

## **Outdoor Study for Understanding and Critical Thinking Skills of Rock Material (Geosite) Karangsambung – Karangbolong Geopark**

**Ni'am Khakiki <sup>1✉</sup>, Dewi Liesnoor Setyowati <sup>2</sup>, Puji Hardati, Hariyanto, Erni Suharini**

Sekolah Pascasarjana, Universitas Negeri Semarang, Indonesia

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### **Abstract**

Geography learning has not utilized the potential of the Karangsambung-Karangbolong Geopark geosite as a learning resource. The purpose of this study is to analyze the implementation of outdoor study and evaluate understanding and critical thinking skills after studying rock material in the Karangsambung-Karangbolong Geopark. The research design was Pre-Experimental Design, One Shot Case Study approach. The sample of class X 1 was 34 students and 4 (Geosite). Data collection used observation, interviews, documentation studies, student worksheets, questionnaires, and tests. Data analysis used descriptive and scoring. The results of the outdoor study in the Karangsambung-Karangbolong Geopark made it easier for students to identify rocks in the field, 58.82% (high) and 41.18% (moderate). Students' positive responses that outdoor study made it easier and helped them understand rock material, 52.90% (appropriate) and 47.10% (very appropriate). Outdoor study at the Karangsambung-Karangbolong Geopark supported student understanding, with 52.94% (high), 35.29% (moderate), and 11.76% (sufficient). Meanwhile, students' critical thinking skills averaged 36 (high), with 50% (high) and 50% (moderate).

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<sup>✉</sup> Correspondence address:  
Kampus Sekolah Pascasarjana UNNES, Indonesia  
E-mail: niamkhakiki14@gmail.com

## INTRODUCTION

Learning that utilizes the environment (nature) as a learning medium can facilitate the process of conveying material or concepts to students, in this case, student understanding becomes better because this medium can provide a basic overview of everything they learn (Susilawati & Sochiba, 2022). The concept of learning using the environment according to Uno and Mohamad (2011: 146-147) is a learning concept that identifies the environment as a learning resource (Nalisa, Hariyanto, Suroso 2018). In line with this, according to Wijayanto et al. 2017 (Astutik et al., 2023) revealed that geography learning does not only focus on theoretical explanations but also requires a combination of theory and environmental conditions. Geography learning has not utilized the Karangsambung-Karangbolong Geopark as a learning resource regarding rock material.

The Karangsambung-Karangbolong Geopark has the potential for a real-world classroom, with its unique geoheritage richness and in the educational field, it can be utilized by students as a learning resource to study rocks. One use of the geopark in the educational field is by making it an outdoor study location regarding rock material. Where students can observe geosphere phenomena, one of which is geological wealth (geodiversity) in the form of geosites consisting of various types of rocks in the field. The reason for choosing the Karangsambung-Karangbolong Geopark as an outdoor study location for rock material is because of the geological diversity in Karangsambung which is the result of subduction in the Cretaceous-Paleocene era, there is evidence of rock outcrops originating from the Indo-Australian Ocean Plate and the Eurasian Continental Plate. The rocks contained therein are Cretaceous-Eocene in age with various types, namely high-grade metamorphic rocks, basic to ultrabasic igneous rocks and deep-sea sedimentary rocks presented in the form of the Lukulo Melange hills. In addition, it is equipped with 27 geosites consisting of various types of rocks in it. In line with this, (Brilha et al., 2018) stated that the

Geopark area must have many geological heritage sites that are famous for their beauty and rare attractions that can be developed to integrate conservation, education, and economic development (Ansori. et al., 2022).

Utilizing the potential (geosite) of the Karangsambung-Karangbolong Geopark through outdoor study can facilitate students in directly observing the real conditions of rocks in the field. Outdoor study is an effort to encourage students to engage in activities that can lead them to observe the surrounding environment in accordance with the material being taught (Susanti et al., 2023). Learning activities utilizing the environment can enable students to make direct observations related to the problems presented and also make the learning situation more enjoyable (Nugraha et al., 2017). Outdoor learning can strengthen students' understanding of the concepts of the material being studied (Asmara, 2019). In addition, outdoor study can also provide opportunities for students to solve real-world problems, which can improve their problem-solving skills (Samsiyah et al., 2020; Zheng et al., 2021). Outdoor study can stimulate students' thinking skills because it can motivate students to construct knowledge independently and students can compare their understanding with the material presented by the teacher (Paramita et al., 2020).

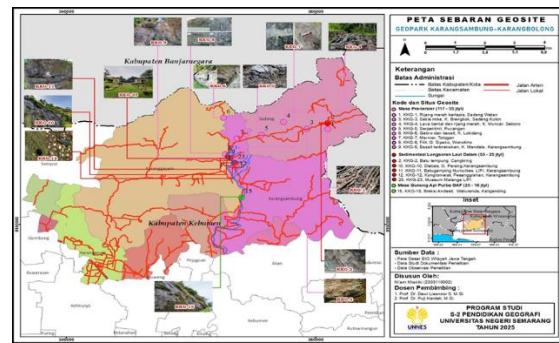
The role of outdoor study in geography learning about rocks is to provide a clearer picture of the rock material, with the hope of helping students' learning progress. In line with this (Susilawati and Sochiba, 2022), revealed that through direct learning outdoors, it can make it easier for students to capture, understand, clarify the material and can strengthen the mastery of concepts received by students in the classroom so that students' critical thinking skills increase. It is hoped that through outdoor study in the Karangsambung-Karangbolong Geopark, it can make it easier for students to observe rock material that is in accordance with real conditions in the field and is able to support students' understanding and critical thinking skills regarding rock material. Therefore, the researcher wants to conduct research related to how the

implementation of outdoor study in the Karangsambung-Karangbolong Geopark to study rock material in students' critical thinking skills.

## METHOD

This study uses a quantitative approach, and the research design used in this study is Pre-Experimental Design, using the One Shot Case Study approach, with the aim of seeing the effects of a treatment in one shot. The location of the outdoor study was in the Karangsambung - Karangbolong Geopark while the research location studied was located at SMA Negeri 1 Karangsambung. The population in this study consisted of research subjects and research objects. The subjects of this study were students of Class X 1 and X 2 of SMA Negeri 1 Karangsambung, while the objects of this study were 27 geosites of the Karangsambung - Karangbolong Geopark. There are two types of samples used, namely the first student sample, which is a non-probability sampling type and then using a purposive sampling technique, which means the research sample is determined solely by the researcher or determined subjectively. The student sample in this study was class X IPS 1, totaling 34 students. The second type of sample used in selecting the geosite is probability sampling, using a proportionate stratified random sampling technique based on two consideration factors, namely accessibility (distance and accessibility) and rainfall (coinciding with the rainy season). Based on the existing considerations, the geosite samples used in this study were 14 geosites including KKG 1-12, KKG 15, and KKG 23. From these samples, direct visits were made to 4 geosite sample points, including KKG 5 Serpentinit Pucangan, KKG 10 Diabas, G. Parang, KKG 11 Numulites Limestone, KKG 23 Melange Museum. Data collection methods used observation, interviews, documentation studies, student worksheets, questionnaires, and tests. Data analysis techniques used in this study were descriptive and scoring. The data obtained were measured using

an assessment rubric and a Likert scale, then processed using scoring.



**Figure 1.** Map of the Distribution of Geosites in the Karangsambung - Karangbolong Geopark

## RESULTS AND DISCUSSION

### *Outdoor study to study rock material in the Karangsambung-Karangbolong Geopark*

Outdoor study provides direct experience for students to be able to see and observe rocks and problems according to real conditions in the field. Through outdoor study students are able to actively participate in outdoor learning because the learning process is student-centered, making the teaching and learning process effective. Outdoor study can provide important experiences for students to be able to transform theoretical knowledge into practice by recording direct experiences as long-term memory. So that students are able to create solutions to solve problems they face in learning while in class. The implementation of outdoor study at the Karangsambung Karangbolong Geopark was carried out by 34 class XI students. Outdoor study activities require stages that must be arranged to ensure that learning activities are able to achieve competencies and activities run smoothly, the following are the steps of the activities carried out:

#### 1. Before Outdoor Study

The first stage of outdoor study implementation, conducted a curriculum analysis using the independent learning curriculum. Second, studied the layout of the place to learn the distribution of the Karangsambung -

Karangbolong Geopark geosite locations and analyzed which geosite location points were suitable and safe for the implementation of outdoor study with the determining indicators namely location, distance, accessibility. Third, determined the purpose of the field visit, namely outdoor study supports students' understanding and critical thinking skills regarding rock material. Fourth, conditioning students, researchers carried out 2 activities including: a). Informing the implementation of the outdoor study regarding which locations will be visited, there are 4 geosite points including KKG-5 serpentinite, KKG-10 Diabas G. Parang, KKG-11 Numulites Limestone and KKG-23 Melange Museum; b) Explained the purpose of the outdoor study and ensured student readiness by informing what necessary necessities must be brought.

Before the outdoor study took place, the researcher first created a systematic and thorough flow and guide for implementing the learning process in the field to ensure the activities ran smoothly. The learning process will run smoothly if the learning plan is well-structured (Novalita, 2014). In the outdoor study phase, students observed the geosite in small groups. Then, they recorded the data/information in student worksheets. The results of the student worksheet assessment in Table 1 show that through the outdoor study at the Karangsambung-Karangbolong Geopark, students were able to identify rock types, namely igneous, sedimentary, and metamorphic rocks very well.

## 2. During Outdoor Study

This stage begins with gathering in the class then the researcher gives a short briefing session and asks students to group according to the groups that have been formed. Next, students, teachers and researchers travel to the Karangsambung - Karangbolong Geopark. Upon arrival at the location, experts from the geopark provide directions on what locations will be visited and tell students to always maintain safety. Next, visit 4 geosite points, starting with KKG-5 Serpentinite, second KKG-10 Diabase Gunung Parang, third KKG-11 Numulites

Limestone and fourth KKG-23 Melange Museum. During the outdoor study at the Karangsambung - Karangbolong Geopark, students record data regarding rock material information (geosite) obtained during observations in a rock type identification table made by the researcher.

**Table 1.** Student Worksheet: Identifying Rock Types (Geosites) in the Karangsambung-Karangbolong Geopark

Interval Class	Frequency	Percentage (%)
13 – 25	0	0
26 – 38	0	0
39 – 51	14	41.18%
52 – 65	20	58.82%
Total	34	100%
Highest Score	65	
Lowest Score	45	
Average	54 (High)	

Table 1 shows that the assessment results of the worksheets of class X 1 students, namely 58.82% are included in the (high) category, while the other 41.18% are included in the (moderate) category. This shows that most students are able to achieve optimal scores in completing the student worksheets on rock material during the implementation of the outdoor study. The highest score obtained was 65, the lowest score was 45 and the average score for the student worksheets was 54 (high). Thus, students can be said to be able to work and fill in the rock type identification table on the sheet during the implementation of the outdoor study. The existence of a fairly wide range of scores 45–65, indicates differences in ability levels in each group. This is because students are divided into 3 groups during the outdoor study so that students work together to complete the student worksheets. Group 3 gets the highest score compared to groups 1 and 2, because based on the results of discussions and presentations, group 3 conveys complete and comprehensive data/information according to the points in the Karangsambung – Karangbolong Geopark rock identification table on the student worksheet.

Learning is considered an activity of conveying information from teachers to students during the learning process (Dakhi, 2022). Learning is a process that has been structured and regulated according to steps to achieve learning outcomes and objectives. Learning that utilizes the environment or nature as a learning medium can facilitate the process of conveying material or concepts to students, in this case, understanding is improved because the media used presents a basic overview of the material being studied (Susilawati & Sochiba, 2022). One form of environmental utilization in geography learning is conducting outdoor study of rock material (geosite) in the Karangsambung-Karangbolong Geopark.



**Figure 2.** Outdoor Study to study the rock material (Geosite) of the Karangsambung – Karangbolong Geopark in KKG-5 Serpentinit, Pucangan

### 3. After Outdoor Study

After the implementation of the outdoor study at this stage, the researcher held two meetings, namely the first meeting the researcher conducted reflection activities that included presentation activities and discussion activities. The purpose of the presentation was to train students' speaking skills to convey the information they obtained in front of other students. While the purpose of the discussion was to train students in making arguments, increasing insight, gaining better understanding, being able to solve problems, making decisions and training students' critical thinking skills. The presentation process was carried out by group representatives

who were represented by 2 or 3 students alternately. After completing the presentation, each group continued by opening a discussion session with 1 term with 2 questioners. After conducting the discussion and presentation activities, students filled out a questionnaire on the implementation of the outdoor study with the aim of seeing how students responded to the outdoor study using a digital book on rock material in the Karangsambung - Karangbolong Geopark.

**Table 2.** Student Response Questionnaire for Outdoor Study Implementation to Study Rock Material (Geosite) Karangsambung – Karangbolong Geopark

Interval Class	Amount	Percentage (%)
16 – 27	0	0
28 – 39	0	0
40 – 51	18	52.90%
52 – 62	16	47.10%
Total	34	100%
The highest score	62	
Lowest Value	40	
Average	51 (As per)	

The results of the calculation of Table 2 results of the student response questionnaire assessment regarding the implementation of outdoor study, as many as 52.90% are included in the (appropriate) category and 47.10% are included in the (very appropriate) category. The highest score achieved is 62, the lowest score is 40 and the average student score obtained is 51 (appropriate). Thus, this shows that outdoor study in the Karangsambung-Karangbolong Geopark can help students in identifying rock types in the field and students gave a good response regarding the implementation of outdoor study. The second meeting is working on comprehension questions in the form of 25 multiple choice questions and working on critical thinking ability essay questions according to the critical thinking skills indicator as many as 12 questions. Before students work on the questions, the researcher asks students to remember and

study all the material that has been obtained during observations in the field.

Assessment of student response questionnaires regarding the implementation of outdoor study to study rock material in Karangsambung - Karangbolong Geopark, namely 34 students gave a positive response marked by the average questionnaire score of 51 (appropriate). This means that grade XI students consider the implementation of outdoor study according to its intended purpose to study rocks in Karangsambung - Karangbolong Geopark which runs fun, not monotonous and helps students in observing rocks in real terms in the field. This is supported by the statement (Nugraha, et al. 2017) which says that learning by utilizing the environment can make students make direct observations which then creates a pleasant learning situation.

The role of outdoor study activities is important for student development because it provides students with direct experience and makes the subject matter more concrete and real, thus making the learning process more meaningful (Sujarwo, Samsi I, Wibawa L. 2018). In line with this statement in Edgar Dale's 1946 cone of experience theory (Ratnanto Agus, 2021), it states that doing real things is included in the category of active involvement and the memory absorption capacity obtained reaches 90%. When compared to abstract learning experiences, concrete (real) learning experiences have a greater impact on students' memory absorption capacity (Khasanah et al., 2024).

#### **Students' understanding and critical thinking skills in outdoor study to study rock material (geosite) in the Karangsambung - Karangbolong Geopark**

Outdoor study provides students with the opportunity to solve problems directly in the field. This is because outdoor study emphasizes real-world experiences by inviting students to conduct direct observations, allowing them to assimilate, adapt, and construct opinions and ideas gained in the field. This, in turn, stimulates understanding and critical thinking skills. This allows students to construct knowledge

independently and compare their understanding through their own ideas with the material presented by the teacher.

#### **1. Understanding**

Outdoor study learning at the Karangsambung-Karangbolong Geopark can support and facilitate students in understanding rock material and strengthen mastery of rock material concepts in the classroom so that students' understanding and critical thinking skills increase.

**Table 3.** Students' Understanding of Rock Material

Interval Class	Frequency	Presentation
0 – 6	0	0
7 – 12	4	11.76%
13 – 18	12	35.29%
19 – 25	18	52.94%
Total	34	100%
The highest score	25	
Lowest Value	12	
Average	18 (Medium)	

The calculation results in Table 3 show that the understanding scores of class X 1 students are more concentrated in the (high) category, which is 52.94%. This indicates that more than half of the students have achieved a high level of understanding. 35.29% achieved a (moderate) category, while 11.76% were in the (sufficient) category. Overall, the highest score for students was 25, the lowest score was 12, and the average score for students was 18 (moderate). This confirms that students' understanding of rock material is generally in the moderate category, indicating that the majority of students understand rock material after conducting outdoor study at the Karangsambung - Karangbolong Geopark.

Outdoor study can help students understand the rock material being studied. This is supported by the statement (Asmara, 2019) who said that students' understanding of the concepts of the material being studied will be strengthened through outdoor study. This is supported by Manni, et al. 2013, who said that

outdoor learning experiences can provide practical and cognitive, social and emotional experiences and can introduce students to continuing education (Remmen & Iversen, 2023). In addition, outdoor study can strengthen students' understanding of the concepts of the material being studied (Asmara, 2019). In other words, through outdoor study, students can make direct observations that have an impact on increasing their understanding of rock material.

## 2. Critical Thinking Skills

Critical thinking skills studied by researchers, using 6 indicators of critical thinking skills involved in the critical thinking process include interpretation (categorization, explaining meaning, clarifying meaning), analysis (checking ideas, identifying arguments, analyzing arguments), evaluation (arguments and assessing claims), inference (listing evidence, guessing alternatives, drawing conclusions), explanation (describing methods & results, justifying procedures, presenting arguments) and self-regulation (self-assessment & self-correction).

**Table 4.**Critical Thinking Skills on Rock Material

Critical Thinking Skills	Average	Category	Critical Thinking Skills
Interpretation	7	Tall	36 (Tall)
Analysis	5	Currently	
Evaluation	5	Currently	
Inference	6	Tall	
Explanation	5	Currently	
Self-Regulation	6	Tall	

Students are considered to have critical thinking skills if they are able to carry out 6 indicators of critical thinking skills, namely interpretation, analysis, evaluation, inference, explanation, and self-regulation in understanding rock material in detail and depth. The assessment

of critical thinking skills of grade XI students based on the first critical thinking skill indicator, interpretation, received an average score of 7 (high). This shows that the majority of students are able to interpret including clarifying meaning, categorizing and explaining meaning. The second indicator of critical thinking skills, namely analysis, obtained an average score of 5 (moderate), which means that the majority of students are able to analyze in identifying arguments, checking ideas, and analyzing arguments in rock material questions made by researchers. This is supported by the statement (Bayu Indra et al, 2022) which says that critical thinking is an organized process that involves mental such as decision making, analysis, problem solving, assumptions, and investigation.

The third indicator of critical thinking skills, namely the evaluation of class X, received an average score of 5 (moderate), which means that most students were able to conduct good evaluations, including assessing arguments and assessing claims in working on rock material questions made by researchers. This is supported by the statement (Widya W and Rini F, 2016) that one of the indicators of student learning success, namely critical thinking, is considered a cognitive process that can be used to identify, analyze, and evaluate. Meanwhile, the fourth indicator of critical thinking skills, inference, class X 1 students received an average score of 6 (high), which means that the majority of students have the ability to make inferences very well and show full mastery in listing evidence, guessing alternatives, and drawing conclusions. This is in line with the OECD statement, 2018, which says that critical thinking skills can train students' reasoning and argumentation in providing reasons to support the conclusions or assumptions obtained (Rosidin U, Kadaritna N, Hasnunidah N., 2019).

Critical thinking skills, the fifth indicator of explanation, in this indicator, class X 1 students get an average score of 5 (moderate) which means that most students are able to explain by describing methods & results, justifying procedures and presenting arguments well. In line with this, (Hasnunidah, Susilo, Irawati, &

Sutomo, 2015) said that critical thinking skills are influenced by various factors, one of which is the structure of thinking, namely the structure of thoughts expressed orally and in writing, which is called argumentation. This is what requires students to have adequate background knowledge, because providing arguments means thinking and in writing arguments requires complex skills that involve various aspects including cognitive aspects (Widyastuti S, 2018). Meanwhile, regarding critical thinking skills, the sixth indicator of self-regulation, the average score obtained by students is 6 (high) which means that class X 1 students are able to carry out self-regulation including self-assessment and self-correction on rock material very well.

Students have reasoning skills in integrating their knowledge, so they are able to analyze facts, create ideas, make comparisons and draw conclusions to be able to solve problems (Ghofur, et al. 2016). So students are said to have been able to develop critical thinking skills to solve problems of different interpretations through activities to explore problems, understand problems in context and express their opinions (Mujib, 2016). Through outdoor study with educational value is considered to be able to develop students' abilities as critical thinkers and be able to work as part of a team or group to solve problems (Larsen et al., 2016).

The outdoor study method demands a change in teaching practices where teachers are no longer in the central role but rather become learning facilitators through interaction with the environment making nature the main teaching material (Hendratno et al, 2024). Outdoor study also provides opportunities for students to be able to solve real-world problems that can improve students' problem-solving skills (Samsiyah et al., 2020; Zheng et al., 2021). In addition, students' thinking skills can be stimulated by outdoor study, this is because students are motivated to construct knowledge independently and students can compare their understanding with the material presented by the teacher (Paramita, et al. 2020). Outdoor study is considered an effective method to improve students' critical thinking skills at various levels of education (Winter et al.,

2019). Therefore, students' critical thinking skills increased after conducting outdoor study in studying the rock material (geosite) of the Karangsambung-Karangbolong Geopark. Meanwhile, the overall average value obtained by students related to the 6 indicators of critical thinking skills was 36 (high), which means that the critical thinking skills of class X students increased after carrying out outdoor study to study rock material in the Karangsambung - Karangbolong Geopark.

## CONCLUSION

Outdoor Study in studying rock material (geosite) Karangsambung - Karangbolong Geopark students obtained an average score of 54 (high) on the student worksheet, namely 58.82% (high) and 41.18% included in the (moderate) category. This means that students are able to identify various types of rocks including igneous, sedimentary and metamorphic rocks when conducting direct observations in the field. Students' positive responses that the outdoor study was fun and helped in understanding rock material were 52.90% included in the (appropriate) category and 47.10% included in the (very appropriate) category with an average questionnaire score of 51 (appropriate). Outdoor study to study rock material in Karangsambung-Karangbolong Geopark was able to support students' understanding, namely 52.94% (high) and 35.29% (moderate), while 11.76% included in the (sufficient) category with an average score obtained of 18 (moderate). Furthermore, the average value of students' critical thinking skills is 36 (high), marked by 50% of students included in the (high) category and the other 50% included in the (moderate) category. This shows that students are able to interpret, analyze, evaluate, infer, explain and self-regulate. Overall, the implementation of outdoor study to learn about rocks in the Karangsambung - Karangbolong Geopark is able to support the critical thinking skills of class X 1 students of SMA Negeri 1 Karangsambung.

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