



## Research Article

# The Effectiveness of Outdoor Learning in Improving Spatial Intelligence

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### Abstract

Spatial intelligence is essential for geography education students for identifying geosphere phenomena. The aim of research to measure spatial intelligence and the effectiveness of the application of outdoor learning in geography education students. It used a pre-experimental study with a pretest-posttest one group design. The form of field learning activities in the form of camps and a series of practical activities. Before the student activity will present a pre-test which has the same weight as the final test given the end of the activity. Data collection techniques use tests, as well as observations for conformity between design and action. Spatial intelligence test instruments will test for validity, reliability and different. The test format is designed using geographic spatial intelligence references. Data analysis through homogeneity, normality and hypothesis testing using the t-test. Hypothesis testing results show that  $H_0$  is rejected and  $H_1$  is accepted, which is indicated by the results of  $t_{count}=1.7108 > t_{table} 0.492$  with a significance level of 5%. This research concludes that outdoor learning models can improve students' spatial intelligence and can increase their intelligence specifically in geography learning.

### Keywords:

spatial intelligence, outdoor learning, education, learning process

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## Introduction

In human perception, the view of visual objects is very crucial. It can be a separator and differentiator of information received. Spatial intelligence is a process of perception in translating, selecting and organising information received, present or that observed. For which the whole thing takes place in activities of observation or direct observation of objective reality. A study in the outdoor can construct the person no stranger with their surrounding environment and can direct person attitude for environmental awareness and its sustainability (Vera, 2012). Özdilek et al. (2011) explained that outdoor learning in environmental education can increase knowledge and positive attitude toward the environment.

Spatial Intelligence has a central role in the scientific realm (Hegarty, 2009). For example, geography such as the activity of interacting the processes that form the geological formation or structure that forms the mountains. In addition, for instance, in outdoor activities that use maps, maps are a picture of the earth's surface, which poured in the data field or two dimensions. The user must be able to visualize the image of the object and associate it with the appearance of the object in the area. Spatial thinking or spatial understanding involves the ability to think in shaping and organizing spatial objects or spatial processes that occur.

Outdoor learning is a teaching and learning activity that directed towards students facing the object of study. In some developing countries, it experiences symptoms of reducing a time for students to study outside the classroom (Rickinson, 2004). The tradition of learning and curriculum design does not pay attention to learning activities outside the school and is limited to extracurricular activities, in contrast to developed countries that have paid attention to outdoor learning activities even early on.

The approach to outdoor learning is the value and effectiveness as well as the possibility to combine theoretical knowledge with experience-based learning. It is because the information is not only derived from the class but more than that, this model builds students' knowledge obtained from various sources (Salam et al., 2019).

Outdoor learning can improve learning success, especially in the cognitive domain that has a formula (Bloom, 1976) and perfected by (Krathwohl, 2002). Learning is a linking process between current information and relevant concepts in-person cognitive structure (Dahar, 2011). Next, Gunarsa (1982) meaningful learning, there is an interactional relation between concept and necessary structurally development. Then Arsyad (1997), direct observations provide a complete impression and meaningful on existing information and ideas.

The approach to learning outside the classroom uses outdoor settings as a means. The learning process using nature as a medium seen as very useful in knowledge management, where everyone will be able to feel, seeing can even do it themselves so that the transfer of knowledge based on experience in nature can be

felt, translated, developed based on capabilities. The selection of outside-class learning activities refers to the experience cone of Dale, as proposed by Molenda et al., (1996) Direct Purposeful Experience is the experience of students getting a result of their activities. Students experience, feel for themselves, everything related to achieving goals. Students relate directly to the object to study without using an intermediary because students get directly into concrete so that it will have high accuracy.

The approach to outdoor learning uses outdoor settings as a means. The learning process using nature as a medium seen as very useful in knowledge management, where each person will be able to feel, see directly even can do it themselves so that the transfer of knowledge based on experience in nature can felt, translated, developed based on the capabilities possessed. This approach sharpens physical activity and social children where children will do more activities that indirectly involve cooperation between friends and the ability to create. This activity will bring up the process of communication, problem-solving, creativity, decision making, mutual understanding and respect for differences (Husamah, 2013). Intelligence Spatial-Visual is an ability to capture the world of visual space appropriately, as possessed by a decorator and architect. Included in this intelligence is the ability to recognize shapes and objects appropriately, make changes in the shape of objects in mind and recognize these changes, describe a thing/object in mind and change it in original form and reveal data in a graph (Suparno, 2004).

In fact, only several students and a small number of postgraduate students have the opportunity to develop these skills at a satisfactory level. Spatial intelligence means one of the intelligence that supports one to visualize information and synthesize data and concepts into visual or image metrics (Suprpto et al., 2018). Students who are in the realm of thinking are already in analytical thinking ability; it is still often found that there are difficulties in identifying objects, differentiating and processing information related to geosphere phenomena. It based on the process of receiving geosphere information in the form of indirect visualization through the learning media used. Ratnasari et al. (2018) suggested that teachers have not used innovative learning models and the learning media used are still not varied; therefore, learning tends to be annoying for some students. It caused by the lack of processing multiple intelligences in student learning.

In addition, there is an assumption that most students, especially in the geography education environment, have not yet built up a perfect spatial understanding because the help of direct learning activities is difficult to provide. Geography is an educational discipline that indicates the relationship between humans and exploits space with better representation as diagrams and maps, photographs (Utami and Zain, 2018). It is essential to understand because geography concerned in the process of improving spatial intelligence because

geography is a science that combines physical aspects and social aspects of the earth's surface are spatially (Urfan et al., 2018). Next, according to Sumarmi (2012), one of geography study object is about earth surface and also all processes that relation between place and the human interaction. The outdoor learning process can provide students with direct experience and can make lessons more concrete or real (Prasetya, 2014). Meanwhile, Mariana (2005) argues that outdoor study can help in the overall student's development, and there are physical-motoric, socio-emotional, cultural, and intellectual.

In this encourages researchers to design research related to how spatial intelligence enhanced through direct learning activities outside the classroom. The purpose of this study is expected to be able to provide learning concepts for improving spatial intelligence and scientific understanding of geography education students. Spatial intelligence is a primary tool that must be possessed by geography students to identify geosphere phenomena, while outside-class learning is considered sufficient for geographic, scientific knowledge and understanding in the form of spatial intelligence.

### **Method**

This research is a pre-experimental study carried out on the department of Geography Education, University of Halu Oleo. The sample was several students who purposively selected with specific considerations of 25 people. This research includes three stages, namely the research preparation stage, the research phase, and the final stage of the study. The research preparation stage is as follows:

Firstly, the preparation of instruments and media activities for participants (research samples): formed a team tasked with organizing camp activities. Other activities, location determination and survey. Location criteria are the availability of geosphere phenomena that can use as a material as part of research treatments or treatments.

Secondly, the preparation of research instruments in the form of visual-spatial category intelligence test devices. Thirdly, Judgment test instrument to the expert team of the department of psychology education, Halu Oleo University. Fourthly, test the test instrument

The data collection tool used is a test instrument that contains questions about spatial intelligence that designed to source from geographic teaching material or content. Test instruments have passed the validity test using the Pearson product-moment correlation formula with a very low validity level-enough. The low validity of the questions expected that there are no guidelines in making the question of spatial intelligence using geographic material sources. After testing the validity, the reliability test using Cronbach alpha formula, the results of the instrument reliability category in the category is sufficient (0.405). The whole process of data analysis uses statistical tests, has passed the homogeneity test, normality is then carried out hypothesis testing using the t-test test formula.

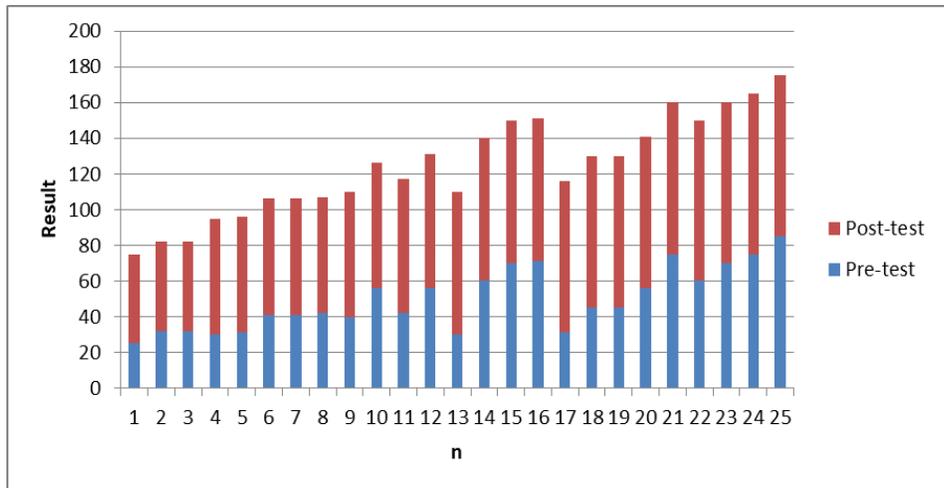
## Result and Discussion

Data from the test results of spatial geography intelligence students are presented in the form of data descriptions of each variable as follows: Spatial intelligence pre-test learning results showed a mean of 49.64, a minimum value of 25, a maximum value of 85, with a standard deviation of 17.387. While the results of the post-test in the table show the mean of 74.80, the minimum score is 50, the maximum score is 90, with a standard deviation of 12.778. The following are the results of the post-test in the form of a descriptive statistic in Table 1:

**Table 1.**

*Statistical descriptives*

Treatment	N	Mean	SD	Standar error
Pre-test	25	49.6400	17.38745	3.44749
Post-test	25	74.8000	12.78671	2.55734



**Figure 1.**

*Improving Graph of Spatial Intelligence in Test Results*

Based on the calculated results, it is known that the value of  $t_{\text{count}} = 0.492$  while the value of  $t_{\text{table}} = 1.708$  then  $H_0$  is rejected, thus there are differences in the results of tests of geography education students in increasing spatial intelligence through non-classroom learning. From the results of the ANOVA test, it was seen that significant value ( $p$ -value) of  $0.000$  means  $> 0.05$ , this indicates that the decision taken is to accept  $H_1$ , which means that there are differences in the average value of pre-test and post-test. Increased interpersonal intelligence of students is characterized by an improvement that occurs in every aspect of interpersonal intelligence assessment. In this demonstrates outdoor learning model can improve the spatial intelligence of students.

**Table 2.***The Result of ANOVA Test*

	Sum of squares	Df	Mean Square	F	Sig
<b>Between Groups</b>	7912.820	1	7912.820	33.973	.00
<b>Within Groups</b>	111179.760	48	232/912		

**Table 3.***Results of the Study*

Result	Criteria	Interpretation
$t_{\text{count}} = 0,492$	$t_{\text{count}} > t_{\text{table}}$ (1,708 significant level 5%)	Hypothesis accepted

From the results of the study (see Table 2 and Table 3) on the group of geography education students who included in the learning activities outdoor classroom and given spatial intelligence test instruments. In general, showed an increase in test results marked an increase in spatial intelligence. Seen from the results of the analysis are shown in Table 2 and Table 3 that there is significant learning in outdoor learning outcomes with value  $t_{\text{count}} = 0,492 < t_{\text{table}} = 1,708$ . This result is in line with Alirman et al., (2019) suggests that in the learning process, there is an influence of spatial thinking understanding on student geography learning outcomes. Meanwhile, Rohmadi, 2018; Yani et al., 2018 said there is a positive and significant correlation between spatial intelligence with the capability to read technical images with a correlation coefficient of 0.371.

Sirih et al., (2019) argues that spatial intelligence is very influential on results, especially on student learning outcomes. Next, Sirih et al., (2019) use two forms of learning models to see differences in students' spatial intelligence. The results explained that there are significant results obtained by interpreting the spatial intelligence of students. Those who use the visual-spatial intelligence area can be said to learn permanently, describe in detail the information and gain the skills. This expression supported from Table 1 that the results of the study results of the test scores before the outdoor learning activities on the test instrument showed the results of 49.64 and the results of the tests after outdoor learning showed a result of 74.80. Several factors influence the results of this study, namely the criteria for the instrument and the process of outdoor learning. Based on the different test the average test results before (pre-test) outdoor learning activities amounted to 49.64, and the results of the test after (post-test) of 74.80 showed that outdoor learning activities were higher and had increased. It is because visual-spatial intelligence, students provided with mind mapping projects, demonstrations, card games and crosswords, so students are required to think and construct their knowledge into an organized pattern (Pratiwi et al., 2018).

The overall results of the study have several analysis results related to the research process as follows: First, outdoor learning activities affect the way of sampling, Use purposive sampling technique because not all students who selected

as samples are willing to participate in camping activities or forms of outdoor learning. So the sample of this study is a group of 25 students who are willing to take part in activities outdoor learning. According to Vera (2012), the outdoor study makes student learning activities more comprehensive and active because the matter can be done by group working. According to Sumarmi (2012), the number of members in each group must be considered to determine the effectiveness of the data that should be collected.

Second, the low average test results before the outdoor learning activities in the student group are because the teaching material in the lecture is not contextual, besides students often do not know the empirical form of material content or which is often exemplified in the lectures taught. The content of the material taught in the form of conventional learning is not associated with material objects that are in the closest environment of students, also influencing the understanding of the test program questions used. The low results of these tests underlie the formulation of the content of learning activities outdoor with a good plan. According to Bilton (2010), without planning can make field observation not better than learning in the classroom.

Third, Based on the instrument validity test, shows the results of validity with a very low to a quite valid category. The low factor of instrument validity is assumed by the composition of test questions (instruments) to measure spatial intelligence related to geographic science that has never formulated before. Fourth, Outdoor learning that used as a model in research is effective in increasing spatial intelligence but is not efficient in financing. Meanwhile, according to Winarti et al., 2019 argues that multiple intelligence includes spatial intelligence is an indicator that needs to be taken into account in the learning process. According to him (Winarti et al., 2019) multiple intelligences which there are aspects of spatial intelligence is a teaching strategy that is oriented towards academic ability into intelligence-oriented and focus on the potential of each student. This opinion is in line with the opinion Prasetya (2014), one of weakness in the free study method is financed to the object. According to Suprpto et al., (2018), visuospatial based learning can improve student's spatial intelligence. According to Johan et al. (2018), visualisation can improve prospective physics teacher in earth science.

Learning effectiveness primarily determined by the planning of activities that can describe follows:

- a) Determination of a suitable location between content and objects. Associating class material content in learning activities outdoor classroom is the first thing that must be identified by researchers in outdoor learning activities from the process of determining between teaching content and the availability of objects in the field. In the scope of geographic science, the distribution of formal geographic objects includes the Biosphere, the atmosphere, the hydrosphere, and the lithosphere. These four aspects interpreted in various studies of lecture

material. According to Paisley et al. (2008), the outdoor study creates student knowledge about the environment well.

- b) Each course has an element of practice and then chose what practices correspond to conditions in the field. The field requirements or location must include at least four practical activities from some lecture material that can be applied to that location. In this study determined the practice material based on location suitability can be seen in the appendix of the activity. In summary, the location of the activity must be observed, measured and observed. According to Johnson (1990), learning willing to become high when a student can make free and active throughout learning. According to Tuula (2013), outdoor make active student participation in a learning activity, so they more understand about student activity.
- c) Selection of material and practice outside the classrooms. The next step in the preparation of learning activities outside the classroom is the selection of practice material and the arrangement of practical activities. The time aspect that becomes a benchmark, because the duration of each practice must be able to accommodate the involvement of participants in this case students to be able to engage in activities. In the selection of practice, content pays attention to aspects of time and duration. For example, in this research activity, the night is filled with observations of celestial bodies and morning sketches of landscapes. According to Thomas (2005), in the student report, there is data connected with collecting criteria what previously planning.
- d) Compilation of practice guide modules. In order to ensure effectiveness, the material is arranged more concise and practical, containing explanations and guidelines for work steps. An explanation assists in understanding related material from the lecturer or as the filler of the material, and then the work step guide is made in the form of syntax. Guides, besides containing good explanations, also contain pictures of directives. According to Nugroho (2013), engaging physically and mental emotionally encourages willingness, ability, high curiosity, and as a driver for improving quality and learning success.
- e) Technical plan for activities. After knowing the location, materials and modules, the following steps are the preparation of the plan for carrying out the activities. At this stage, researchers compile a sequence of material activities and forms of work. The form of work preferred in groups according to field management capabilities. Ensure that there is no free time that does not contain content or pause other than resting time. The more content you want to practice in the activity, the more time you use, the preparation of the activity plan ensures that the entire material can be distributed evenly throughout the learning activities. According to Brown (2012), outdoor learning can make a student more understand about location concept include physic and human activity in the location where they visit. According to Dolan

(2016), outdoor study and primary geography discipline collaborate, especially about spatial.

In addition, in this study using spatial intelligence in outdoor learning practices place in two forms which students are told to draw and represent. It was done to train students in the ability to create a symbol that can recognise from the current object, such as people, plants, animals or houses. As well as the knowledge to coordinate those elements are spatially into one section. The next step of exploration which proposes to elaborate the ability to reflect design, and the use of artistic expression, flexibility, creativity and discovery, and finally express emotions and create specific effects. Therefore, students who study using the outdoor learning model significantly get better grades. In this because the activities in the learning process based on outdoor learning include skills that preformed in the affective, cognitive and psychomotor aspects of students. This condition is possibly related to the use of individual intelligence that enables success in the learning process.

### **Conclusion**

Based on the results of data analysis and hypothesis testing as well as increasing spatial intelligence through the outdoor learning for geography education students, conclusions can be drawn; There are differences in the results of spatial intelligence tests of geography education students before and after participating in outdoor learning activities. In this indicated by the results of the t-test obtained by the results of  $t_{count} = 0.492$  while the value of  $t_{table} = 1.708$  with the level of sig  $\alpha \leq 0.05$ . Thus, it can conclude that  $H_0$  is rejected and  $H_1$  is accepted. Joseph et al. (2017) stated that spatial intelligence plays an essential role in improving students' intelligence. It is evident with the difference in significance values in the analysis results. Apart from all that, spatial intelligence is instrumental in supporting the process of learning and training (Hegarty, 2010). In this because calculating the spatial intelligence of students able to arrange and make patterns or reconstruct their understanding in the form of cognitive patterns found in their minds. In a study conducted by Yazici (2017) that students had good performance in answering questions and had a significant correlation to students' positive understanding. Students with local cognitive styles have higher spatial skills than students with global styles.

Based on the average test results before and after outdoor learning activities on the test results of spatial intelligence instruments. Where the results of the student group test after participating in the outdoor learning activities are higher than the results of the test before outdoor learning. That is, with an average value of 49.64 on the test results before and an average of 74.80 in the test results after the outdoor learning activities. Salam et al. (2019) reported that there were interactions learning model application to spatial intelligence of students. Salam et al.(2019) reviewing the mathematics learning process the application of learning models

affects learning outcomes by paying attention to students who have high intelligence and low intelligence. Whereas Ferdiansyah et al. (2019) reported in his study that integrated geography learning was carried out to provide spatial intelligence to students, so they could be able to complete the geography approach.

Therefore, outdoor learning activities are effective in increasing the spatial intelligence of geography education students, and this can be seen from the increase in the test results of spatial intelligence instruments.

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