
Fieldwork: Utilizing the Environment for Comprehensive Geography Learning

Daska Azis^{1*}, M Hafizul Furqan¹, Suhendro², Muhammad Al-Farisy¹, Ahmad Nubli Gadeng¹, Mirza Desfandi¹, Rizka Dewantara³, Cut Meurah Badriatun Nufus¹, Rahmilia Hadiyani⁴

¹Geography Education, Faculty of Teacher Training and Education, Universitas Syiah Kuala, Indonesia

²Geography Education, Faculty of Social Science Education, Universitas Pendidikan Indonesia, Indonesia

³SMAN 1 Sungai Lala, Indragiri Hulu, Riau, Indonesia

⁴Economic Education, Faculty of Teacher Training and Education, Universitas Syiah Kuala, Indonesia

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Corresponding Author

E-mail: daska@usk.ac.id

ABSTRACT

This study provides an overview of how the Field Trip learning method can be used in school geography by utilizing natural and artificial laboratories. Geography education includes various components, including the lithosphere, anthroposphere, hydrosphere, biosphere, and atmosphere. One effective method to enhance learning is to utilize the environment as a resource through fieldwork, where students engage in direct observation and investigation outside the classroom. The research method uses a qualitative approach with literature studies and bibliographic analysis. The findings show that natural and artificial environments can support fieldwork-based learning, including (1) studying the distribution of flora and fauna in urban forests, (2) understanding natural disasters through visits to the Tsunami Museum, (3) applying remote sensing techniques by exploring hilly landscapes, and (4) utilizing university laboratories for Geographic Information Systems. The fieldwork method encourages interactive learning between teachers and students and peer involvement, creating a fun yet focused learning experience. In addition, incorporating the environment as a learning resource enhances students' critical thinking, encourages active participation, and fosters a scientific mindset. Students gain deeper geographical insights through this approach while developing important analytical and observation skill.

INTRODUCTION

The change in education mode in the 21st century is where teachers and students will play an important role in learning activities. The role of teachers is not only as a transfer of knowledge or teachers are the only source of learning that can do anything (teacher center), but teachers as active mediators and facilitators to develop the active potential of students in themselves (Tambak et al., 2024; Thomas & Martina, 2022; Khoiri et al., 2023). Teachers' knowledge, skills, and experience are integrated into creating effective and

professional learning conditions that are more varied, meaningful, and enjoyable. Teachers, as one of the important components in learning, are expected to be able to manage interactive learning. This perspective has been changed with the constructivist learning approach (Furqan et al., 2017; Suhendro et al., 2020; Wannapiroon et al., 2021)

Geographical science is concerned with its ability to explain and analyze the diversity (spatial) of the earth's properties and phenomena related to its dynamics, both those caused by natural phenomena

and the results of interactions with humans and living creatures within it (As'ari et al., 2022). Geography is one of the subjects that teachers find challenging when implementing a constructive approach using various cooperative models. Geography studies the relationship between humans and the natural environment and how natural life affects humans and vice versa (Furqan et al., 2020).

As'ari et al. (2022) believe that an area's natural conditions greatly determine the nature, character, and lifestyle of those who occupy that area. While possibilism believes that nature only provides possibilities to be processed and utilized for human life, the human aspect determines changes in the earth's surface (Marfai, 2015; Santosa & Lutfi, 2014).

Geography bridges social and natural sciences (Sui, D. & Kedron, 2021; Putra et al., 2022). In Geography, phenomena ranging from the lithosphere, pedosphere, hydrosphere, and biosphere to the atmosphere are studied. Geography studies the earth physically, social phenomena, territoriality, and human interactions (Sulistiyanto, 2009; Marston & Himley, 2021). Physical geography studies study the phenomena of rocks, soil, landforms, climate, and water. In contrast, in social geography studies, there are phenomena of population, social interactions, economics, culture, and politics because geography is closely related to other sciences, causing the complexity of the material that must be studied (Hasan, 2021). It is a challenge for teachers to deliver material to make students think about expressing their ideas, not just receiving information from the teacher in the classroom.

Teachers must strive to make the teaching and learning process reflect two-way communication. Beavers (2009) states, "Teachers are required not only to be experts in their content area but are also expected to be fluent in child psychology, skilled in communication, execute brilliant classroom management strategies, and navigate the unrelenting gauntlet of educational politics."

Effective learning methods, including fieldwork, are needed to overcome this

challenge. Geography fieldwork can provide opportunities for learners to connect concepts with real-world experiences, making learning more active (Dale et al., 2020; García et al., 2022; Opoku et al., 2021). It is also beneficial for learners' cognitive and social development (Lambert & Reiss, 2016) and significant for critical thinking, problem-solving skills, and adaptability (Ito & Igano, 2021).

Field Work is a unit of practice of educational values and problem-solving activities planned by students and teachers through direct practice of real skills needed in the field of work. The project teaching method is carried out by designing the object being studied as a research-based study project in the laboratory. Fieldwork or fieldwork practicums accustom students to applying attitudes, knowledge, and skills in an integrated, useful, and practical way for everyday life (Muthoharoh, 2010).

In the fieldwork method, students can easily get to know and observe directly from close up the objects of the environmental situation that attract their attention and their relationship to school lessons. With environment-based fieldwork, students can gain in group life, organization, cooperation, and responsibility. The utilization of laboratories in geography is still minimally implemented by teachers. They stated that learning in the laboratory has been widely developed by researchers or teachers who teach science subjects. However, it is difficult to find studies on the development or utilization of natural laboratories for geography subjects that can support scientific learning, even though geography is also one of the subjects that requires a scientific approach to studying geosphere phenomena directly (Ikhsan & Haris, 2022; Kim, 2022).

As'ari et al. (2022), the teaching and learning process carried out in the field is a design of learning that aims for students to study the subject matter directly on the actual object; learning in the field will minimize misperceptions from the discussion of the subject matter carried out in the classroom. In addition, learning objectives related to skills should require a

direct learning process; strategies to achieve learning objectives also require a direct learning process.

Several alternatives can be used in the learning process at school. Research results (Dewantara, 2022; Furqan et al., 2017; Nufus, 2022) show that using the environment, both natural and artificial (laboratory) environments, plays a significant role in the learning process, where using the environment as a learning resource can reconstruct experiences through direct interaction.

As'ari et al. (2022) State's the learning process can be carried out anywhere, inside or outside the classroom (open space/field). The learning process outside the classroom (open space/field) can positively impact students' development, considering that the activities carried out can provide direct experience, making theories in the form of textbooks more concrete and real and making learning more meaningful.

In this study, we construct novelty by elaborating on learning between natural and artificial laboratories as fieldwork material. In previous studies, we have observed fieldwork trends, such as Exploring the opportunities of virtual fieldwork in teaching geography during covid-19 pandemic (Firomumwe, 2022), Pilot study using ArcGIS Online to enhance student's learning experience in fieldwork (Phantuwongraj, 2021); Learning in the wild: Fieldwork, gender, and the social construction of disciplinary culture (Posselt & Nuñez, 2022). Thus, we try to provide an

overview of how the field trip learning method can be used in Geography Learning at School by utilizing natural and artificial laboratories as an objective in this study.

RESEARCH METHODS

This study uses a qualitative approach with a descriptive method. This study attempts to explain the potential for utilizing the surrounding environment as a natural laboratory and an artificial laboratory that can be used as an alternative for teachers to explain material in comprehensive geography learning. Data collection techniques use literature studies, either primary or secondary, namely by collecting data by looking at various studies conducted by the author that have been applied and proven to improve student learning outcomes.

Data analysis uses bibliographic analysis, which is the activity of citing at least one similar document. Bibliographic analysis is carried out to search for, analyze, and make interpretations and generalizations of facts that are experts' opinions on a problem. Bibliographic analysis helps map the knowledge network, making it easier for researchers to understand the relationship between concepts and theories. In the analysis process, the geography curriculum at the high school / equivalent level was also reviewed to obtain information related to the scope of the material and to interpret how the environment can be a medium and source of learning according to the competencies in the material.

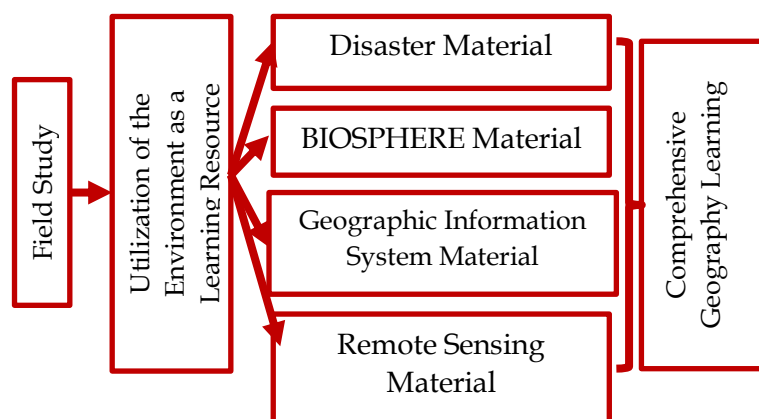


Figure 1. Research Thinking Framework (Source: Data Processing, 2025)

RESULTS AND DISCUSSION

Learning by using the environment as a learning medium means that students learn to gain knowledge by observing for themselves what is in the surrounding environment or can ask something they want to know to people in their environment who are considered to know about the problems they are facing so that they can train students to improve their thinking skills, learning activities, and foster their scientific attitudes. Teachers can invite students to get involved in lessons by including the environment and the child's daily life. Thus, what is explained by the teacher becomes concrete.

Using an environmental approach is a way to eliminate verbalism in students and apply scientific values manifested in the love of the environment and the willingness to protect it from damage. In addition, students are increasingly motivated to learn while enjoying nature's beauty and uniqueness (Uno & Mohamad, 2014). Saifullah (2008) conveyed another opinion: "The environment is everything around children that is material and therefore not personal, or associations that are not personal."

The environment is the family that raises and cares for children, the school where they educate, and the community where children socialize and play daily. The environment has a very important meaning. The fieldwork method is a teaching method that is carried out by inviting students to a certain place or object outside of school to study/investigate something, such as reviewing a shoe factory, a car repair shop, a department store, a farm, or plantation, a museum, and so on (Roestiyah, 2012). With this field trip method, students will be taken to compare what they have learned theoretically in the classroom with its practical use. Learning using the fieldwork/outdoor study method will provide students with a direct experience of learning not obtained in the classroom, as well as arouse students' interest and motivation toward science. Using outdoor study will activate students' various psychomotor senses, not only focusing on

the sense of sight and hearing like learning in the classroom.

Field study methods have several benefits besides increasing interest and motivation to learn. According to (Society, 2008):

1. Seeing geography and theories come to life: Improving your knowledge of geography and understanding.
2. Developing your skills: This will give you a chance to learn skills in data collection and analysis, map work, observational and investigative skills, computer and technology skills, communication, and mathematical skills.
3. Appreciating environments: giving you a chance to experience and enjoy a wide range of environments and landscapes
4. Opinions and views: It helps you to understand other peoples and cultures and your views about social, political, or environmental issues
5. Taking responsibility for your learning, gaining confidence, and developing your skills, such as leadership and teamwork
6. It is enjoyable

One of the concrete steps in the learning process that can improve students' competence in understanding disasters is to utilize the environment as a source of learning with the field trip/outdoor study method. The field trip method is a teaching method that is by the nature of geography; in utilizing mangrove forests as a learning resource in Langsa City, (Nufus, 2022), it mentioned that the fieldwork learning method of taking students to the Mangrove Forest can have a positive impact on student learning outcomes, where the fieldwork method is learning by utilizing the real environment so that students will get concrete experience, not just the theory in the book.

Aisyah and Hardjo (2022) argue that school geography education aims to help students master spatial, environmental, and regional patterns and other interconnected geographical processes. Students can also adapt to the environment and use natural resources wisely to develop a sense of

tolerance for natural resources and society (Herianto & Ali, 2020).

In addition, students get information from researchers and exchange ideas with group members as the main learning material. With this view, of course, students are not solely directed to find the correct answer, but how students can develop a concrete understanding of the material being taught so that they can improve student learning outcomes.

Mangrove forests or mangrove forests are one of the characteristics of the ecosystem found in Indonesia. This forest is located in a brackish water environment. This forest is a forest that is greatly influenced by the presence of sea tides. In this material, the characteristics of the Mangrove Forest will be discussed, namely: 1) lack of soil abrasion, 2) high soil salinity, 3) experiencing a cycle of inundation by sea tides, 4) types of plants that can live are unique because they have gone through a period of adaptation and evolution. In addition, this material is also required to explain the process of ecosystem formation, where the mangrove forest ecosystem is formed from several factors, namely soil

type, wave exposure, and inundation by water. The form of adaptation of mangrove forests and the function of mangrove forests both from an economic and ecological perspective.

After knowing the function of an ecosystem in basic competencies (KD) 3.2, class XI, students are also expected to be able to make efforts to preserve an ecosystem for sustainable survival. The descriptive statistical analysis results show that the average score of students taught through fieldwork is 80.2, and the average score taught in classroom learning using the discovery learning model is 64.6. The learning outcomes of the fieldwork method differ from those of the discovery learning model. The difference is that fieldwork learning provides a complete experience, and the result is that students understand concepts better; this aligns with the statement (Nusi, 2016), "The fieldwork method helps students get a concrete picture of the object (thing) being studied." In the fieldwork learning process, teachers (researchers) interact with students, resulting in fun but serious learning that is expected to achieve learning objectives.



Figure 2. Student observations of the mangrove ecosystem
(Source: Researcher Documentation, 2024).



Figure 3. Presentation of observation results by students
(Source: Researcher Documentation, 2024).

Utilization of the Aceh Tsunami Museum (MTA) as Disaster Learning Material

One of the materials integrated into geography learning is disaster material. Aceh is an area prone to disasters, and utilizing the Tsunami Museum can improve students' understanding of disasters. As stated (Furqan et al., 2017), there was an increase in students' understanding of disasters after utilizing the Aceh Tsunami Museum (MTA) as a learning resource, where before being given treatment (pretest), the average student score was 50.27. After being given treatment (posttest), the average score was 79.53, with a difference in the average pretest and posttest scores of 29.25. The average Gain score obtained was 0.59, a moderate category, and the average increase in scores experienced by students in the experimental class was 58.42%. The Aceh Tsunami Museum (MTA) was inaugurated by the President of the Republic of Indonesia, Mr. Susilo Bambang Yudhoyono, and officially opened to the public on May 8, 2011.

Rahmadhani (2014) stated, "MTA is the only Tsunami Museum in Asia that is considered very strategic and representative, besides the Kobe Earthquake Museum in Japan." The Aceh Tsunami Museum has various collections of tsunami

relics disaster media (geology) that can be a center for education, recreation, and evacuation as the purpose of its establishment, as stated by BRR, "the purpose of establishing the MTA is a scientific object, research, and learning about the tsunami disaster for the community," apart from its main purpose as a memory of the tragedy and tsunami earthquake. The Aceh Tsunami Museum (MTA) is the work of Indonesian architect Ridwan Kamil. The concept of the MTA design adopts local wisdom from the philosophy of Rumoh Aceh. The Aceh Tsunami Museum (MTA) was built specifically and specifically in the center of Banda Aceh, which is only ± 1 km from the Baiturahman Grand Mosque, Banda Aceh. (Rahmadhani, 2014) Stated that:

"Ridwan Kamil combines concepts in the life of the Acehnese people, starting from the concept of spirituality in various corners of the room, one of which is a prayer well above which is written the word Allah in Arabic. The aspect of harmony in the social and community life of the Acehnese people is manifested in the concept of an exterior that crosses resembling the Saman dance. Harmonization in the Saman movement creates a peaceful and safe atmosphere in the life of the Acehnese people".



Figure 4. Students conduct observations at the Aceh Tsunami Museum (MTA)
(Source: Researcher Documentation, 2024).

Adequate museum facilities can be used as supporting media in learning activities by teachers, especially in disaster understanding materials. The results of observations at the Aceh Tsunami Museum show that various facilities can be used to improve students' disaster understanding,

including 1) a Monitor memory hall, 2) a Simulation room, 3) a Miniature of the fault process, 4) a Monitor of the earthquake process, 5) Seismograph, 6) Miniature of the earth's inner layers, 7) Various disaster-themed posters, and there are still various other facilities that can be used.



Figure 5. Students listen to an explanation from a museum guide
(Source: Researcher Documentation, 2024).

Utilization of Geography Laboratory for GIS Material

The geographic information systems (GIS) material is in the basic competency 3.3 for grade XII SHS. This material continues the material for grade X SHS Competency 3.2, namely understanding the basics of mapping, remote sensing, and geographic information systems. In this material, there are two main learning materials, namely: (1) map interpretation and remote sensing image processing related to transportation networks and land use; (2) spatial analysis in geographic information systems (GIS) related to regional potential and environmental health. In this material, the learning objectives to be achieved are conceptual understanding and their application in everyday life so that practical learning (practicum) is needed, which is carried out in the laboratory. The limitations

of existing facilities and infrastructure in schools can be minimized by utilizing the laboratories available at the University. Utilizing the University laboratory allows students to try out the material and theories studied in the classroom directly.

As'ari et al. (2022) states that the laboratory is one of the facilities and infrastructure that must be available in an educational institution to support learning and research activities. Until now, the word "laboratory" has maintained its original meaning, namely "workplace," which is specifically for the needs of scientific research activities.

The laboratory has an important role in supporting the learning process. In the context of GIS education, laboratories equipped with advanced software and hardware facilitate the development of spatial thinking and data fluency.



Figure 6. Students listen to the teacher's explanation in the laboratory
(Source: Researcher Documentation, 2024).

After using the laboratory as a learning resource, student learning outcomes showed.

Better results than learning only in the classroom with conventional learning s(Dewantara, 2022). As'ari et al. (2022), the laboratory can also be said to be a place to conduct various experiments; the current reality can drive this that activities in the laboratory can be used as a place to 1) experiment as a continuation to prove the truth of theories obtained from learning in

class, 2) stimulate students through certain experiments in a guided manner, and 3) find out for themselves through experimental activities while increasing reasoning power. This definition explains the laboratory as a supporting facility in the learning process, which is theoretically studied in class and then proven in the laboratory as an experimental activity.



Figure 7. Teachers accompany students doing practical work
(Source: Researcher Documentation, 2024).

These results are also supported by the theory put forward by Edgar Dele (in Sadiman, 2014) that the learning experience obtained by students/learners will be different for each action or sense used in carrying out learning. According to Edgar Dele, when students whose learning experience is only reading, only 10% of the material will be remembered; if they listen to 20% of the material, if they see pictures/diagrams, videos/films, and demonstrations, they will remember 30% of the material, involved in discussions 50% of the material, presenting/presenting 70% and the highest is role-playing, doing simulations and doing real things reaching 90% of the material (Sadiman et al., 2014).

One significant benefit of utilizing laboratories in geography education is promoting active, inquiry-based learning. Engaging students in laboratory exercises fosters critical thinking and problem-solving skills, as they are required to formulate hypotheses, conduct experiments, and analyze data.

The role of laboratories in Higher Education in Education and Teaching includes the following three aspects: (a) helping the smooth running of the learning process or practicum, (b) helping students

and lecturers in organizing independent learning about various fields of science and skills through training activities, experiments, and practices or development of other scientific information/findings; (c) providing opportunities for students to develop soft skills by becoming part of the laboratory services in their campus environment (Zulaikha, 2015).

This approach has been shown to enhance conceptual understanding and scientific procedural knowledge. Studies have demonstrated that laboratory-based learning environments significantly improve students' grasp of geoscientific principles and methodologies (Nelson et al., 2010).

As'ari et al. (2022), practical learning activities in the laboratory will provide opportunities for students to 1) construct conceptual understanding, 2) foster process skills and affective attitudes of students, 3) foster motivation towards the subject matter being studied, 4) prove and find patterns of conceptual truth; 5) train psychomotor skills; 6) foster scientific attitudes; and 7) develop teamwork skills.

Geography is a science that supports life throughout life and encourages improving life (Allik, 2004). The geography

learning process needs to be related to skills and habits, in addition to understanding concepts (Hamidah & S. Palupi, 2012), stating that learning soft skills of responsibility and integrated discipline through practice has been able to improve and maintain responsible and disciplined (Aisyah dan Hardjo, 2022). Behavior and integrated soft skills learning have proven effective in increasing the mastery of responsibility and discipline (Nurdiana et al., 2020).

However, the effective integration of laboratories in geography and GIS education is not without challenges. Factors such as limited access to computer laboratories, high student-to-computer ratios, and insufficient GIS software resources can impede the successful implementation of laboratory-based learning. Addressing these obstacles requires institutional support, investment in infrastructure, and professional development opportunities for educators to enhance their GIS proficiency, laboratories are indispensable in advancing geography and GIS education. They provide immersive, hands-on learning experiences that bridge the gap between theory and practice, foster critical analytical skills, and prepare students to address real-world geographical and spatial challenges effectively (Mohashole, 2018).

Aisyah and Hardjo (2022) also note that the teacher gives students the freedom to explore ideas and respond to questions (Alfi et al., 2016). For example, the teacher shows a media map, and then the students respond with questions about how the world was formed and which part of Indonesia is on the continent.

Learning is carried out by utilizing the facilities available in the geography laboratory of the Faculty of Teacher Training and Education, Syiah Kuala University, in the form of computers equipped with ArcGIS software and equipped with various Shapefile (SHP) data that support the learning process of GIS material. Students are given student worksheets (LKPD) as a guide for implementing learning. Students learn directly the analyses that can be carried

out by GIS so that they clearly understand the use of GIS in everyday life.

Utilization of the Surrounding Environment for Remote Sensing Materials

High school geography teachers must be more creative, innovative, and technology-literate in designing learning. They must utilize the environment around students as a learning resource for all learning materials, especially remote sensing materials (Gadeng et al., 2022). Geography makes it possible to make nature a student learning laboratory. According to As'ari et al. (2022), a laboratory can be interpreted as a place to conduct observations, laboratory experiments, sample testing, data analysis, and/or practice certain knowledge and skills according to the theory obtained from classroom learning.

In this study, the natural environment is used as a geography laboratory. In line with the opinion of (As'ari et al., 2022), studying geography is about understanding the landscape and cultural landscape. Therefore, basic knowledge about the landscape reflects the competence of a geographer (Santosa & Lutfi, 2014). Geographical phenomena are often at the heart of topics and problems directly relevant to students' lives (Butzow, 2019; Waite et al., 2017). As'ari et al. (2022), my most prominent field guide activity is a sense of place duty. Direct experience of the landscape immerses us in its physical and human characters, spatial arrangements, environmental qualities, sights, sounds, textures, tastes, and aromas. As'ari et al. (2022), the experience of landscape immersion evokes various feelings and thoughts. Thoughts revolve around our conceptual framework. Feelings arise from our emotional states. Our experiences are a mixture of objective and subjective realities (Butzow, 2019).

When the natural environment is used as a geography laboratory or learning resource, teachers must utilize various learning models, learning methods, strategies, approaches, and appropriate learning media. Therefore, in teaching

geography to students, teachers should prefer a variety of approaches, strategies, and methods that are appropriate to the situation so that the planned learning objectives will be achieved (Alfi et al., 2016).

Teachers can use the field trip, field trip, outdoor study, and field observation. As'ari et al. (2022), the use of laboratories as a place of learning can be collaborated with the use of learning models based on student-centered learning, learning by doing, joyful learning, meaningful learning, and daily life problem-solving.

According to (Munandar et al., 2019), field study is a characteristic activity of geography because geography studies the reciprocal relationship between humans and their environment, including their natural environment. Understanding this requires field activities/work. The field is a geography laboratory where direct experience can be obtained about landscapes, places, and residents with their characteristics, and participants can learn to collect data and practice in the real environment (Munandar et al., 2019).

As'ari et al. (2022), the geography education field laboratory has a role: 1) helping the smooth running of the learning process or practicum of various courses that require practical applied studies; 2) helping to organize independent learning through practicum activities, experiments, exercises, or the development of other scientific information; 3) providing opportunities for students to develop their soft skills.

(Septaria & Dewanti, 2021) Students' learning experiences are activities that can be recorded by the brain and entered into long-term memory so that students do not easily forget cognitively and psychometrically about reducing the negative impacts of disasters.

The role and contribution of geography subject teachers are very much needed in order to deliver learning materials well; it is hoped that teachers can use various approaches, methods, models, and learning media that can arouse students' enthusiasm For learning so that they can actively Participate in the learning process (Gadeng et al., 2020).

In addition, learning models can provide opportunities for students to practice high-level thinking skills (critical and creative thinking) (Suarmika et al., 2022). Teachers play a very important role in the educational process (Nuryana et al., 2020; Tjabolo & Herwin, 2020), both in learning management (by preparing learning plans, choosing learning approaches and methods (Yunus et al., 2020), and effectively and efficiently influencing student learning outcomes (Suratmana et al., 2020) and forming students who have a religious character and master science and technology (Supadi et al., 2021).

Students need to get learning that can be experienced and implemented by students directly to improve their experience and skills so that students' learning achievements are expected to increase significantly (Handayani et al., 2020). State's that students' new knowledge is based on experience and knowledge before they receive certain treatments (Kilpatrick & Swafford, 2002). Special treatments can add new experiences and stimulate students' reasoning in analyzing a particular, which is a presented phenomenon.

Based on the research results of (Aisyah & Hardjo, 2022), students can interact with their geographical environment by studying geography to understand modern processes and problems better. The strongest open personality of MAN I Medan students is curiosity, which is an action that always tries to find out more deeply or more broadly from something that is learned, seen, and heard, so it is necessary to be given freedom by explaining the learning encyclopedia to develop and accommodate students' curiosity.

In geography subjects, much of the learning can be done in nature by utilizing the environment as a learning resource (Gadeng, 2022). For this reason, to become a qualified teacher, you must have social, personality, pedagogical, and professional competencies (Hinostroza et al., 2021; Kim, 2022; Narciss et al., 2020; Nouri et al., 2021; Toom et al., 2021; van Werven et al., 2023; Zaragoza et al., 2021).

Utilization of the environment as a learning resource for remote sensing material in geography subjects. Based on the results of a literature review, the same phenomenon occurs throughout Indonesia in the form of many teachers who have difficulty teaching remote sensing material to students, resulting in minimal student knowledge related to remote sensing material (Gadeng et al., 2022). Several innovations in learning remote sensing material: First, the traditional way consists of fieldwork/outdoor study and image interpretation projects. Second, the modern way is to use software and can use drones (Unmanned Aerial Vehicles/UAVs) (Gadeng et al., 2022).

There are several requirements that teachers must prepare before implementing

this remote sensing learning innovation, namely: 1) Teachers must first survey the closest environment to students, which has a minimum altitude of 50 MDPL, with the aim that the appearance of the surrounding environment can be observed directly by students. 2) Teachers must prepare a good observation guide for remote sensing learning materials so that the activities carried out by students in the field are focused and learning objectives can be achieved. Students and group members document the natural features around them from 50 meters above sea level using their respective camera devices. Next, students try to interpret the natural features in the aerial photos owned by the students.



Figure 8. Natural appearance seen from a height of 80 meters above sea level
(Source: Researcher Documentation, 2024).

As stated, artificial environments such as laboratories can be used in addition to the natural environment when learning remote sensing material (Gadeng et al., 2022).

"The modern method of using software in practicums has challenges in the availability of adequate software and hardware for image processing. Generally, image processing

software has standard hardware specifications that the software can install. If the implementation uses a school laboratory, it is better to check whether the available computer is adequate. The modern method with practicums using drones, in addition, also requires software and hardware to process the results of recordings by drones".

Based on the explanation above, another modern way that can be used in utilizing the environment as a learning resource for remote sensing material is with the teacher's ability to fly drones in safe locations and not violate the Regulation of the Minister of Transportation of the Republic of Indonesia Number PM 37 of 2020 concerning the Operation of Unmanned Aircraft in Airspace Served by Indonesia. This is because drones cannot be flown in certain locations that are prohibited according to government regulations, as they can endanger national security stability and disrupt commercial aircraft traffic (Gadeng et al., 2022). After the teacher gets aerial photos using drones, the next step that can be taken is to ask students to interpret the natural features in the aerial photos.

Suciani et al. (2021) argues that teachers' limited ability to develop IT-based media is due to the lack of facilities in schools and competency training. Although there is no special technology training for teachers, teachers can become self-taught through online training. Self-development independently requires a solid and stable internet signal, which is not found in the area where they live or even at school.

Teachers utilizing the environment as a learning resource in remote sensing material means that geography subject teachers have implemented the constructivism learning theory well. Gadeng (2022) learns from experiences that occur in life and are found in the environment and are used as knowledge; in constructivism theory, the environment can be used as a source for student learning to gain knowledge. It can be related to constructivism, a theory based on the attitude that knowledge comes from students' interactions in the real world with socio-cultural contexts (Larasati, 2017). Rusman (2017) believes that the learning environment should (Rusman, 2017).

- 1) The learning environment can involve students in various authentic disciplinary activities in which they can learn.
- 2) The learning environment provides cooperation and opportunities for

students to offer their perspectives on the material they are studying.

- 3) The learning environment can help learners determine their goals and coordinate student learning.
- 4) The learning environment can provide learner support for reflections on what will be learned and how to learn it.

High school geography teachers must be more creative, innovative, and technology-literate in designing learning. They must utilize the environment around students as a learning resource for all learning materials, especially remote sensing materials (Gadeng et al., 2022).

As'ari et al. (2022) states that state laboratories in education and learning function as learning activities, training, or practicum for students. In addition, laboratories can also function as a place to develop student interests properly. Laboratories can also function to overcome problems that arise in learning. The investigation and practicum in the laboratory can add to the learning experience for students, make time more efficient, and improve the professionalism of educators.

Students learning experiences are activities that can be recorded by the brain and entered into long-term memory, so students do not easily forget cognitively and psychometrically about reducing the negative impacts of disasters (Septaria & Dewanti, 2021).

The results of a (Suciani et al., 2021) study conducted at the Geography MGMP of Senior High Schools in Langsa City and East Aceh Regency, which involved 27 teachers, show that teachers have the same difficulties in developing geography learning media, namely the lack of skills in utilizing IT technology. In fact, teachers are very aware that interactive media will present material or information that students want. Therefore, teachers must be able to develop interactive multimedia for their students.

In addition, fieldwork facilitates the development of important skills such as data collection, analysis, and interpretation in a

real-world context. Direct engagement with the environment allows students to observe and analyze geographic phenomena firsthand, deepening their understanding and retention of the subject matter. This experiential learning approach is particularly effective in illustrating complex geographic processes and fostering a deeper connection to the environment (Casinader & Kidman, 2018).

CONCLUSION

Geography is a subject that has material objects in the form of physical and social aspects and the impact of these phenomena with a spatial perspective (formal object). Then, teachers can utilize the surrounding environment as a learning resource. Fieldwork is important in geography education by providing students with experiential learning opportunities that bridge theoretical knowledge with real-world applications. Utilizing the environment as a natural or artificial laboratory with the fieldwork method can train students to improve their critical thinking, observation, and analytical skills, improve understanding, and foster their scientific attitudes toward comprehensive geography learning. Research consistently shows that field-based learning fosters deeper understanding, increases environmental awareness, and encourages active student participation. In addition, integrating fieldwork into the geography curriculum helps foster a sense of responsibility for sustainability and equips students with practical skills to address contemporary environmental challenges. As education continues to evolve, fieldwork remains an important pedagogical tool for fostering comprehensive geography learning and preparing students to navigate the complexities of the world around them.

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