysis studying the problem, and looking at the problem from a spatial perspective is characteristic of true geography learning (Chun, 2010; Bednarz & Bednarz, 2008).

Geography learning in the 21st century must direct students to look at problems and solve them from a geographical perspective, one of which is spatial (Nagel, 2008). Therefore, learning guidelines are important to support students to be active and critical in seeing and solving problems as well as being communicative by the 21st Century Geography education objectives.

Human resources in the 21st century are important to have critical thinking skills (Snyder & Snyder, 2008; Alismail, & McGuire, 2015; Sumarmi, 2017; AlJaafi & Şahin, 2019; Affandy, et al., 2019). Thus, the target of teachers in this century is important to prepare graduates who can think critically. Students who can think critically can face challenges in the future (Tsui, 2002; Ennis, 2011). Life and career readiness require critical thinking skills (Kraisuth & Panjakajornsak, 2017). Even employers look for individuals who are not only capable of reading and writing but also capable of critical thinking (Casner-Lotto, & Barrington, 2006; Sulaiman et al., 2008).

The 2010 survey notes reported that the 21st-century business world needs human resources with critical thinking skills (AMA, 2010). Other contemporary evidence shows that critical thinking is of utmost importance, according to 144 entrepreneurs surveyed (NACE, 2016). One of the ASEAN countries, in Thailand Vision 4.0, establishes critical thinking as a key pillar in the development of a new knowledge-based economy (Jones & Pimdee, 2017).

Every individual needs to have critical thinking skills. Student learning conditions are often with a learning approach that is limited to discussing the material in books and tends to be not factual (Elbow & Sharma, 2000). This is another challenge for teachers to encourage students to think critically (Karakoç, 2016). Therefore, an educator must think a lot in facilitating a class by choosing the latest models and methods that are more effective in directing and facilitating students to think critically.

Making the right decision is an indication that students think critically. Critical thinking must involve students in researching, differentiating, and evaluating information and reflection related to data and information to make judgments and convey decisions (Papathanasiou et al., 2014; Snyder & Snyder, 2008). The critical thinking process trains students to make decisions with scientific steps.

Most students in Indonesia lack 21st-century skills. Several reports prove that Indonesian students are still classified as low in critical thinking (Wayudi, et al., 2019; Susilowati, et al., 2017; Suardana & Selamet, 2017). Therefore, teachers and students need learning guidelines that facilitate the learning atmosphere to be critical.

The learning model is a guideline and framework that can support learning (Sumarmi, 2012). SPBL is one of them. The uniqueness of SPBL is that it provides opportunities

for geography students to study a problem actively and scientifically and solve it with a spatial approach (Silviariza & Handoyo, 2020).

SPBL with problem-solving characteristics with a spatial approach has the advantage to be applied to develop 21st-century skills. These advantages are: (1) students work in teams (Sun, et al., 2018), (2) With scientific observations and activities allow students to identify and formulate spatial problems (Darmaji, et al., 2019), (3) students think critically about contextual and factual spatial problems that want to achieve meaningful learning (Koohang et al., Nd; Loveless et al., 2006; Swan, 2005; Utami et al., 2016), (4) students can describe the relationship between one phenomenon with another (Nursa'ban, et al, 2020), (5) with scientific activities that allow students to practice making decisions from these spatial problems (Pérez - delHoyo, et al, 2020). With the application of SPBL, it is very appropriate to provide scientific Geography learning, hone teamwork skills, sensitivity, and critical decision making for students. Based on these descriptions, the researcher formulated two hypotheses as follows: "a class that applies the SPBL model during the learning process gets a higher critical thinking score than a class that does not". The purpose of this study is to produce information that the SPBL model affects improving students' critical thinking in higher education.

Literature Review

SPBL as a Model of Teaching

SPBL is created from integrating Problem Based Learning (PBL) with the same spatial geographic perspective as Spatial Based Learning (SBL) (Silviariza & Handoyo, 2020). The integration between the SBL model which focuses on students' way of thinking about space and the PBL model which focuses on problem-solving makes SPBL a problem-solving-based Geography learning model with a geographical perspective with a spatial approach (Silviariza & Handoyo, 2020). The implementation of the SPBL model aims to create an atmosphere of learning geography that is scientific, active, critical, creative, collaborative, and innovative in solving Geography problems (Silviariza, et al, 2020). Thus, the application of SPBL in geography classes can familiarize students with critical thinking to solve problems with a spatial approach.

This is motivated because in learning geography it is very important to solve problems critically (Nagel, 2008). Geography learning is a multidisciplinary science that contains complex and authentic spatial problems that allow students to solve problems critically (Huang et al., 2012). Thus, the application of SPBL in Geography subjects can influence critical thinking activities in solving geographic problems with a spatial approach. Furthermore, the table below describes the activities of each step in the SPBL model.

Table 1
Step design for the SPBL learning model

No	Syntax	Activity
1	Orienting Spatial problem	Students scrutinize directly the spatial phenomena in the field. The teacher becomes a facilitator by providing opportunities for students to recognize space with the initial step of knowing its absolute and relative locations, then looking at its spatial characteristics (cultural, social, and even economic if needed), and recognizing the factors associated with that space. The orientation of the problem in space is also done with related spatial maps. This makes it easier for teachers and students to recognize objects spatially. Non-forcefully, this activity allows students to think from a spatial perspective
2	Formulating spatial problems	The activity of formulating spatial problems begins with student activities in identifying the relationship between space and spatial phenomena
3	Collecting and organizing spatial data and information	For data and information from data collection results to be neatly organized and easy to read, students make tables, graphs, diagrams
4	Analyzing spatial data and discussing the results	After organizing and processing the data, students analyzed and discussed it with their respective groups. Students analyze spatially with various spatial analysis techniques that are following the characteristics and objectives of the data. In analyzing the data that has been collected, students can use data processing applications even if they need a Geographical Information System (GIS), SPSS is also suggested.
5	Building communication	In addition to building good communication skills, at this stage students are welcome to present their arguments by the data and group discussions with other groups.

Source: (Silviariza & Handoyo, 2020)

The SPBL model has five steps. The steps for the SPBL Geography learning model are as follows (Silviariza & Handoyo, 2020); (1) orientate spatial problems, (2) formulate spatial problems, (3) collect, organize spatial data and information, (4) analyze spatial data, (5) build communication.

The concept of Critical Thinking Skill

The demands of the 21st century are challenging humans as individuals and even groups to think critically in seeing and solving problems (Lai, 2011; Higgins, 2014; Snyder & Snyder, 2008; Wagner, 2010; P21, 2015; Kereluik, 2013). Critical thinking is a skill that goes beyond memorization (Kraisuth & Panjakajornsak, 2017; Haridza & Irving, 2017). The world of work requires human resources who have skills other than basic knowledge (NACE, 2016; Sulaiman et al., 2008; Tapper, 2004) in problem-solving (Conklin, 2012).

Sharing their opinions, listening to other people's opinions, summarizing concepts with analysis, confirming and/or defending their opinions, making decisions, and solving problems in the real world are the characteristics of critical students (Nelson, 2013; ŽivkoviĿ, 2016; Karakoç, 2016). Students must behave intellectually and in a constellation that allows the person to be accustomed to thinking critically (Kereluik, 2013). One must improve critical thinking skills from school (Facione, 2011). Students

must be accustomed to asking, interpreting, synthesizing, and digesting (Paul & Elder, 2019).

Critical thinking activities are a student thinking process starting with asking questions (Nappi, 2017), examination (Yanchar, & Slife, 2004), analysis (Saputra, et al, 2019), testing (Fatmawati, et al, 2019), and exploration (Rahmat, et al. al. al., 2020). Therefore, students need to recheck the scientific truth of each reason and gather facts from each side to think critically. Students become critical if they meet the indicators of critical thinking (Facione, 2000). Critical thinking indicators from Ennis (2011) become the benchmark for this study. The following provides indicators of critical thinking related to the syntax of the SPBL model (table 2).

Table 2
Indicators of students' critical thinking skills

No	Critical Thinking Skills	Indicator
1	Formulation of The Problem	Formulation of problems and provide directions to obtain answers
2	Giving Arguments	Providing arguments accompanied by suggestions
3	Doing Deduction	Providing an explanation from general to specific
4	Doing Induction	Making conclusions about the problem
5	Evaluating	Evaluation based on facts
6	Deciding and Implementing	Determination and selection of alternative solutions to problems for planning and implementation

Source: (Ennis, 2011)

Train students' critical thinking skills as well by using learning strategies. Constructing categorization, finding problems, and improving the environment are important strategies to encourage students to think critically (Facione, 2000). This strategy has the same goals as the SPBL syntax.

Table 3
The relevance of SPBL with strategies and indicators of critical

NO	SPBL steps	Strategy	Indicator of Critical Thinking
1	Spatial problem orientation	Building Categories	Giving Arguments
2	Formulating spatial problems	Finding Problem	Formulating the Problem
3	Collecting and organizing spatial data and information	Enhancing Environment	Giving Arguments
			Conducting Induction and Deduction
			Conducting Induction and Deduction
4	Analyzing spatial data and discussing the results	Enhancing Environment	Giving Arguments
			Evaluating
			Conducting Induction and Deduction
5	Building Communication	Enhancing Environment	Giving Arguments
			Conducting Induction and Deduction
			Evaluating
			Deciding and Implementing

Source: (Facione, 2000; Silviariza & Handoyo, 2020)

Thus, the application of SPBL is relevant with the aim of improving students' critical thinking.

METHOD

Research Design

Quasi-experimental with a pre-posttest control group is the design of this study. Figure 1 below is an illustration of how the experiment was carried out.

Experiment	O1	X	O2
Control	O3	-	O4

Figure 1
The quasi-experimental procedure was adapted from Fraenkel et al. (2011)

Subject

Based on practical reasons, conditions, and ethics in the quasi-experimental sample design is not selective (Campbell & Stanley, 2015; Fraenkel et al., 2011). The use of a purposive sampling technique to obtain samples that have the same characteristics of critical thinking skills. Another thing also shows that each class has the same ability; no class is superior. besides, taught by the same lecturer in the same subjects. Thus, the selection of class “K” as an experiment and class “A” as a control.

Experimental research was conducted in the 2018 Geography Education study program, State University of Malang (UM) in two different classes. Experimental research subjects were selected in the "Environmental Geography" class. The objectives of the "Environmental Geography" class; (1) examining the human environment; (2) critical human; (3) creative humans in protecting the environment; (4) people who actively protect the environment. These objectives are appropriate when implementing the SPBL model.

Instruments and Procedures

The purpose of testing the validity and reliability is to ensure that the instrument is good at measuring symptoms and produces valid data (Purwanto, 2009). 30 students who had taken the "environmental geography" course were top targets for the instrument test (validity and reliability). This means that the subject has learned how to recognize environmental problems and solve these problems.

At the beginning of the class meeting, students worked on the pretest questions. This aims to determine the initial abilities of students. Furthermore, the treatment uses the SPBL model. Furthermore, data collection from the final test to the experimental and control groups. The next step, data collection posttest results of the two subject groups. The data shows the critical thinking skills of control and experimental students before and after treatment with the SPBL model. The pre and post-test score calculation use the following equation (Purwanto, 2009).

$$n = \frac{\sum B}{smi} x\ n\ max$$

Description:
n: final score
∑ B: total correct (a grade that can be achieved by students)
smi: Highest score ideal (32)
n max: the highest score used (100).

Five questions related to environmental problems to measure whether students can think critically or not. The test questions are arranged based on indicators of critical thinking (Ennis, 2011). To answer these questions, the teacher provides students with spatial contextual questions from newspaper articles. Following are the item validation qualifications.

Table 4
Qualification of Item validation

Correlation coefficient	Qualification
0.800 – 1.000	Highly Valid
0.600 – 0.799	Valid
0.400 – 0.599	Valid enough
0.200 – 0.400	Less valid
0.000 – 0.199	Invalid

Source: (Purwanto, 2012)

The 5% significance level becomes the basis for the analysis of the validity test using a two-sided test (α) .444. Furthermore, the critical thinking skills test was declared valid based on the social material classification criteria. The results of statistical calculations for each item with sig. (2-tailed) ≤ 0.444. In addition to validity, the measurement of instrument reliability is as follows.

Table 5
Item reliability criteria

Reliability value	Criteria
0.00 – 0.20	Very low
0.21 – 0.40	Low
0.41 – 0.60	Average
0.61 – 0.80	High
0.81 – 1.00	Very High

Source: (Arikunto, 2010)

The summary table presenting the results based on the reliability test is as follows.

Table 6
Item reliability criteria

Question No	Validity	Reliability
1a	0.526	0.707
1b	0.495	
2	0.510	
3	0.611	
4a	0.447	
4b	0.887	
5	0.798	

From the table above, we can conclude that the instruments used to collect valid and reliable data on critical thinking skills.

Data Analysis

Proof of improving students' critical thinking by testing the hypothesis. Hypothesis testing with SPSS 23 for windows uses the Independent sample t-test.

Table 7
Criteria for critical thinking skills

Classification	Score	Qualification
A	81 – 100	Highly critical
B	66 – 80	Critical
C	56 – 65	Critical enough
D	41 – 55	Less critical
E	0 – 40	Not critical

Table 7 indicates a significance level of 0.05 applies to decision making with the t-test (Purwanto, 2012).

FINDINGS

Prerequisite Testing

Proof of sample data is normally distributed or not by normality testing. It is normally distributed if most of it is close to average. SPSS with a 95% Komlogoror Smirnov Test helps in normality testing. Summary of test results according to the following table.

Table 8
Normality Tets

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
Critical Thinking	PreTest Experiment	.141	40	.045	.939	40	.031
	PostTest Experiment	.113	40	.200*	.958	40	.143
	PreTest Control	.095	38	.200*	.958	38	.161
	PostTest Control	.130	38	.103	.939	38	.040

analysis by Kolmogof Smirnov. The (2-tailed) experimental group showed that the pretest was 0.141 and the post-test was 0.200. The next is the control class with pre-tests is 0.095 and a post-test of 0.130.

Furthermore, homogeneity test to show the diversity in the two subject groups. The homogeneity test uses Levene's test at the 95% significance level.

Table 9
Homogeneity of variance test

		Levene Statistic	df1	df2	Sig.
Critical Thinking	Mean	1.252	1	76	.267
	Median	1.029	1	76	.314
	Median and with adjusted df	1.029	1	64.289	.314
	Based on trimmed mean	1.133	1	76	.291

The Levene test for the homogeneity test in the table below states the probability result (sig.) ≥ 0.05. So, H0 is rejected. In conclusion, the level of critical thinking of the two classes has homogeneous diversity.

Hypothesis Testing

The hypothesis test aims to decide whether to accept or reject a hypothesis. Hypothesis testing has a significant level of 0.05 (Independent Sample t-Test). Hypothesis testing aims to provide knowledge about the effect of the SPBL model on improving the critical thinking skills of Geography students. The conditions for making this hypothetical decision are as follows:

H1 = students who apply the SPBL model during the learning process get a higher score of critical thinking skills than those who do not.

H0 = students who apply the SPBL model during the learning process did not get a higher score of critical thinking skills than those who do not.

Table 10
Group statistic

	Class	N	Mean	Std.Deviation	Std.Error Mean
Critical Thinking Results	Experiement Post-test	40	73.95	7.268	1.149
	Control post-test	38	63.21	9.450	1.533

From the results of data acquisition after treatment, both groups showed a significant mean value. This shows that the SPBL model provides an increase in students' critical thinking skills.

Table 11
Independent sample t-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
The result of critical thinking	Equal variances assumed	1.252	.267	5.643	76	.000	10.739	1.903	6.949	14.530
	Equal variances not assumed			5.605	69.456	.000	10.739	1.916	6.918	14.561

The results of statistical analysis stated that the hypothesis testing was 0.000 for sig (2-tailed). Thus, the probability value is 0.000 ≤ 0.05 and the mean value of students' critical thinking after the post-test in the experimental class is (74)> complete class (63). This means that H0 is rejected.

Experimental and Control Class Critical Thinking Skills

Table 12 contains information about the acquisition of data from the pre and post-test scores in the experimental and control classes, then the preparation of the frequency distribution of students' critical thinking with the table.

Table 12
The Frequency Distribution of The Pre and Post-Test Data for the Experimental and Control Classes

Qualification	Pre-test Frequence Experimental Class	Post-test frequence Experimental Class	Pre-test Frequence Control Class	Post-test frequence Control Class
Highly critical	0	10	0	0
Critical	14	24	12	14
Critical enough	18	6	15	18
Less critical	6	0	9	6
Not critical	2	0	2	0

The table contains information about increasing critical thinking in both subject groups. The experimental group showed an increase in the value of critical thinking compared to the control group. The post-test results showed that most students in the experimental group could think critically. Thus, critical thinking scores changed significantly in the experiment class. the frequency distribution for the experimental class can be illustrated in the following graph.

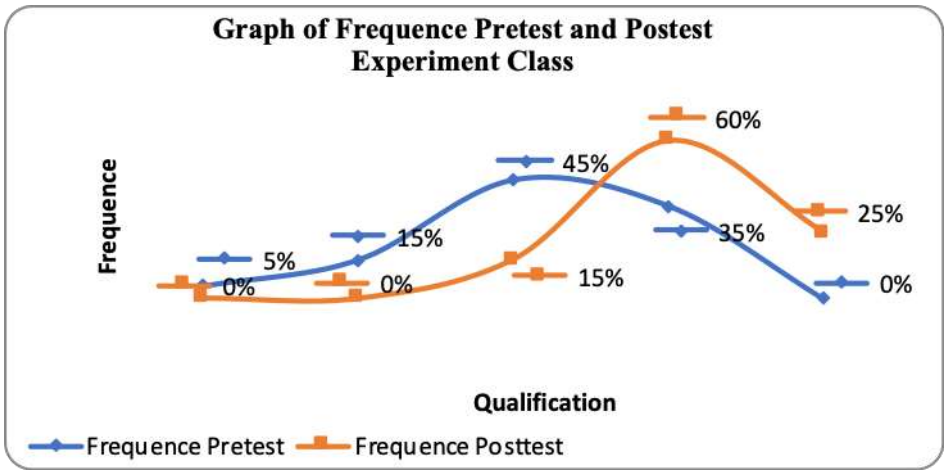

Figure 2
Comparison of Pre-Test and Post-Test Results in Experiment group in Graph

The graph above provides information about increasing scores in the experimental group after treatment. The qualification critical score of the pre-test was 35%, while the post-test was 60%. Qualification score was quite critical at the pre-test by 45% and 15% at the post-test. Highly critical score qualification at the post-test was higher by 25% and 0% at the pre-test. In the pre-test, 15% and 0% in the post-test, there is a qualifying score that is less critical. Then, the percentage difference between the control groups is depicted in the graph below.

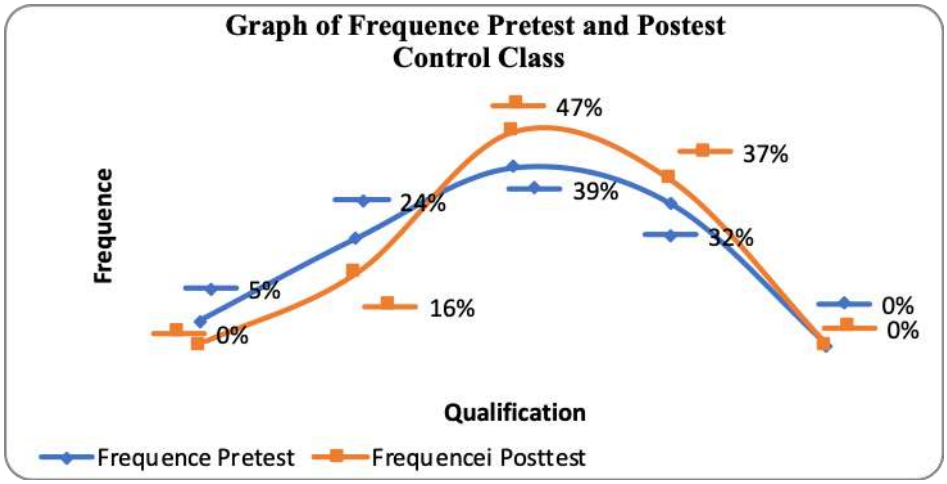

Figure 3
Comparison of the results of the control class pre-test and post-test in a graph

The graphs describe that there is no "quite critical" score at the pre-test of 39% and 47% at the post-test. Qualification of the critical score at the post-test was higher at 37% and 32% at the pre-test. Qualification was less critical at the pre-test by 24% and 16% at the pre-test. The not critical score is 5% on the initial test and the post-test is 0%.

From the discussion of these data, it was concluded that the SPBL model improved students' critical thinking skills. However, other findings can provide a new perspective for the SPBL model. The results of the calculation of the N-Gain Score, the SPBL model is not yet effective. This is evidenced from the results of the analysis using SPSS version 23 for windows. A summary of the calculations can be seen in the table below.

Table 13
Summary of N-Gain Score Calculation

	Class		Statistic	Std. Error	Percentage
NGain_Percent	Experiment	Mean	31.8434	1.90395	31.8 %
		Minimum	7.69		
		Maximum	58.14		
	Control	Mean	5.5804	2.84319	5.5 %
		Minimum	-37.04		
		Maximum	47.83		

Based on the provisions of the experimental effectiveness of a product if it has a percentage value >76%, it is quite effective when it has a percentage of 56-75%, less effective if it is 40-55%, and is declared ineffective when it is <40% (Hake, R. R, 1999). The effectiveness of the SPBL model in the experimental class <40% is 31.8%. This finding is evidence, although SPBL affects improving students' critical thinking, the SPBL model cannot be declared effective. Meanwhile, to improve students' critical thinking, conventional methods such as lectures applied to control classes are no longer recommended.

DISCUSSION

Previous research supports the argument that the application of the scientific learning model is superior to conventional learning with the lecture method (Aliman et al., 2019; Farah et al., 2018; Handoyo et al., 2016; Sari et al., 2019; Sumarmi et al., 2019; Sumarmi et al., 2019; Sumarmi et al., 2019; Sumarmi et al. Al., 2020; Aliman et al., 2020; Umiyaroh, 2017). Interactive learning affects the improvement of students' critical thinking (Utami et al., 2016). Acquisition of student knowledge directly from student searches and experiences (Puspitasari et al., 2016) from the scientific learning process (El Bedawy, 2017; Erikson & Erikson, 2019; Syaodih et al., 2019; Woa et al., 2018).

The results of field observations show that the SPBL syntax is based on their experience, students work together to investigate scientifically to collect data, organize data and analyze data with a spatial approach (Silviariza & Handoyo, 2020). The scientific syntax can encourage critical thinking (Halim & Mohtar, 2015; Shaughnessy et al., 2017). Thus, the implementation of the SPBL model provides students with a scientific learning experience in solving critical problems spatially. The implementation

of the SPBL model helps students solve problems based on a spatial perspective. As is well known, problem-solving based on a spatial point of view is a characteristic of Geography (Goodchild et al., 2007; Huynh, 2009; Miller, 2000; Shoorcheh, 2019).

The research at the first meeting was carried out by pre-test, three meetings took place as usual with the topic of learning "Human Resources with Environmental Insights" and one last meeting took place by carrying out a post-test. Each meeting has a time of 100 minutes.

The first meeting in the experimental class (pre-test) took place on November 14, 2019. The second meeting took place on November 21, 2019. The third meeting took place on November 28, 2019. The fourth meeting took place on December 5, 2019. The last meeting (post-test) was held on 12 December 2019.

The process of learning is oriented towards environmental problems by looking at the spatial pattern (Marshall, et al, 2011). The spatial-based orientation of environmental problems is used with the activity sheet guide. The syntax of the PBL model is adjusted to the student activity sheets. Students are given a stimulus to ask questions and begin to identify some problems. The critical thinking process emerges at this stage. (Paul, & Elder, 1990). This is based on a learning strategy by providing opportunities for students to think critically (Bonie & Potts in Amri, 2012).

Class K as the experimental group with the SPBL model has a higher thinking ability than the control group which is a class A student. Thus, with the results of experimental research in the form of statistical data calculations. In conclusion, there is an effect of the SPBL model treatment on the increase in critical thinking of Geography students.

The control group with conventional treatment did not show a significant increase in critical thinking. In literature class, students are dominant as listeners by relying on subject matter from the teacher so that they are less literate (passive). Teachers are considered the main source of information and knowledge in solving problems (Marmah, 2014). Students are reluctant to look for sources of information directly in the field.

When conducting group discussions in the control class, most students presented arguments that were not based on data. This proves that students' critical thinking is not optimal (Ennis, 2011). Also, some students were not enthusiastic about participating in the discussion. Researchers assume that this is due to lessons that take place during the day after recess.

Another thing with the experimental group treatment with SPBL, students were able to identify problems from a spatial perspective, orient problems spatially, formulate problems, collect and compile data and information spatially, analyze data and information spatially together and communicate scientifically about the results of problem-solving in front of other groups by way of presentation using power points in front of the class. The process of solving spatial problems takes place scientifically (Silviariza, et al, 2020).

In infield activities in the experimental class, students are not only actively looking for supporting sources of information in the library, but the information search process is also carried out with other media such as print, mass, and electronic media. The process of arguing confirmation through the search process enabled students to think critically (Ennis, 2011). Furthermore, SPBL effects and is proven by the results of the post-test. So, the conclusion is that during the treatment process the SPBL model can improve critical thinking shown by test results and student behavior. The steps in the SPBL model allow students to become centers of learning. Besides, student learning activities are constructive.

CONCLUSION

The SPBL model provides a reference for teachers to improve critical thinking in solving geographic problems. Learn directly with spatial problems can maintain geographic scientific ethics in school learning. It is proven from the experimental results that the SPBL model has a significant effect on students' critical thinking skills. The control class and the experimental class for the pre-test and post-test with a significant score <0.05. The difference in the mean score between the two groups is the reason for the conclusion.

In addition to proving the hypothesis, the finding of an N-Gain score <40% is certainly an important thing to pay attention to. Although the SPBL model enhances students' critical thinking, the SPBL model product needs further evaluation so that its effectiveness and quality are getting better.

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