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Sekotong Tengah Mangrove as a Geography Learning Resource: An Analysis of Phenomena and Learning Implementation

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ABSTRACT

Geography learning faces a gap between classroom theory and field activities, resulting in a lack of development of students' spatial analysis skills. Context-centered learning in real environments, such as mangrove forests, offers a solution to this problem. This study aims to (1) identify and analyze the physical and social geographical phenomena within the Sekotong Tengah Mangrove area, and (2) analyze the practical implementation of this area as a geography learning resource. This study employed a descriptive qualitative approach with a case study design. The subjects were three students from the Madrasah Aliyah Negeri 2 Mataram Geography Olympiad Team. Data for phenomena (objective 1) were collected through field observation, documentation, and literature review. Data for implementation (objective 2) were gathered via participant-observation, with the researcher as a facilitator. The results confirm that the Sekotong Tengah Mangrove is a comprehensive "geosystem microcosm". (1) Identified physical phenomena include the geological Pengulung Formation (Tomp), geomorphological alluvial plains (F.1), surrounded by steep hills (D-series), and associated multi-hazards (landslides, floods, and abrasion). Identified social phenomena include dynamic resource use (ecotourism and aquaculture) and community-based conservation (Pokdarwis). (2) The practical implementation proved effective in shifting students from passive receivers to critical observers. The most significant skill honed was synthesis, demonstrated by students' ability to connect field observations (e.g., landslides) with the abstract data (e.g., geology and geomorphology maps). The Sekotong Tengah Mangrove functions as a "geosystem microcosm" with physical and social phenomena, bridging the gap between theory and practice by improving students' spatial synthesis skills.

A. INTRODUCTION

Geography learning faces gaps and challenges between theoretical material in the classroom and phenomena in the field. The geography learning process tends to focus on theory and memorization from textbooks. This results in students' understanding tending to be low and disconnected from the real environmental context around them (Khalidy et al., 2025). Students may explain theories or memorized facts about the mangrove environment, but have difficulty explaining them when conducting field studies directly (Wu et al., 2023). This condition is not in line with Geography, which is a science oriented towards observation and spatial analysis (Khalidy et al., 2025). Geography skills, such as field observation and spatial analysis, are not optimally developed.

Geography skills can be improved through a shift in the learning paradigm, from text-centered to context-centered. A relevant conceptual solution is to utilize the real environment as a "source of geography learning". This approach is often referred to as place-based education, which changes the learning process method (Korson, 2023). Students are not only passive recipients of teachers, but also observers who identify geographical phenomena in the field. Students are indirectly required to observe, ask questions, record data, and analyze phenomena directly (Eaton et al., 2025). This process bridges the gap between theory and practice, and addressing the urgent need for 21st-century skills. By engaging directly with the environment, students develop critical thinking and complex problem-solving abilities, competencies that are difficult to facilitate through traditional classroom learning (Almulla, 2023).

The selection of learning resources that are appropriate for the study of geographical phenomena is important for the practical learning process to be effective, one of which is the mangrove ecosystem. Mangroves are an ideal environment because they are an intertidal zone or a place where physical phenomena occur, such as geomorphological processes (sedimentation or abrasion), hydrology (tidal ebb and flow), and biogeography (vegetation zoning). In addition, mangrove areas are also the site of interactions between anthropogenic phenomena, such as resource utilization and ecotourism activities (Putra et al., 2025). One location that is representative of these physical and social phenomena is the Sekotong Tengah Mangrove area.

The Sekotong Tengah Mangrove is located in West Lombok Regency, West Nusa Tenggara, and is a microcosm for geography learning. This area provides physical and social learning resources that are easily accessible to students (Japa et al., 2024). Physically, students can directly observe geomorphological processes, such as differences in sedimentation zones at river mouths and the effects of abrasion. In addition, mangrove vegetation provides a study of biogeography, namely adaptation to salinity and tidal fluctuations (B et al., 2021). Furthermore, this area demonstrates the dynamics of human-environment interactions, particularly the development of ecotourism (B et al., 2023). Students can analyze spatial issues, such as land use change and conservation efforts in this area.

Previous studies have shown that mangrove areas have a positive impact on various aspects of students' lives. Research by Prastiyono et al. (2023) shows that Wonorejo Mangrove has the potential as a source of geography learning that can enhance students' creativity through the "one student, one tree" movement, barcode education, and mangrove chocolate. Another study by Wicaksono et al. (2023) shows the potential of the Tuban Mangrove Center as a source of geography learning, particularly in ecological studies. Additionally, research by Musyawarah (2024) shows that the Lantebung Mangrove area is a subject of study in fieldwork-based geography learning due to its biodiversity and local community activities.

Based on preliminary studies, the Sekotong Tengah Mangrove area has high educational value. This potential confirms the area as a functional field learning resource, not just as a tourist destination to enjoy the coastal area. Research on Sekotong Tengah Mangrove focuses on mangrove composition (Martha et al., 2025), ecotourism (B et al., 2023; B et al., 2021), and education for elementary schools (B et al., 2021). However, these studies tend to be monodisciplinary and limited to basic educational levels. The novelty of this research lies in its comprehensive approach, treating the mangrove area as a "geosystem microcosm" that integrates both physical and social phenomena. Unlike previous studies, this research targets higher-level geography education (Senior High School) to analyze how complex field realities can be synthesized to enhance students' spatial thinking skills.

This shows that there is a gap in the utilization of educational potential and studies on implementation in field geography learning. Consequently, based on the identified gap and urgency, this study aims to (1) identify and analyze the geographical phenomena, both physical and social, within the Sekotong Tengah Mangrove area, and (2) analyze the practical implementation of this area as a geography learning resource in the study of mangrove ecosystems.

B. METHODS

This study utilized a descriptive qualitative approach with a case study design to deeply investigate the field learning process within a bounded system. The research was centered in the Sekotong Tengah Mangrove area, geographically located at 8°45'50"S 116°02'48"E in West Lombok Regency, West Nusa Tenggara (Figure 1). This location was purposively selected not only for its accessibility but also for its representation of complex physical and social phenomena suitable for geography learning. The research procedure followed a systematic flow as illustrated in Figure 2, starting from problem identification and curriculum analysis, proceeding to field execution, and concluding with the synthesis of findings.

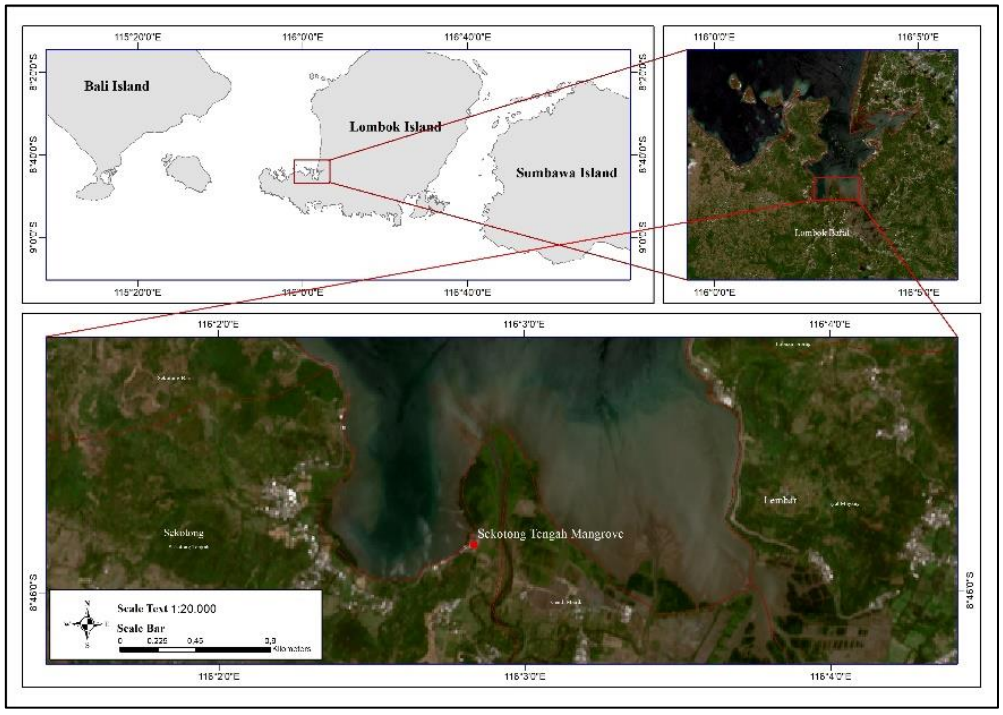

Figure 1. Map of the Sekotong Tengah Mangrove Area

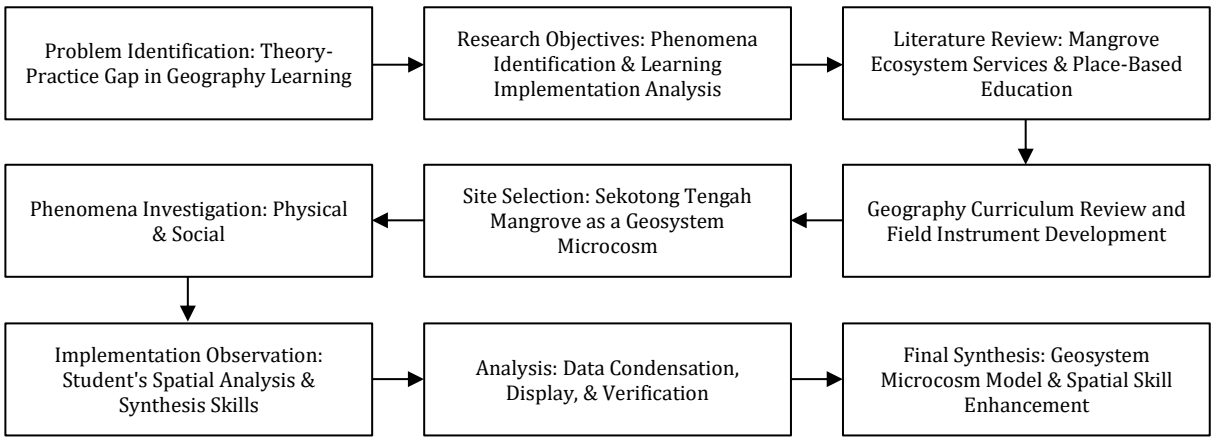

Figure 2. Research Flow

The research subjects were selected through purposive sampling, consisting of three students from the Geography Olympiad Team of Madrasah Aliyah Negeri 2 Mataram. These subjects were chosen as they represent high-ability learners capable of conducting advanced spatial analysis in the field. In this context, the researcher acted as the key instrument and a participant-observer. The researcher's role was dual, serving as a learning facilitator to guide the field exploration and simultaneously as an observer documenting the students' learning implementation and skill development processes.

Data collection involved triangulation of primary and secondary sources. Primary data were gathered through three techniques: (1) Field observation to identify specific physical (geology, geomorphology) and social phenomena; (2) Participant observation to record students' interactions, critical questions, and spatial synthesis skills during the fieldwork; and (3) Documentation of field activities and findings. Secondary data from credible journals were used to support the theoretical framework. The collected data were analyzed using the interactive model by Miles, Huberman, and Saldana. This process involved data condensation (selecting and focusing on key field notes), data display (organizing findings into structured matrices and narratives), and conclusion drawing (verifying findings against the research objectives).

C. RESULT AND DISCUSSION

1. Geographical Phenomena in the Sekotong Tengah Mangrove as a Source of Geography Learning

Based on field observations, the geographical phenomena found include physical aspects and social aspects. The geographical phenomena are summarized in Table 1 as follows.

Table 1. Geographical Phenomena in the Sekotong Tengah Mangrove as a Learning Resource

Aspect of Study	Category of Phenomenon	Findings	Potential as a Learning Resource
Physical	Geology	Lithology	Identify rocks
		The constituent rocks	Endogenous forces
			Understand karst landforms
	Geomorphology	Alluvial plains (F1)	The relationship between landforms and land use
		Surrounded by hills	The watershed system (DAS)
	Disasters	Mass movement	Landslide risk factors
		Flood risk	Flood risk factors
		Abrasion and wave energy risk	The role of mangroves in disaster mitigation
	Hydrology	Intertidal zone	The Concept of tidal dynamics
		Estuarine zone	The concepts of estuaries and salinity
		River flow	The abiotic factors that control biogeography
	Climatology	Macroclimate	Linking macroclimate as a triggering factor for landslides and floods
		Microclimate	Case study of local wind circulation
			The concept of differential heating as a cause of sea breezes
	Biogeography	Flora	The morphological adaptation of mangroves to hydrological factors
		Zonation	The concept of ecosystem zonation
		Fauna	The concepts of food chains and habitats
Social	Dynamics of resource utilization	Ecotourism	Tourism geography
		Fisheries and aquaculture	The multiple-use of ecotourism and aquaculture areas
		Settlements	Settlement spatial patterns
	Conservation and sustainable development	Community-led conservation	The concept of sustainable development
		Tourism awareness groups (pokdarwis)	The case studies of community-based management in environmental conservation

a. Physical aspects

1) Geology

Geological studies in the Sekotong Tengah Mangrove Area focus on identifying the constituent rocks (lithology) of the steep hills surrounding the mangrove alluvial plain. Based on field observations and analysis of regional geological maps, this area is part of the Pengulung Formation (Tomp). This code indicates rocks dating from the Tertiary (T), Oligocene (O) to early Miocene (M) periods, with "P" referring to the name of the formation (Pengulung). This formation consists of breccia, lava, and tuff with limestone lenses containing sulfide minerals and quartz veins. These rocks are related and correlated with volcanic rocks and sedimentary rocks (Figure 3). This indicates differences in processes based on rock type, namely volcanic and tectonic. This series of geological phenomena has potential as a source of learning for geography, including: (1)

Introduction and identification of rocks, (2) Understanding the concept of volcanism (3) Geological processes, namely uplift and karstification.

Figure 3. Rock outcrops in the mangrove area

2) Geomorphology

Geomorphological studies show that the Sekotong Tengah Mangrove grows and develops on an alluvial plain (F.1), with very flat topography that is used by humans for settlements, rice fields, and other activities. Based on the geomorphology map, this area is surrounded by steep hills, namely: (1) Irregular hills (D.1) on the west side, (2) residual hills (D.2) on the north side, (3) debris slopes (D.5) on the east side, and (4) degraded land (D.6) on the south side. The results of this study have the potential to be used as a source of learning for geography, namely: (1) Analyzing the relationship between landform and land use, (2) Understanding the watershed system, and (3) Analyze the relationship between geology and geomorphology.

3) Disasters

The study of disasters in the location is an interaction between geology and geomorphology, with real risks in the field. Based on the results of the analysis, the Sekotong Tengah Mangrove area was identified as having multiple hazards, focusing on landslides, floods, and coastal abrasion. The analysis of each risk is described as follows: (1) Landslide risk, (2) Flood risk, and (3) abrasion and wave risk.

4) Hydrology

A hydrological study of the Sekotong Tengah Mangrove explains the characteristics of the waters that form the mangrove habitat. The hydrological phenomenon at this location is the intertidal zone, which is an area directly affected by tidal dynamics. This can be observed from the mudflats at low tide, which are flooded at high tide (Figure 4). This series of phenomena has the potential to be a source of learning, including: (1) Understanding coastal concepts (tides and salinity), (2) Explain the abiotic factors that control biogeography, and (3) Connect geomorphological aspects.

Figure 4. Mudflats (alluvial deposits) at low tide

5) Climatology

The climatological study of the Sekotong Tengah Mangrove Area covers two scales, namely macro (regional) and micro (local). In terms of macroclimate, the Sekotong region, like Lombok in general, is influenced by a tropical monsoon climate (type Am or Aw according to Koppen). In terms of microclimate, a phenomenon that can be observed directly in the field is the sea breeze that occurs in the morning or afternoon. This wind moves from the sea towards the land, as evidenced by the direction of the flag at the location. The temperature difference creates a difference in air pressure (low on land and high at sea), causing air (wind) to move from the sea to the land.

6) Biogeography

Biogeography is the analysis of physical phenomena, explaining the response of living things (biosphere) to the abiotic conditions discussed earlier. Field observations clearly identified biogeographical phenomena (Figure 5). This series of findings is a source of geography learning for students, namely: (1) Analyzing morphological adaptations, and (2) Understanding the concepts of food chains and habitats.

Figure 5. Some of the fauna identified as being used by humans are

b. Social Study Aspects

1) Dynamics of resource utilization

A significant anthropic phenomenon is the utilization of the area for three activities, namely ecotourism, fishing or aquaculture, and settlement. (1) Ecotourism, that can be seen from the supporting infrastructure, such as wooden bridges (tracking) that jut into the mangrove forest, gazebos for resting, gateways marking the area, and photo spots (Figure 6). (2) Fisheries and aquaculture, observations in the bay waters show the presence of floating net cages (KJA) used by the community for fish farming. (3) Settlements, that support the findings of the geomorphological study, the relationship between landform and land use and analyzed the spatial pattern of settlements concentrated in flat zones that are prone to flooding.

Figure 6. Ecotourism supporting facilities

2) Conservation and Sustainable Development

In addition to resource utilization, another identified anthropogenic phenomenon is the conservation and rehabilitation of mangrove ecosystems. These activities are coordinated by local institutions, namely the tourism awareness group (Pokdarwis), which also manages ecotourism activities. These findings serve as a source of field learning in geography for students, namely: (1) Analyzing the concept of sustainable development, and (2) Case studies of community-based management.

2. Practical Implementation of Sekotong Tengah Mangroves as a Source of Geography Learning

The implementation process of this learning was summarized into four stages, as shown in Table 2 below.

Table 2. Stages of Field Learning Implementation in Sekotong Tengah Mangrove

Stage of Activity	Teacher Activities	Student Activities	Skills Developed
Preparation and briefing	Explaining learning objectives	Listening to learning objectives	Critical thinking (understanding the context of the location and issues)
	Providing initial context (geological, geomorphological data, etc.)	Listening, asking questions, and understanding the context of the phenomenon	
	Providing directions and focus of observation	Preparing tools (notebooks, cameras, smartphones, etc.)	
Field observation and data collection	Guiding students along the tracking route	Conducting direct observation of physical and social phenomena	Observation skills, data recording, and spatial skills
	Acting as a facilitator by asking provocative questions	Interacting with the environment	
	Observing and recording student interaction processes	Recording findings in the field	
		Documenting the phenomena found	
Discussion and analysis on site	Facilitating discussion on site directly	Presenting initial findings	Analytical thinking, synthesis, verbal communication, and problem solving
	Encouraging students to connect findings	Asking critical questions	
		Verbally analyzing and connecting phenomena	
Reflection and final conclusions	Guiding closing discussions	Reflecting on findings	Metacognitive skills
	Providing confirmation or clarification of student findings and analyses	Summarizing answers to observation objectives	
	Recording student reflections	Identifying new understanding gained	

a. Findings from Observation of the Learning Process

Significant interactions were observed when confronted with physical findings (geosphere). The researcher explained geology and geomorphology, and students actively observed the rocks on the cliffs and rock outcrops near the beach. Participatory observation noted that students did not touch the rocks directly, which was visual-analytical in nature due to limited access. Students demonstrated conceptual understanding when linking geomorphology with hydrology. Students identified that mangroves grow in fine mud, not coarse sand, and linked this to sediment or deposits originating from river flows.

In terms of the social-anthroposphere, the analysis was quick and responsive. Students saw various ecotourism facilities, such as wooden bridges and gazebos, and linked them to the concept of tourism geography. Students also saw cultivation activities and linked them to the concepts of dual use and conservation. In addition, several local people were seen catching fish with guns when the mangrove waters receded. These results became a discussion about resource utilization and function as a direct resource for the local community.

b. Analysis of Refined Skills and Difficulties Encountered

Based on the analysis of findings and participatory observations, the implementation of this field study successfully honed several higher-order thinking skills (HOTS) in students. The significant skill that was honed was synthesis, which is the ability to connect several different geosphere variables to explain a phenomenon. However, observations also identified several difficulties and challenges in implementation. These difficulties were physical in nature, namely limited access. As observed, students were unable to identify lithology (rocks) directly due to the absence of tracking paths to descend to the coastal rock formations. Another challenge is map data abstraction, namely that students need guidance to connect the abstract codes on the map with the actual landscape seen directly.

D. CONCLUSION AND SUGGESTIONS

Based on the results of research and discussion, it is concluded that the Sekotong Tengah Mangrove serves as a comprehensive “geosystem microcosm”. This area effectively integrates physical phenomena (geology, geomorphology, hydrology) and social-anthroposphere phenomena (ecotourism, aquaculture) into a unified learning resource. Furthermore, the practical implementation with the Geography Olympiad Team demonstrated that field-based learning in this area is effective in bridging the gap between classroom theory and field reality. Specifically, it significantly honed students' high-level geographical skills, most notably the spatial synthesis ability to connect abstract map data with actual landscape features. Consequently, this study emphasizes the necessity of shifting the geography learning paradigm from text-centered to context-centered. For future researchers, it is recommended to employ broader subjects or quasi-experimental designs to quantitatively measure the improvement in students' spatial understanding, complementing this qualitative case study.

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CONFLICT OF INTEREST

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