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EFFECTIVENESS OF PROJECT-BASED LEARNING COMBINED WITH OUTDOOR STUDY ON STUDENTS' MENTAL MAP

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ABSTRACT: Mental maps can be used as an effort to determine the understanding of students' spatial patterns. Mental maps can also be used to measure students' perceptions of environmental characteristics. A good mental map ability can also help students understand spatial information. Geography learning provides various kinds of spatial information so that a mental map is needed to assist in completing the learning. Besides, geography learning must also be able to improve students' understanding of spatial information. Therefore, improving the ability of the student mental map is important. This study aims to improve the mental map of high school students through project-based learning combined with outdoor study. Research is a quasy experiment using post-test only control design. The research hypothesis test uses an Independent sample T-Test. The results showed that the experimental class had a higher average value compared to the control class.

Keywords: Project-Based Leaning, Outdoor Study, Mental Map

1. INTRODUCTION

Geography is the study of geosphere phenomena with a spatial perspective. Learning geography in schools must be able to provide student competence in learning geographic phenomena that occur with a geographical perspective. Therefore, the objectives of learning geography include 1) To develop a mental map of your community, province or territory, country and the world so that you can understand the "where" of places and events. 2) To understand the spatial organization of society and see the order in what often appears to be random scattering of people and places. 3) To recognize spatial distributions at all scales - local and worldwide - in order to understand the complex connectivity of people and places. [1].

The development of mental maps has become one of the focuses of geography learning objectives not only in Canada but also in Indonesia. The 2013 curriculum which was later refined into the 2016 curriculum also states the same thing. The aim of geography learning is to understand spatial, environmental and territorial patterns, as well as processes related to geosphere phenomena in national and global contexts [2]. A good understanding of spatial patterns is supported by a good mental map.

patial pattern is something that shows the placement or arrangement of objects on the surface of the earth [3]. The composition of these objects is formed due to the interaction of environmental and cultural factors so that the uniqueness of space can occur. The spatial pattern can be interpreted as the peculiarities of the spatial distribution of the earth's surface geosphere phenomena [4]. Distribution of the geosphere phenomena vary depending on the characteristics of the region and the processes occurring in the region.

Geosphere phenomena based on the process of formation, namely natural phenomena, artificial phenomena, and artificio-natural phenomena [4]. Natural phenomena are formed from natural processes such as rivers, hills, valleys, mountains and the sea. Artificial phenomena are symptoms that are formed due to the work of humans, such as roads, buildings, agriculture, industry, and settlements. Geosphere phenomena that occur due to a combination of natural phenomena and artificial phenomena are called artificio-natural phenomena, for example cave settlements.

Distribution shape of the geosphere phenomena known as spatial patterns. To be able to understand distribution shape of objects or geographic phenomena, students must be able to coordinate the spatial knowledge they obtain. In addition, students must explore various factors that influence the emergence of a particular situation. Students need precision in finding the causative factors, identifying and looking for relations of these factors. Therefore, students can discover the factors that affect this situation.

In identifying causal factors, students analyze many factors such as natural, social, economic, cultural, and other factors. Among the

influencing factors are identified the relationship, both in causal relations and grouping and mapping problems. Natural factors affect social factors or social factors affect natural factors [5]. Thus to understand a situation on the surface of the earth, it requires a comprehensive insight and looking for relations between rational factors. Furthermore students can use this information to study various kinds of phenomena and provide solutions to problems that occur.

Understanding spatial patterns is a basic competency in geography. This competency will develop spatial understanding such as structure, process, interaction, comparison, and spatial development tendencies. Knowledge of the location and character of the community, space, and environment is a necessary precursor to geographic learning and thinking [6]. Competency can be used to determine the understanding of spatial patterns is by using a mental map [7]. In addition to understanding spatial patterns, mental maps are also indicators of how well students' introduction of environmental characteristics.

Mental maps are personal visualizations of spatial information. Mental mapping is the cognitive competency to collect, store, organize, remember, and manipulate spatial information [8] [9] [10]. Other terms, it is a map in our own minds. Mental maps reflect individual knowledge and experience. Sometimes mental maps are inaccurate due to lack of experience, perception, or lack of knowledge. We can improve our mental map through learning and adding personal experiences. This experience can be done either directly (like a trip) or indirectly (like looking at other maps).

Benefits of mental maps for students as activities that increase creativity. The teacher can use mental maps for diagnostics (perception, representation, and learning) and informative goals (location information and focal point of the environment to be known). Important aspect of mental maps is to compare between the mental maps students make and the real maps they will use for learning. Currently the use of mental maps in schools is still quite rare. When learning, the teacher only conveys the concept of the map and how to interpret the map [11].

Better understanding of environmental characteristics through observation and analysis will help students in problem solving and decision making. Therefore, mental maps are the basic abilities that students must possess. The perception or mental image of the world held by individuals is at the root of all perception studies conducted by geographers [8][9]. Improvement of student mental maps needs to be done in order to comprehensively understand geography. So far there has not been much research on appropriate learning models used to improve students' mental maps

Project based learning is a learning approach that gives students the freedom to plan learning activities, carry out projects collaboratively, and ultimately produce work products that can be presented to others [12]. This freedom will increase student creativity. Mental map is a form of student creativity in describing maps that exist in themselves. Therefore, project based learning is still used to improve students' mental maps.

Project based learning was first developed in the United States. PBL through the six stages of learning, that is: (1) start with the essential question, (2) design a plan for the project, (3) create a schedule (4) monitor the student and the progress of the project (5) asses the outcome, (6) the Evaluate experiences. [13]. This learning method is very suitable to be applied to the theme that requires a higher level of understanding than any cognitive domain.

Advantage of PBL is that it motivates students to be fully involved in the learning process and gives them a feeling of satisfaction. PBL can encourage students to collaborate with each other in solving problems. This result makes learning more independent when students become more responsible in their learning; and because PBL involves a range of activities, meeting various learning needs and student interests. students have the opportunity to self-assess their own product goals, they can also evaluate their classmates' projects and provide constructive feedback for each other. This will help them realize their own strengths for improvement and weaknesses that must be eradicated. [14][15][16][17]

Disadvantage of PBL is that activities require time and require great attention to detail. In addition, students who lack the skills to work in groups may face several challenges in collaborative work. The implementation of PBL can conflict with deep belief insome from the teacher. That is, some teachers reject any proposed changes from this method. [14][15][16][17]

Outdoor study is a method that invites students to study outside the classroom to observe events directly in the field with the aim to familiarize students with their environment [19] [20]. Environment can be used as a learning resource. teacher's role as a motivator, means teacher as a guide or guide so that students learn actively, creatively and familiar with the environment.

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Outdoor study can foster student interest in learning, because students can directly interact with the surrounding environment [21]. Besides that, outdoor study is able to make student learning activities more interesting and not boring. Direct environmental observation can improve student mental maps. This result is due to students being able to directly observe and experience conditions in their environment.

2. METHOD

This research method is quantitative. This type of research is quasi-experimental. Quasi experiments are used because subjects are naturally formed intact groups [22], like groups of students in one class. This research uses Posttest Only Non-Equivalent Control Group Design. The design model is as follows in Fig. 1:

	Intact Class	Experimental Variabel	Posttest
G1	Class1	X1 ----------	O1
GC	ClassC	Tradisional (-)--------	Oc

Fig 1. Posttest Only Non-Equivalent Control Group Design

Information:
G1: Experiment Class
GC: Control Class
X1: Treatment (project-based learning combined with outdoor study)
O1: Posttest experimental class
Oc: Postest control class

Research variable is the learning model as the independent variable and the student mental map as the dependent variable. Population of this study was students of class XII IIS in SMA N 1 Kesamben Blitar. Sampling technique used is stratified cluster random sampling which is done by selecting 2 classes randomly. One experimental class of 36 students and one control class of 34 students.

Research instruments were tests and observation sheets. Test is used to see the student's mental map and observation sheet is used to implement the learning model. Collected data was analyzed using Independent Sample T-Test. Before testing hypothesis, assumption test is carried out. These tests are normality test and homogeneity test. For the mental map criteria students use the score classification as follows in table 1:

Table 1. Classification of students' mental map

Score	Criteria
13-16	Very good
9-12	Good
5-8	Less
1-4	Very less

3. RESULT AND DISCUSSION

Before testing the hypothesis, researcher tests the assumptions as a prerequisite. This tests are normality test and homogeneity test. The normality test uses Kolmogorov Smirnov and the homogeneity test uses the Levene test. Assumption test results using SPSS in table 2.

Table 2. Assumption test

Asumpsion test	Test used	Result	Conclusion
Normality test	Kolmogorov -Smirnov Test	Sig. Control Class= 0,75 Sig. Experiment Class = 0,89	Data has a normal distribution
Homogenity test	Levene test	Sig. = 0,88	homogeneous data

Based on table 2, it can be concluded that the distribution of control class and experimental class data follows the normal curve. Data of both classes also has a homogeneous variant. Both tests were conducted with a 95% confidence level. The prerequisite tests that had to be carried out in order to test the hypothesis had been fulfilled. Therefore the hypothesis test is then performed.

Hypothesis test in this study is an independent sample T-test. This test is conducted to compare the mean between the control class and the experimental class so that it can be generalized to the results of this study. Null hypothesis in this study is that there is no difference between the control class and the experimental class. To test these hypotheses a statistical test with spss is performed. Test results in this study are as follows:

Tabel 3 Hyphothesis test

Hyphothesis test	Result	Conclusion
independent sample T-test	Sig. 0.012	Null hypothesis is rejected

Based on table 3, results show that Sig (2 tailed) or p value of 0.012 where <0.05. Because <0.05, difference is statistically significant or

significant at probability of 0.05. In other words, there is a significant difference between the control class and the experimental class. It can be concluded that PBL combination with outdoor study has an effect on improving mental map of students. Difference in mental map scores between the control class and the experimental class was 4.45. When viewed from the classification of mental map criteria, control class is classified as good criteria and experimental class is classified as very good criteria (Tabel 4). Provision of the average mental score is quite far between control class with experimental class. This proves that the use of the right model can improve student mental maps.

Table 4. Every Indicators of Average Score and Students' Mental Map Score

Class	Each Indicator Assessment average score				Average total score	Criteria
	Room / Building Completeness	Space / Building Identity	Focus orientation	Space / Building Proportion		
Control Class	3.295	2.543	2,145	1,366	9.349	Good
Experiment Class	3,740	3.308	2.872	3,879	13.799	Very Good

Mental map condition is influenced by internal factors and internal factors. Internal factors include the ability to remember and ability abstraction space, while external factors are clustered school spaces (Iskandar, 2012). Students' memory abilities are very supportive in developing their mental maps. Students receive stimuli in the form of information about location and layout of the school.

Information obtained will be studied in their thinking. This process is known as "encoding" and occurs in the cortex system. After that, information is stored in their memory in "hippocampus". Information about school condition will be displayed as a depiction of a mental map. Process of forming mental maps

Good student's memory of school environment will give them better mental map. Memory is influenced by the interval of student interaction with school experience. The experimental class has good mental map compared to the control class. This is due to PBL combined with outdorr study can provide real experiences to students [26[. Students are given the opportunity to directly observe the condition of the school.

Good abstraction space capabilities from someone will be able to make good mental map because mental maps are related to spatial intelligence. Spatial ability is the abstraction of space. Spatial intelligence is a combination of various abilities: to visually understand the world, to carry out transformations based on one's initial perception, and to recreate aspects of one's visual experience. Intelligence is an innate factor; but the experience of exploration into the surrounding environment affects that intelligence.

Students in the experimental class have directly interacted with the environment. They directly observe and analyze the condition of school. A person's cognitive map, or knowledge of large-scale space, is built from observations collected when he makes observations through the environment. Therefore, they are very familiar with the condition of their school which then produces good mental map.

Beside internal factors, there are external factors that also affect good mental map. External factors are spatial planning. Mental maps are the result of processes between observers and the environment. The environment gives different impressions and emotional ties to each person. Therefore, in general, a good environment must meet two conditions, namely imageability and legibility. Imageability is ability to make an impression. legibility is ease to be understood or imagined and organized into a coherent pattern.

To produce an environment that has the imageability and legibility needed requires good environmental planning. Method that can be used is clustering. Spatial planning at the place of the research took place was arranged according to its function, such as grouping classrooms, laboratory rooms, and administration rooms. This method can help students remember and the interaction behavior of citizens with the school environment to be efficient. The ease of the process of remembering will be easier to form mental maps.

4. CONCLUSION

Project based learning combination with outdoor study is effective in improving students' mental maps. This is because students can directly observe and analyze school location and layout. This direct experience increases the ability of space abstraction so that mental map improvement.

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