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Research Article

Using of Spatial Problem Based Learning (SPBL) model in geography education for developing critical thinking skills

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Abstract

Geography education in the 21st century will require students to think critically to prepare themselves for the dynamic changes in the world in the future. It discusses the ability to think critically in orienting, analyzing, and solving problems with a spatial perspective is one of the fundamental abilities that must be supported by geography students. The spatial problem-based learning model (SPBL) has been developed by Silviariza & Handoyo (2020). This study aims to explore the spatial problem-based learning model of students' critical thinking skills. This study uses a quasi-experimental design with control and experimental groups. The study was conducted at the Department of Geography, State University of Malang. Participants in this study were students of Geography Education Study Program semester 3 with an average age range of 19 years. The control class offers A with 38 students consisting of 16 boys and 22 girls. While the experimental class offered K with 40 students consisting of 12 boys and 28 girls. Data collection is carried out after implementation with the SPBL model. Data obtained from the pretest and posttest activities in the control class and experiment with question sheets that were questioned on the matter of modification expertise from Ennis (2011). Furthermore, an independent sample t-test was conducted to analyze the data using SPSS for Windows version 23. The conclusion of the analysis shows a positive model of spatial problem based learning (SPBL) in Geography education to develop critical thinking skills. Thus, the results of this study can be used as valid data which proves that the Spatial Problem Based Learning Model as one of the learning models in Geography education and can be used by Geography teachers to improve students' critical thinking skills.

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Introduction

Spatial is one of the characteristics of Geography. Spatial is a perspective or analytical framework that emphasizes the existence or existence of a related space with the physical phenomenon of the earth's surface (Chun, 2010). Spatial interaction emphasizes the interdependence of the area and implies the movement of commodities, goods, people, information, etc. between areas "(Yunus, 2010).

Spatial characteristics of learning Geography are currently aimed at preparing students' abilities to face 21st-century challenges (Amaluddin et al. 2019). These capabilities include; creativity and innovation; creative thinking and problem-solving; communication and collaboration skills (Nagel, 2008). Therefore, it needs support learning that demands student activity to achieve the goals of the 21st Century Geography education.

One of the supporting learnings is the learning model. The learning model is Plans or patterns that can be used to shape curriculum, plan learning materials, and guide learning in the classroom (Nurdyansyah & Fahyuni, 2016).

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One of the learning models of Geography is SPBL. SPBL is a learning model that provides opportunities for students to be able to provide solutions to problems by studying them spatially and scientifically (Silviariza & Handoyo, 2020). There are five syntaxes of the SPBL learning model; (1) orienting spatial problems, (2) formulating spatial problems, (3) collecting, organizing spatial data and information, (4) analyzing spatial data, (5) communicating.

SPBL model is an integration of Spatial Based Learning (SBL) and Problem Based Learning (PBL) (Silviariza & Handoyo, 2020). Some weaknesses of the SBL and PBL models for Geography were later overcome by the SPBL. Thus, the SPBL was created to perfect the SBL and PBL.

PBL is a scientific learning model widely applied in various disciplines, including Geography. PBL's track record in its development and application is initiated from the health sciences (Savery, 2006; Vleuten & Schuwirth, 2019; Jin & Bridges, 2014; Ansari et al. 2015; Galukande et al. 2015). PBL is also often applied in Geography learning (Arifianti et al. 2016; Mallawaarachchi et al. 2018; Purnomo, 2015; Suryani et al. 2014; Trinugroho, 2017). However, the application of PBL has not been able to meet the needs of Geography, which is solving problems with critical and spatial thinking (Pawson et al. 2006). Although some notes state that PBL in Geography has been widely applied in various countries, it has not been successful yet, so it needs to be continuously developed (Boud & Feletti, 1997; Maudsley, 1999). Therefore, in Geography learning, PBL model should be modified to fit the needs and spatial characteristics.

Then, it came to the learning model with the unique characteristics of Geography, namely SBL. The application of SBL in learning enables active, critical, and collaborative students in analyzing and applying concepts, theories, and facts that are indeed needed in Geography learning (Handoyo & Purwanto, 2017). However, this must be completed by solving a real problem. It seems from the developing SBL syntax that has not been firm and correctly described the syntax with an orientation of solving a real spatial problem. Learning by a problem-solving method is the process of training for students when studying Geography to recognize the earth (Schalk & Golightly, 2016). Thus, applying SPBL in Geography learning is very appropriate because of its superiority, which orientates students to solve problems in space.

SPBL has several advantages. These advantages include:(1) students are trained to work in teams, (2) students can identify and formulate spatial (Geography) problems through observation with a scientific process, (3) students are encouraged to think critically about spatial problems contextually and factually, so learning becomes meaningful (Swan, 2005; Burton, 2006; Koohang, 2009; Utami, 2016), (4) students are trained to describe the relationship between one phenomenon and another, (5) students can make decisions for a spatial problem with a scientific step. The use of SPBL is appropriate for creating an atmosphere of scientific learning, honing teamwork skills, sensitivity, critical decision making. Therefore, SPBL is a learning model that is believed to be able to foster critical thinking skills in solving spatial problems.

Critical thinking is one of the abilities and demands of the 21st century. Critical thinking is one of the abilities in higher-order thinking (King, Ludwika & Faranak, 1998; Marni, et al. 2019; Snyder & Snyder, 2008). Therefore, critical thinking is one of the abilities that must be possessed by students to become human resources who are ready to face the challenges of the 21st century.

Preparing graduates who can think critically is one of the professional educator targets. Teaching students' high-level cognitive skills, including critical thinking, can help them improve their functioning in a variety of circumstances (Tsui, 2002). Critical thinking skills are essential things needed for the readiness of life and career (Kraisuth & Panjakajornsak, 2017). Individuals who can think critically are one of the qualities sought by most employers (Sulaiman et al. 2008) who will be able to create new jobs.

According to the 2010 American Management Association (AMA) survey, businesses need human resources equipped with skills other than basic knowledge such as reading, writing, and arithmetic to develop a business. These skills include critical thinking (AMA, 2010). Contemporary evidence from the National Association of Colleges and Employers (NACE) shows that critical thinking skills are ranked most important according to the survey to 144 entrepreneurs (NACE, 2016). One of the countries in ASEAN set a vision namely the vision of Thailand 4.0, stipulating that critical thinking skills are the central pillar for a new knowledge-based economy (Jones & Pimdee, 2017). Thus, creating human beings who can think critically is very urgent to prepare human resources that can answer the challenges and needs of the 21st century.

Critical thinking is an activity of thinking that includes all thought processes; to ask, dig up, analyze, test, and explore. The key steps in critical thinking are; (1) describe, clearly defining what is said, clarifying specifically about everything involved, (2) reflect, reconsidering a topic by considering information, experience, and or other points of view, (3) analyze, examining and then explaining, including comparing and distinguishing different elements and understanding the relationship with the subject/topic being studied, (4) critique, identifying and examining weaknesses in arguments, and recognizing weaknesses and strengths, (5) reason, using methods such as cause and effect to show thought logically, also present evidence that refutes or proves an argument, (6) evaluation, including commenting on the level of success and failure of something or judging something (University of Leeds). Thus, critical thinking skill requires perseverance to re-examine the scientific truth of each argument and gather evidence from every side.

The ability to think critically can be known from several aspects. Those aspects are divided again into several indicators of critical thinking skills. Those indicators are (Ennis, 2011); (1) focusing questions, (2) analyzing questions, (3) clarifying an explanation through a question and answer, (4) considering whether the source is reliable or not, (5) observing and considering an observation report, (6) deducing and considering the results of deduction, (7) inducing and considering induction, (8) making and determining the outcome of consideration, (9) defining a term and considering a definition, (10) identifying assumptions, (11) deciding on an action, (12) interacting with other people.

Also, critical thinking skills can be measured by several other indicators. Each of these indicators has criteria to measure. Modifications from Ennis (in Agustina, 2012) formulated several indicators to measure the ability of critical thinking; (1) formulating the problem, (2) giving an argument, (3) doing deduction, (4) conducting induction, (5) evaluating, (6) deciding and implementing. Based on the explanation, the researcher set the following hypothesis: "A learning process that applies SPBL model will enable students to get a higher score of critical thinking skill compared to that of not applying it".

The SPBL model experimental test in this study was the first time conducted after the SPBL model was developed in early 2020 by Silviariza & Handoyo. Thus this study was designed to determine the effect of the SPBL model on the ability of students to think critically. The hope is to get a valid renewal of the learning model in the field of Geography education. Therefore, it is further explained the relationship of the SPBL model and critical thinking skills in the next paragraph.

The following notes describe the relationship between the SPBL syntax and indicators of critical thinking skills. Learning processes that orient problems by looking at spatial planning. The critical thought process is seen at this stage. Students are invited to ask questions and start identifying from several problems. This is the following learning strategies that can foster critical thinking skills (Bonie & Potts in Amri, 2012).

After commenting on the problem, students formulate problems related to a particular room. Furthermore, collecting data and spatial information. The data and information collected are then analyzed from various spatial perspectives which are then discussed with the family members. Students' critical thinking is based on the process of discovery and problem solving (Bonie & Potts in Amri, 2012).

The last step is communicating. Communication can be done with a presentation in front of other groups about the process of solving spatial problems scientifically. Communication activities are an opportunity for other groups to give their views and argue about the results of the work of other groups in resolving the issues raised. The last stage is the strategy in growing critical thinking skills in making decisions based on data that has been obtained on the previous site.

Solving problems scientifically can help in the process of critical thinking. The process of learning with a scientific approach that is carried out continuously accustoms students to critical thinking (Nurcahyo, et al. 2018). Thus, learning with SPBL model can accustom students to think critically and scientifically.

Problem of Study

Based on the problem description, the purpose of this study was to determine the effect of the Spatial Problem Based Learning (SPBL) model in improving the critical thinking skills of Geography students at State Universitas Negeri Malang. Therefore, the formulation of the problem based on the explanation is, "How does the Spatial Problem Based learning model influence the critical thinking skills of Geography students?". Thus, the researcher formulated the hypothesis as follows: "Students learning to use the SPBL model score higher critical thinking skills compared to students who study not with the SPBL model". The advantages of this research are:

- Through the application of the SPBL model, students, as the main object of education, can interpret and apply meaningful learning to improve critical thinking skills.

- Providing teachers a reference of the learning models usage according to the proper teaching material so that the learning will be more meaningful to improve students' critical thinking skills.

Method

Research Model

The design of this study was a quasi-experimental with pretest-posttest control group design type. One independent variable and one dependent variable. The independent variable is the conventional learning model (control class) and the spatial problem-based learning model (experimental class). The dependent variable is the ability to think critically. The research concepts are presented in Figure 1.

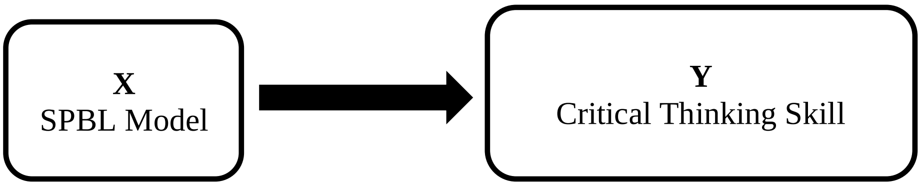

Figure 1.

Research concept

Note:
X = Spatial Problem Based Learning Model
Y = Critical Thinking Skill
Table 1 indicates the experimental design according to Sugiyono (2016).

Table 1.

Quasi Experiment Procedure

Subject	Pretest	Treatment	Postest
Experiment class	O_1	X	O_2
Control class	O_3	-	O_4

Note:
X = treatment/learning using SPBL model
O1 = pretest result of experiment class
O3 = posttest result of the control class
O2 = posttest result of experiment class
O4 = posttest result of control class.

Participants

Experimental research is essential to find the effect of certain treatments on others under controlled conditions (Sugiyono, 2016). The design of experimental research requires a control group and an experiment as a research subject. Thus, an experimental study was conducted in the Geography Education study program, Faculty of Social Sciences (FIS), State University of Malang (UM) with the research subjects being students of the Geography Education study program class of 2018. The experimental group is class K (40 people) and the control group is class A (38 people). The number of participants, according to Federer (In Ihwah et al. 2018), follows the following formula

$$(t-1)\ (n-1) > 15$$

t = number of treatments, n = number of participants.

Students in this study are in the third semester. The sampling technique used in this research is a nonprobability sampling. There are no specific provisions above in selecting experimental research subjects (Sugiyono, 2016). That is because all classes have the same abilities and are taught by the same participants in the same subjects, apart from that there are no superior classes. Distribution of participants in this study as shown in the following table.

Table 2.
Participant Distribution by Gender

Group	Gender	N
Experimental	Male	12
	Female	28
Control	Male	16
	Female	22
Total	Male	28
	Female	50

Data Collection Tools

The research instrument is a data collection tool in research. The instrument needed in this research is a critical thinking skills test in the form of a test question sheet that refers to the indicators of critical thinking skills from Ennis (2011). Test sheets were prepared to obtain learning outcomes data on critical thinking skills.

Students are said to be able to think critically if they meet the indicators of critical thinking. Indicators of critical thinking used for research and following the SPBL learning model are as follows (Ennis, 2011).

Table 3.
Indicators of Critical Thinking Skills

No	Critical Thinking Skills	Indicators
1	Formulate the Problem	Formulate the problem and give directions to get answers
2	Giving Arguments	Provide arguments accompanied by suggestions
3	Do Deduction	Provide an explanation starting from general to specific
4	Induction	Make conclusions about the problem
5	Evaluate	Conduct an evaluation based on facts
6	Decide and Implement	Determine alternative solutions to the problem to be planned and implemented

Validity and Reliability

The items on the test sheet are said to be valid if they can measure exactly what will be measured. To find out the validity of the items, the lecturer helps to validate these items as long as the questions must follow indicators of critical thinking. Also, the test questions were tested for validity and reliability for 20 respondents. Validity test with a significance level of 5% (α) 0.444 using a two-tailed test. The results of the respondent's test for number 1a is 0.526 (valid enough), 1b is 0.495 (valid enough), 2 is 0.510 (valid enough), 3 is 0.611 (valid), 4a is 0.447 (valid enough), 4b is 0.887 (very valid), and 5 is 0.798 (valid).

Also, to measure the level of reliability using the alpha cronbanc method. The Alpha cronbanc method was chosen because the problem is in the form of descriptions. Assessing questions in the form of descriptions cannot be done only with "right" or "wrong" (Arikunto, 2012). An item is said to be reliable if the alpha cronbanc value is greater than the 60% confidence level. A test is said to be reliable if r arithmetic> rtable and the test is said to be unreliable when r arithmetic ≤ rtable. The result of the calculation of reliability is equal to 0.707 (High). The criteria for determining reliability are presented in the following table (Arikunto, 2006).

Table 4.
Item Reliability Criteria

Value Reliability	Criteria
0,00 – 0,20	Very low
0,21 – 0,40	Low
0,41 – 0,60	Enough
0,61 – 0,80	High
0,81 – 1,00	Very high

Data Analysis

Provision of treatment carried out for three weeks after the pre-test. Provision of treatment in the experimental group namely the spatial problem-based learning model (SPBL) while the control group uses procedural instructions. After giving treatment to the experimental class, the experimental and control groups were given a post-test. Pretest and post-test scores describe the critical thinking ability of students before and after treatment. The use of this research design was to examine the effect of the SPBL model on students' critical thinking skills. Pretest and post-test scores can be calculated using the following equation (Purwanto, 2010).

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

Description:
n: final score
∑B: correct amount (the score students can achieve)
smi : Ideal maximum score (32)
n max: maximum score used (100)

Scores obtained based on the above equation are then presented in the frequency distribution following with the qualification of the range of values to determine the level of critical thinking skills. Qualification of the range of score, according to Purwanto et al. (2012) can be seen in Table 5.

Table 5.
Criteria for the Implementation of the Critical Thinking Skill Test

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

Source: adaptation from Arikunto, 2001

After scoring, the next step is processing the data using hypothesis testing. Hypothesis testing in this study uses a t-test with a significance level of 0.05. The values used for hypothesis testing were the pretest and post-test scores of the control and experiment class. Hypothesis testing was done using SPSS 23 for Windows.

Procedure

The sub-chapter process was explained by research documentation in the form of pictures of each process carried out by students during the learning process with the SPBL model. The following is a picture of each step of the SPBL done by the students.

Figure 2.
Pretest Implementation

Figure 3.
Orientating Spatial Problems

Figure 4.
Formulating Spatial Problems

Figure 5.
Collecting and Organizing Spatial Data and Information

Figure 6.
Analyzing and Discussing Spatial Data and Information

Figure 7.
Communication

Figure 8.
Post-test Implementation

This research was conducted for five weeks or 1.5 months, with a duration of five meetings from November 14, 2019, to December 12, 2019. This research was applied to Environmental Geography with the topic of environmentally friendly human resources taken in the third semester.

Results

Critical thinking skills are obtained from activities during the learning and treatment process. The results are proven by the ability of students to work on the critical thinking skills test sheet after receiving treatment. Further discussion of student learning outcomes in the next paragraph.

The results were arranged in a distribution table of students' critical thinking frequencies (Arikunto, 2001), as in the following Table 6.

Table 6.

Criteria for the Implementation of the Critical Thinking Skill Test

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

Critical Thinking Skill of Experiment Class

The acquisition of pre-test and post-test data in the experimental class is arranged in the distribution table of students' critical thinking frequencies (Arikunto, 2001), as in the following Table 7.

Table 7.

Pre-Test Frequency Distribution of Experiment Class

Classification	Score	Qualification	Frequency
A	81 – 100	Highly critical	0
B	66 – 80	Critical	14
C	56 – 65	Quite Critical	18
D	41 – 55	Less critical	6
E	0 – 40	Not critical	2

In Table 7 shown that 14 out of 40 students can think critically.18 out of 40 students are quite capable of thinking critically. As many as 6 out of 40 students were less critical, and 2 out of 40 students were not critical. Thus, the mode score of the pre for experiment class shows that students are quite critical. Table 6 shows the post-test frequency distribution of the experiment class.

Table 8.

Post-Test Frequency Distribution of Experiment Class

Classification	Score	Qualification	Frequency
A	81 – 100	Highly critical	10
B	66 – 80	Critical	24
C	56 – 65	Quite Critical	6
D	41 – 55	Less critical	0
E	0 – 40	Not critical	0

Both tables shown a very significant increase. The post-test results showed that half of the student population in the experiment class could think critically. Therefore, there are significant changes in critical thinking scores in the experiment class. Those two tables of the frequency distribution of the experiment class can be illustrated in the following graph.

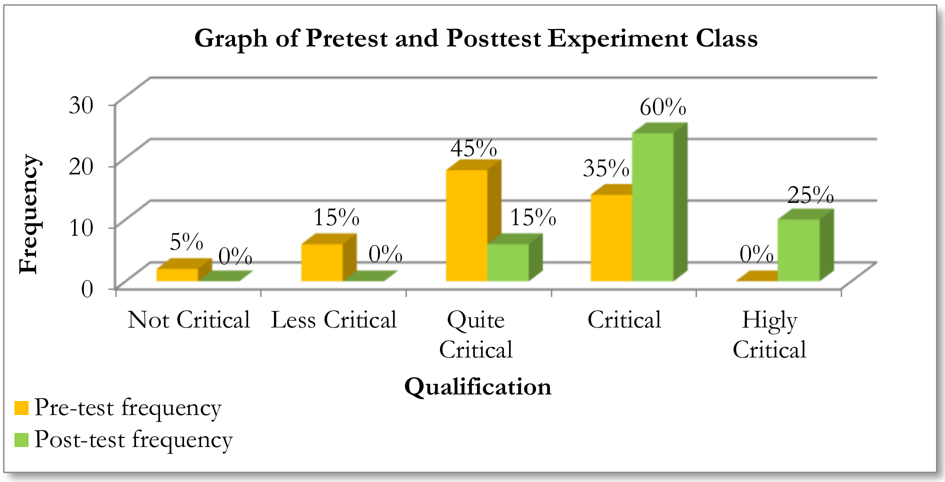

Figure 9.
Comparison Graph of Pre-test and Post-test Results for Experimental Classes

The graph illustrates that the increasing score of qualifications is very critical in the pretest and posttest. Score qualification of highly critical in the pretest was 25%, while the post-test was 0%. Score qualification of critical in the pretest was 35%, while the post-test was 60%. Score qualification of quite critical in the pretest was 45%, while the post-test was 15%. Score qualification of less critical in the pretest was 15%, while the post-test was 0%. Score qualification of not critical in the pretest was 5%, while the post-test was 0%.

Control Class Critical Thinking Skills

Table 9 shown the acquisition of pre-test and post-test data in the control class is arranged in the frequency distribution table of students' critical thinking skills.

Table 9.
Pre-test Frequency Distribution of Control class

Classification	Score	Qualification	Frequency
A	81 – 100	Highly critical	0
B	66 – 80	Critical	12
C	56 – 65	Quite Critical	15
D	41 – 55	Less critical	9
E	0 – 40	Not critical	2

In Table 9 above shown that 12 out of 38 students can think critically. As many as 15 out of 38 students are quite capable of thinking critically. 9 of 38 students were less critical, and 2 of 38 students were not critical. Thus, the average pre-test score for the control class shows that the students were quite critical. Table10 below shows the post-test frequency distribution of the control class.

Table 10.
Post-test Frequency Distribution of Control-class

Classification	Score	Qualification	Frequency
A	81 – 100	Highly critical	0
B	66 – 80	Critical	14
C	56 – 65	Quite Critical	18
D	41 – 55	Less critical	6
E	0 – 40	Not critical	0

In Table 10 above shown an increase in the frequency of students. The difference in the percentage of the pre-test and post-test scores of the control class will be illustrated in the following graph.

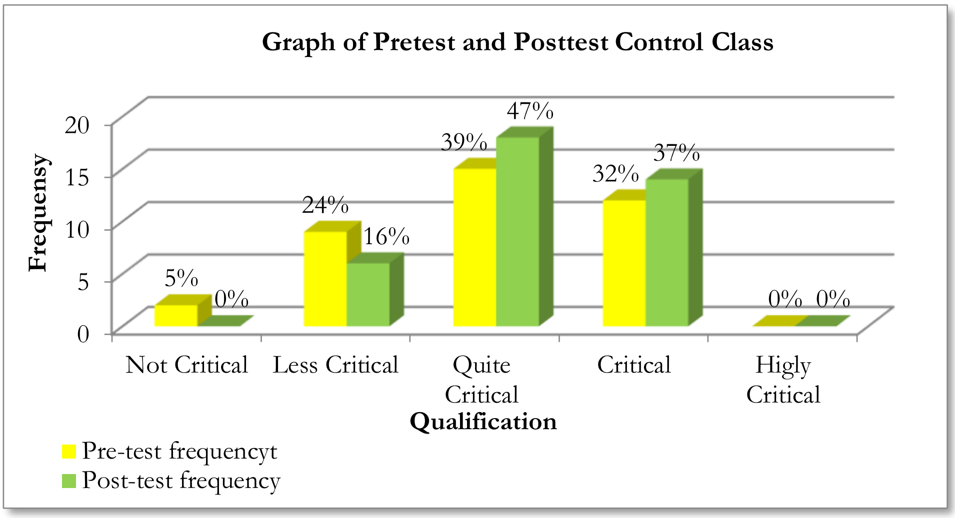

Figure 10.
Comparison Graph of Pre-test and Post-test Results of Control Classes

The graph can be described that there are no scores that indicate "highly critical" qualifications in the pretest and posttest. Qualification of "critical" scores in the post-test is higher at 37% while the pre-test is 32%. Qualification of "critical enough" score in the pretest is 39% while the post-test is 47%. Qualification of "less critical" score in the pretest is 24%, while the post-test is 16%. Qualification of "not critical" in the pretest is 5% while the post-test is 0%.

Hypothesis Testing

The results of the study are described based on the t-test results table as follows.

Table 11.
Statistical Calculations

Group Statistics	Class	N	Mean	Std. Deviation	Std. Error Mean
Pre-Test	Experiments	40	61.3250	10.52077	1.66348
	Control	38	60.1579	10.72891	1.74046

Table 11.
Pre-Test Results of Critical Thinking Skills with Independent Sample t-Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
The Result of Critical Thinking	Equal variances assumed	.044	.834	.485	76	.629	1.16711	2.40634	-3.62553	5.95974
	Equal variances not assumed			.485	75.613	.629	1.16711	2.40756	-3.62837	5.96258

Levene's Test for Equality of Variances shows values> 0.05. That means there is no difference in the variation in the pretest data from critical thinking skills (homogeneous).

Table 12.

Statistical Calculations

Group Statistics	Class	N	Mean	Std. Deviation	Std. Error Mean
Post-test	Experiments	40	73.95	7.268	1.149
	Control	38	63.21	9.450	1.533

Table 13.

Post-Test Results of Critical Thinking Skills with Independent Sample t-Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error 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

Sig of Test for Equality of Variances> 0.05. This means that there are no differences in variations in the pretest data from critical thinking skills (homogeneous). Furthermore, based on the independent sample t-test output table the Sig. (2-tailed) = 0,000 <0.05. As the basis for making decisions on hypotheses, the research hypothesis is that students who study the SPBL model get higher critical thinking skills compared to students who study using conventional methods.

Discussion and Conclusion

Based on the results of the data research analysis, it can be concluded that the SPBL model has a significant effect on students' critical thinking skills. This is indicated by the average difference between the control class and the experimental class in the pretest and posttest with each score smaller than 0.05.

SPBL is a scientific and interactive learning model for Geography. This can be seen in the syntax that makes students the center of learning. Also, the activities carried out by students are constructive in nature. Therefore, the application of the scientific SPBL model has more influence on critical thinking skills than conventional methods.

Several previous research results support the advantages of applying the scientific learning model compared to conventional learning (Handoyo, Amirudin, Soekamto, 2016; Umiyaroh & Handoyo, 2017; Farah, Handoyo & Bachri, 2018; Sari, et al. 2019; Aliman, et al. 2019; Sumarmi, et al. 2020). Increased students' critical thinking is influenced by interactive learning (Utami, Sumarmi, Ruja & Utaya, 2016), obtained from the search and income of direct student experience (Puspitasari, Sumarmi & Amirudin, 2016) and scientific learning processes (Bedawy, 2017; Woa, Utaya & Susilo, 2018; Syaodih et al. 2019; Martin & Erikson, 2019). It seems that the syntax of the SPBL directs students to solve problems from experience and scientific investigation on a spatial basis (Silviariza & Handoyo 2020). The scientific syntax can stimulate students' critical thinking skills (Halim, Mohtar, 2015; Marni et al. 2019; Shaughnessy et al. 2017). Therefore, applying an interactive SPBL model can provide scientific learning experiences to students in solving problems by paying attention to space.

The advantage of the SPBL model application is to help students to solve problems based on a spatial perspective. As is known, problem-solving based on spatial viewpoints is a characteristic of Geography (Miller, 2000; Goodchild, Yuan & Cova, 2007; Huynh, 2009; Shoorcheh, 2018). The process of solving spatial problems in the experimental class takes place scientifically. Students can identify spatial problems, orient spatial problems, formulate spatial problems, collect and organize spatial data and information, analyze spatial data and information with groups, and communicate it in front of other groups, in this case, group presentations.

Before the problem-oriented, students identify several problems that occur. Students choose and discuss spatial phenomena that are completely accurate from the map to find out the absolute and relative location of the space that will be discussed in real terms, understand space, and be successful. Thus students are drilled to think critically by agreeing and classifying with process-oriented spatial problems.

The second syntax is formulating spatial problems. Students encouraged to formulate questions of the problems identified in the previous step. This stage can be called the questioning stage. The questing stage is the beginning of the students being able to think critically about a problem. At this stage, students are trained to look at problems in a spatial manner and formulate them.

The third syntax collects and organizes data and spatial information. At this stage, students collect and organize spatial data in the form of tables, graphs, or diagrams. Students use the Activity Sheet that has been designed by the teacher to collect and organize spatial data organization. It aims to make it easier for data and information to be collected and organized so that the data is easy to read and analyze.

The next syntax is analyzing spatial data. Participants analyze the data that has been compiled and discussed with their respective groups. The analysis was carried out spatially with various analytical techniques following the characteristics of the data and conversation. Stages of data analysis in the SPBL can be done with 2 spatial analyzes. 1) Spatial Interaction Analysis (spatial interaction analysis). Interaction or reward is a process of interplay between two things. Because of the interaction with space, the process interferes with each other between spaces. Initially, this spatial interaction was introduced by Ullman (in Yunus, 2010) namely "Spatial interaction emphasizes regional interdependence and implies the movement of commodities, goods, people, information, etc. between regions". 2) Spatial Comparison Analysis (spatial comparison analysis). This analysis emphasizes the comparison/comparison between one region and another, with a minimum of two regions selected. The more practical purpose is to understand the strengths and weaknesses in each area in terms of regional development (Yunus, 2010).

The fifth syntax is communication. Learners present conclusions and discussions with other groups to get a different view of a problem. Communication activities are the delivery of findings verbally or in writing in diagrams, charts, pictures, and the like from previous activities with simple technology and/or information technology and communication to other people. From this activity, students are trained in self-confidence and develop scientific speaking skills in public.

During field activities, students are active in finding supportive information from various sources. Searching for supporting information through printed or electronic mass media as well as diligently utilizing the facilities in the library. This is proven from the results of the posttest critical thinking skills of the experiment class. Thus, it can be concluded that the behavior of students during the treatment process through the SPBL model influences critical thinking skills.

The SPBL model is a Geography learning model based on constructivism and spatial theory and scientific approaches (Silviariza & Handoyo, 2020). This makes the SPBL model one of the scientific models. Learning models that can hone high-order thinking skills including critical thinking skill (Yustyan et al. 2015). Therefore, the presence of the SPBL model brings innovations in the world of geography education.

From the results of research using the SPBL application model, students as subjects of education, students can collect and apply learning that supports to improve critical thinking skills. Also, this study can provide a reference to teachers about the use of learning models that are following teaching materials that are following learning will further enhance to increase student creativity.

Recommendations

For Applicants

Based on the results of this study, all Geography teachers should apply the spatial problem-based learning model. Thus, the students' spatial and scientific thought processes can be critically honed.

For Further Studies

Furthermore, qualitative or quantitative research can be developed with an orientation to other educational variables.

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