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Fieldwork Implementation in Sendang Biru Karst Area of Malang Regency: A Technical and Operational Review

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Abstract. Teaching and learning activities cannot only be done in a closed space classroom, but also can be done in an opened space or outside the classroom by doing a fieldwork study. Fieldwork study can practically give an understanding of the field condition of the environment. The aim of this study is to figure out the technical and operational aspects of fieldwork implementation in Sendang Biru karst area. This study is a kind of descriptive qualitative research with literature study approach. The subjects of this study are the students who do a fieldwork study in the study area. The objects of this study area the environment situation and condition, as well as the social and culture in the fieldwork area and around Sendang Biru Karst area. The operational aspects review by identifying the needs and the supply of natural resources. The results of the study show the karst landscape condition has unique characteristics hat can be used as a fieldwork study area. The technical aspects show a study of feasibility of the study area that can be used as spots that can be learned. The operational aspects have the things that allow a fieldwork study in Sendang Biru Karst area.

Keywords. Technical Aspect, Operational Aspect, Fieldwork, Karst

1. Introduction

Classroom studies are commonly used by the teachers in teaching and learning activities. Many kinds of interactive activities and interesting methods and strategy are used to bring an innovation for the students/ learners. Teachers have many kinds of methods to deliver the study materials, the use of the methods is to aim the lesson to be achieved [1]. Instead of a closed space classroom, opened space or outside classroom can also be used for learning activities [2]. Outside classroom study can be in the form of outdoor study [3], a study tour, fieldwork [2], and others. Learning can be optimized with ecological participatory learning method in mangrove forest eco-tourism [4].

Learning outside the classroom can be done to provide in-dept discussion of the topics that have been given in the classroom. It can also allow the students to practice with the tools or equipment that will be used in achieving learning objects. Learning outside the classroom also provides in-depth experience in learning activities [5]. Fieldwork study is an outside

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classroom study, which provides learning experiences such as collecting field data, practicing the use of tools and having new knowledge [2]. The examples of learning outside the classroom are about the migrationand demography, about the correlation between population and environment [6].

Fieldwork study is a form of contextual learning that brings students into a real environment to observe, analyze, and directly experience the object of the study according to the field of science being studied [7]. In the context of education, fieldwork study plays an important role in connecting theory and practice. In the implementation of fieldwork study, technical and operational aspects are very important to be considered. This technical aspect refers to all preparations and equipment that support the fieldwork study activities. Some of these technical aspects include choosing a location that is relevant to the learning objectives and the exact time which is very important to make sur the activities run optimally [8], the use of equipment such as questionnaires, interview guidelines, and observation sheets must be adjusted to the objectives of fields research [9], tools such as cameras, GPS, and digital maps help in the documentation and mapping of field data [10], health and safety procedures which include readiness to face the risks, insurance and first aid.

Operational aspects in fieldwork study include practical and systematic implementation mechanisms. This can be done in the form of providing students with supplies that include explanations of objectives, methods, and ethics in implementing learning process [11]. Grouping students according to topics or work areas for effective data collection [12]. In addition, aspects of monitoring and providing direction during learning activities, and evaluating fieldwork study by reflecting and presenting the results of fieldwork study. These technical and operational aspects are very important to see the success of fieldwork study.

Sendang Biru Karst is an area that can be used in outside classroom study. Fieldwork in Sendang Biru karst has learning characteristics related to the environment, social, and culture. Scientific studies have been conducted in the Sendang Biru Karst area and its surroundings, making it possible to increase students' insight with the latest studies on these conditions. The Sendang Biru Karst area and its surroundings can be seen in **Figure 1**, located in two villages, Tambakrejo Village and Sitiarjo Village. The implementation of fieldwork study certainly requires technical and operational aspects to facilitate planning, implementation, until the end of fieldwork study. The implementation of fieldwork study is not only between educators and students but also involves various aspects and relationships with other parties in the study area. It is different from previous studies that explain the implementation of fieldwork [13]. From the description of the background and formulation of the problem, the purpose of this study is to focus on the technical and operational aspects in the fieldwork implementation in Sendang Biru karst area of Malang Regency.

2. Methods

This research is a qualitative descriptive study with a literature study approach. The subjects of the study are students who do fieldwork in the study area. The objects of the study are the environmental, social and cultural situations and conditions in Sendang Biru karst area and its surroundings which are used for fieldwork studies. The technical aspects in this study are by conducting a survey in the study area to see the conditions of the study spots and themes that allow for fieldwork learning. Operational aspects in the implementation of fieldwork by identifying the needs and availability of existing resources.

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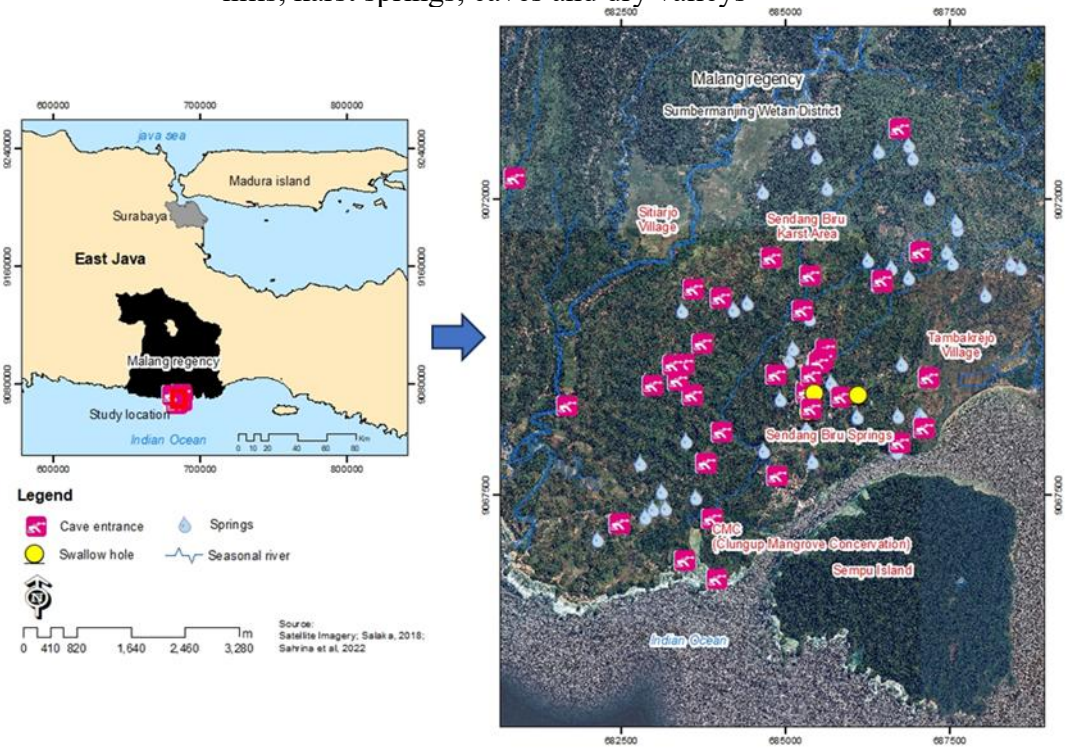
Figure 1. Fieldwork Study area that has karst landscape features with the formation of karst hills, karst springs, caves and dry valleys



3. Hasil dan Pembahasan

3.1 The Condition of Karst Environment

Based on the preliminary survey, it is found that karst is a landscape found in Malang Regency. This area is part of Southern area of Java island that forms Southern mountains of Java [14]. Sendang Biru block karst is separated from Donomulyo Regency block karst, Bantur block karst and Gedangan block karst, but has the same physiographic landscape of cave passages, springs, karst hills in Donomulyo, Bantur and Gedangan [15], [16], [17]. Sendang Biru karst landscape has hills topography [18] in the upstream part and there is a cliff that separated it from Sitiarjo Village. In the South, it becomes a gentle plain that is mostly occupied by the people. In the North under the karst cliff, many spring emerge [2], on the other hand the South, there are many springs and karst [18]. Caves also develop in theis area, span in this area from North to South. The surface conditions, caves, subterranean rivers and karst springs are interconnected to form a unique hydrological system in this karst area [19]. Sendang Biru spring, whose water resources are utilized by the surrounding community, is connected to various karst features, which later form a surface and subsurface flow system. The existence of a connection between these karst features indicates that the karst area is an area that is different from other areas.

3.2 Technical Aspects in Karst Areas Fieldwork Study

Technical aspects in fieldwork implementing by looking at the feasibility of the location that will be used as a study location outside the classroom. A feasibility study is carried out by conducting a preliminary survey regarding the conditions at the study location. Aspects in this feasibility study include content in the spot area, road access to study spots, accommodation (rest area, food and drink tenants, and prayer/worship places). **Figure 2** is a preliminary survey activity by checking several spots that will be visited for fieldwork using a smartphone.

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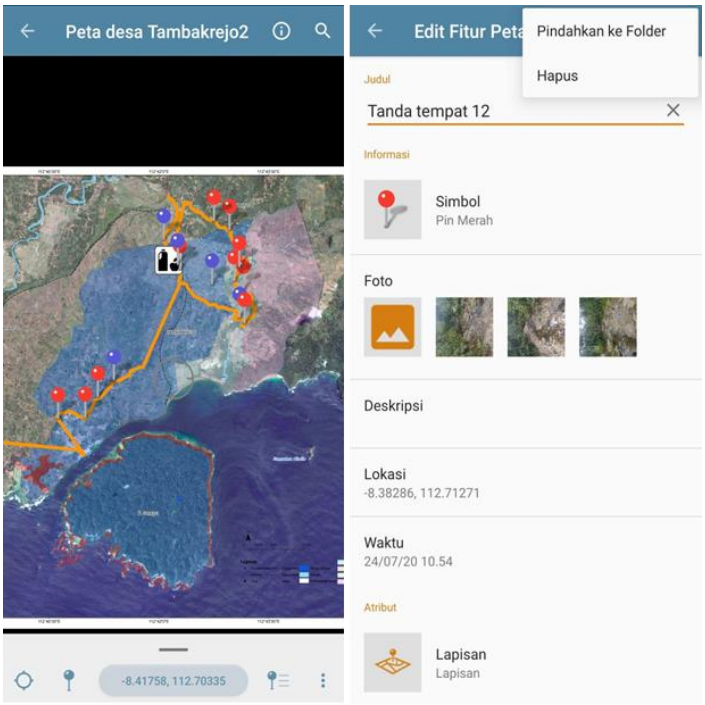
Figure 2. Utilization of Smartphones in Spot Identification in Sendang Biru Karst Area



Study spots in karst area and its surroundings can be seen from previous studies. **Table 1** shows previous studies conducted by researchers/academics to support learning outside the classroom. Learning resources obtained directly from researchers will make the learning meaningful for students, because students can see the conditions in the field directly with existing learning resources, either through scientific journals, books related to the study, and experiences gained in the field.

Table 1. Study topics that can be used as information in learning

No	Study	Source
1	Sendang Biru Karst	[18], [20]
2	Karst Spring	[18], [21], [22]
3	Local Wisdom Study: Petik Laut Sendang Biru	[23], [24]
4	Local Wisdom Study: Flood Mitigation in DAS Penggularan	[25], [26]
5	Sendang Biru Tourism	[27], [28]
6	Local People Participation	[19], [29]
7	Climate Changing	[30], [31]
8	Environment: Marine debris, spring degradation	[18], [32], [33]
9	History of Sendang Biru: Migration of Madurese to Sendang Biru	[18], [34]
10	Mangrove Ecosystem Management in Sendang Biru	[35], [36]
11	Sendang Biru Financial: Resilience, Well-being and Income Inequality	[37], [38]

Source: Literature review by author, 2025

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In terms of access to the location of the study areas, it can be accessed by car/bus/motorcycle either to Sitiarjo Village, to Sendang Biru spring, and to the mangrove area on the South coast. However, to access locations that have features such as caves and springs in the hills, access is difficult. Another aspect related to accommodation at the Sendang Biru karst location and its surroundings, there are many food or beverage sellers that can be accessed by the organizers, in addition, if you want to do activities for several days, you can rent a homestay or an inn available in the area around this area. **Table 2** shows details of accessibility and facilities that support learning activities outside the classroom. Of the three aspects, of course Sendang Biru karst area and its surroundings have conditions that allow for learning outside the classroom.

Table 2. Aspects of Facilities in the Area Around Sendang Biru Karst [39]

Category	Tambakrejo Village	Sitiarjo Village
Inn	13	1
Beach	4	4
Tourism Village	1	1
Transportation Facility	land	land
Public Transportation Existence	YES, Fixed route	YES, Fixed route
Widest Land Road Surface Type	Asphalt/concrete	Asphalt/concrete
Number of Cell Phone Tower	4	2
Number of Cell Phone Communication Service Operator	4	3
Mosques	2	7
Mushola (prayer room)	11	2
Church	9	19

3.3 Operational Aspect in Karst Area Fieldwork Study

This fieldwork learning is focused on Sendang Biru karst area and its surroundings. This karst area is located around the coastal area and Clungup Mangrove Conservation (CMC) area, in this area there are also flood plains, which often experience flooding [25], [26]. There is also local wisdom of the community in dealing with flood conditions, in the coastal area, local wisdom in the form of *Petik Laut* event which is a tradition for the coastal community of Sendang Biru Hamlet [23]. The selection of this location is strategic considering the relationship between the environment, social, and culture which can be used as aspects of study. Learning activities in outdoor locations certainly require caution, considering that activities outside the classroom can have several risks such as the risk of accidents, the risk of theft, the risk of damage and loss of equipment and others [5], these risks must be minimized and anticipated by the committee/implementer of the fieldwork.

Fieldwork management certainly requires human resources who understand the implementation of fieldwork. The technical and non-technical aspects of the implementation must be understood by the implementer of field work. Inadequate number of implementers in fieldwork area can hire the services of a travel agent or other resources. So when teachers/educators explain about the area/spot can focus on fieldwork area. With the presence of travel agent will make it easier for teachers/educators to accommodate students to the implementation of fieldwork. However, if the fieldwork implementer has adequate human

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resources can use a fieldwork committee with several tasks to manage the implementation of fieldwork.

Fieldwork activities also require good coordination and communication between students, educators and travel agents/committees to avoid misunderstandings in the implementation of fieldwork. In addition, communication is also established with external parties such as those responsible for the fieldwork area such as the village or the tourism management, communication related to location security with the police, communication with the nearest hospital if there is an unwanted incident and communication with other parties. **Table 3** shows several operational aspects that can be carried out in relation to fieldwork in Sendang Biru karst area and its surroundings.

Table 3. Operational Aspect in Fieldwork Implementation in Sendang Biru Karst Area

Operational Aspect	Explanation	Notes
Study Area	Physic condition, environment, social and cultural study	Tambakrejo and Sitiarjo Village
Study Feasibility	The study area is the previous study area and can be used in implementation related with data collecting and fieldwork practice	Spot area: Sendang Biru Sping, Emas Caves, Gua Emas, Alluvial Plain (Sitiarjo Valley), Fish Auction, CMC
Time	Execution done in 1 or 2 day	Can be adjusted to the aim of study
Schedule	Schedule and spot of study can be adjusted to the aim of study	Can be adjusted to the aim of study
Human Resource Arrangement	Travel agent or committee	According to the number of human resource
Risk Learning Management	Risks in the form of accident, loss/damage of survey tools	Minimalizing the possible risks
Fieldwork Tools and Material	Study location map, fieldwork guidance book, survey tool (GPS, Compass, anemometer and others)	The use of tools and material are adjusted to the aim of study
Fieldwork Communication Flow	Communication between students-teachers-travel agent or committee travel	Communication between each sector make the fieldwork execution easier.
Financial Management (Costs)	Finance from internal	Needs detailed Finance management of income and outcome

Source: Reviewed by author, 2025

3.4 Discussion

Learning activities outside the classroom certainly require management in the context of fieldwork implementation. Fieldwork study require activities such as pre-implementation, implementation and post-implementation [13] it must be well-managed so that the implementation of fieldwork study can run smoothly.. Soeharto (1999)[40] explains about operational planning, which consists of planning scope, quality, time and schedule preparation,

costs, human resource planning, risk management, contract and purchasing planning, communication planning. This planning must be based on each object of study to be achieved. The use of technology in the implementation of fieldwork can also be done by preparing materials and equipment that will be used in fieldwork learning.

Feasibility studies of the area used in fieldwork study activities are used to see the condition of the area that has criteria that can be used in learning. The technical aspect in the feasibility study is to provide broad boundaries on the technical aspects related to the physical manifestation of the project [40]. The area that is the target of learning to be analyzed can be in the form of content or materials used, access to the location, security, supporting facilities and infrastructure around the location, this needs to be considered in the implementation of fieldwork feasibility. Feasibility analysis is needed as a decision-making material before project implementation is carried out [41]. Analysis of technical aspects and utilization of technology is a must to avoid failure [42].

Fieldwork in Sendang Biru karst area and its surroundings has been carried out by students by visiting several spot areas [2] of the learning activities to practice data collection and learning materials presented in class. Outdoor learning activities are also carried out in the karst and coastal areas in Jember in social studies learning [43]. The landscape, social, and culture in Sendang Biru karst area have interesting content or materials to be presented to students. Various relationships with environmental conditions in the area are an attraction in terms of research or other scientific developments. With the existence of a supportive environment, the technical and operational aspects in fieldwork study must of course be prepared carefully and in detail, so that effective fieldwork study occurs.

4. Kesimpulan

Technical and operational aspects in the implementation of fieldwork are very much needed considering that the implementation of fieldwork requires time and careful planning to be able to run according to the objectives to be achieved. Sendang Biru karst area has adequate technical aspects with various scopes of studies that support fieldwork study. In study, data is needed on technical aspects in the form of spot areas, road access to study spots, accommodation. Operational aspects must be optimized properly so that obstacles during fieldwork can be minimized. The emphasis on operational aspects in fieldwork learning in Sendang Biru karst concerns the scope of the study area, the feasibility of learning studies, time, schedule, preparation of human resources, management of learning risks, fieldwork materials and tools, fieldwork communication flows, and financing. The implementation of fieldwork should pay attention to these technical and operational aspects, and the role of educators or related agencies can use technical and environmental aspects to determine learning outside the classroom which is very useful for future generations.

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