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Mapping of the Fabaceae Family Field Laboratory *on* Mount Galunggung as a Learning Media

Yayu Azmi Indriani[1*], Diana Hernawati[2], Rinaldi Rizal Putra[3]

[1,2,3]Universitas Siliwangi, Indonesia

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***Correspondence** email:
hernawatibiologi@unsil.ac.id

ABSTRACT

This study aims to make a mapping of the field laboratory of Fabaceae plants on Mount Galunggung as a learning medium. This study uses an exploratory qualitative method with a survey technique which is divided into 3 research stations based on their altitude, namely Station 1 (600 – 800 meters above sea level), Station 2 (800 – 1000 meters above sea level), and Station 3 (1000 – 1200 meters above sea level). The stages of this study include planning and preparation, implementation, data collection, and data analysis. The results of the study showed that there were 2 sub-families, 5 genera, 6 types of Fabaceae families in Mount Galunggung. The most dominating sub-family in the Mount Galunggung area is the sub-family Caesalpinioideae with a percentage of 93%. Mount Galunggung is an ideal place to be used as a field laboratory to study Fabaceae plants presented in the form of digital and analog maps processed using ArcGIS and Google Earth Pro technology.

Pemetaan Laboratorium Lapangan Familia Fabaceae di Gunung Galunggung sebagai Media Pembelajaran

ABSTRAK: *Penelitian ini bertujuan untuk membuat pemetaan laboratorium lapangan tumbuhan familia Fabaceae di Gunung Galunggung sebagai media pembelajaran. Penelitian ini menggunakan metode kualitatif eksploratif dengan teknik survey yang terbagi ke dalam 3 stasiun penelitian berdasarkan ketinggiannya yaitu Stasiun 1 (600 – 800 mdpl), Stasiun 2 (800 – 1000 mdpl), dan Stasiun 3 (1000 – 1200 mdpl). Tahapan pada penelitian ini meliputi perencanaan dan persiapan, pelaksanaan, pengumpulan data, dan analisis data. Hasil penelitian menunjukan adanya 2 sub-familia, 5 genus, 6 jenis familia Fabaceae di Gunung Galunggung. Sub-familia yang paling mendominasi di Kawasan Gunung Galunggung adalah sub-familia Caesalpinioideae dengan presentase 93%. Gunung Galunggung menjadi tempat ideal digunakan sebagai laboratorium lapangan untuk mempelajari tumbuhan familia Fabaceae yang disajikan dalam bentuk peta digital dan analog yang diolah menggunakan teknologi ArcGIS dan Google Earth Pro.*

INTRODUCTION

The ideal biology learning is a combination of theory in the classroom, practicum in the laboratory, and observation in the field (Ontowiryo et al., 2024). Biology laboratories have an important role in supporting biology learning (Mohzana et al., 2023). Several studies show that the use of biology laboratories has an effect on

improving learning outcomes (Trianto & Purwanto, 2020);(Ali et al., 2022). Botany learning in higher education is often still dominated by theoretical approaches in the classroom, which do not provide direct experience in recognizing and understanding biodiversity as a whole (Handoko et al., 2024).

According to La Braca & Kalman (2021), laboratory activities are used as a method so that students can more easily understand the material and can build knowledge through direct experience or own experiments. The level of student involvement in practicum activities also has a positive correlation with the achievement of students' understanding and process skills (Rini & Aldila, 2023).

Laboratories as a means of learning and developing biological sciences are very important in the context of biology learning (Inogamova & Shigakova, 2023). In addition to using laboratory rooms, field laboratories can also be used in biology learning, especially in the concept of Plantae family fabaceae. Quoting from Karimov et al. (2024), the field laboratory is a means of learning biology that allows students to observe concepts in the natural environment, such as in the concept of Plantae, especially the family Fabaceae. Students often have difficulty identifying and distinguishing plant species, including those belonging to the Fabaceae family, which are known to have a significant diversity of species and ecological roles. Limited access to adequate field laboratories and lack of interactive learning media are obstacles in achieving effective learning goals. Through field laboratories, students can observe changes and interactions between organisms and the environment, as well as develop skills in observing and analyzing data in the context of the natural environment (Pound et al., 2021).

Based on the results of observations of Biology Education students of Siliwangi University in the cryptogamae botany course, it shows that the lack of knowledge of students to find out the location of cryptogamae botanical plant species when conducting practicum on Mount Galunggung, Tasikmalaya Regency in identifying species types and morphologies. In addition, other obstacles experienced by students in the biology learning process, especially studying botany, are as follows: 1) lack of understanding of theory in learning, 2) limitations of botanical literacy skills, 3) limitations of practicum facilities and equipment, and 4) lack of influence of project-based learning models (Lestara et al., 2024). This problem indicates the need for innovation in botany teaching methods that are more applicable and contextual. Mapping the Fabaceae family field laboratory as a learning medium can be the right solution to overcome these obstacles. With this mapping, students can learn directly in the field, observe and study Fabaceae species in their natural habitat, and develop skills in plant morphological identification and analysis.

One of the field laboratories commonly used in the Tasikmalaya area, West Java is Mount Galunggung. The function of the forest in the Mount Galunggung area has changed to become a place to support natural tourism. This plant from the Fabaceae family is one of the natural resources of Mount Galunggung, but it is still not fully explored. Information about this group of plants in the region is still limited so that its management and utilization are not optimal (Corkley et al., 2022). This can be the subject of further research with the aim of providing a basis for information about the types of plants in the family. Thus, the potential possessed by Fabaceae plants can be studied more deeply, and then field laboratory activities in the field of biology regarding the diversity of the Fabaceae family on Mount Galunggung can be carried out for students.

Regarding the concept of Plantae, especially the fabaceae family, several studies have been conducted on Mount Galunggung. As has been researched by

Anggraeni et al. (2023) related to the identification of moss plants in the Mount Galunggung area, research conducted by Chaidir et al. (2023) related to the exploration of Orchidaceae tribe plants in the Mount Galunggung area, Tasikmalaya Regency as a teaching material for high-level plants, and research by Usman et al. (2022)related to the inventory of Fabaceae family plants in the forest path of Babakan Siliwangi City, Bandung, West Java, and Zhou et al. (2022) about the use of the Fabaceae family for the treatment of liver disease by traditional medicine of various ethnicities in Indonesia.

Based on previous studies, it was identified that field laboratory mapping containing the location of Fabaceae plants on Mount Galunggung had not been carried out. Therefore, it is important to conduct research related to field laboratory mapping on Mount Galunggung, especially on Fabaceae plants in order to obtain data on the existence of Fabaceae plants. The purpose of this field laboratory mapping is to provide direct experience to students in the process of identifying, observing, and studying various types of Fabaceae families in the Mount Galunggung area. In addition, field laboratory mapping can also help students to understand the interaction of Fabaceae plants with their environment, such as distribution patterns, adaptation to environmental factors, and ecological roles in the ecosystem of Mount Galunggung. This is important to increase students' awareness of the importance of biodiversity conservation and environmental protection.

The results of this field laboratory mapping can be used as a learning medium that can be adapted to the curriculum. Learning media is a technology used to convey learning messages to support the learning process (Dita et al., 2021). For students who have difficulty understanding the material, the use of media and simulations can be a tool to explore the learning material (Darmayanti et al., 2022). The existence of learning media supports students actively and creatively during the learning process (Rahim et al., 2022). The output of learning media in the mapping of the Fabaceae family laboratory on Mount Galunggung is in the form of digital maps and analog maps. The purpose of these digital maps and analogue maps is to provide detailed information about the morphological characteristics, habitats and benefits of these plants without having to go to the field. Thus, it is hoped that these digital maps and analog maps will be effective tools in supporting the learning of Plantae concepts, especially the Fabaceae family. Therefore, the mapping of this field laboratory greatly contributes to increasing students' understanding and knowledge of Fabaceae plants on Mount Galunggung.

METHOD

This research was conducted on Mount Galunggung, Tasikmalaya Regency, West Java Province. This research was conducted in February 2024. This study uses a qualitative approach with an exploratory method through survey techniques. The exploration was carried out directly to the Mount Galunggung area by making several observation stations/locations that were divided into three different zones based on their altitude. Observations were made at three stations/locations based on the height that can be seen from Figure 1.

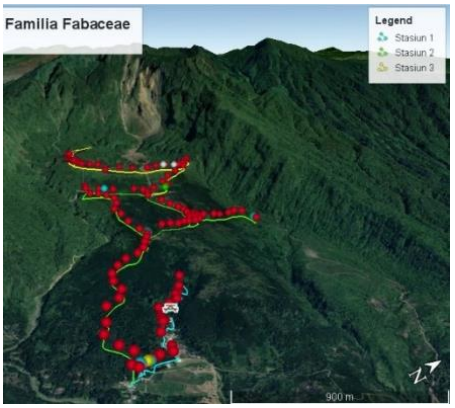

Figure 1. Research Location

Information:
Station 1: 600 to 800 meters above sea level;
Station 2: 800 to 1,000 meters above sea level; and
Station 3: 1,000 to 1,200 meters above sea level

In this study, the data needed consists of two types of sources, namely primary data and secondary data which include: 1) primary data is a type of research data source obtained directly from the original source, without going through intermediaries or other media. The primary data source in this study is the Fabaceae family in Mount Galunggung. 2) Secondary data is a type of research data source obtained by the researcher indirectly or through intermediary media, meaning that this data has been taken and recorded by other parties before.

The data collection technique is shown in Figure 2 and the stages in data analysis in this study are explained in Figure 3.

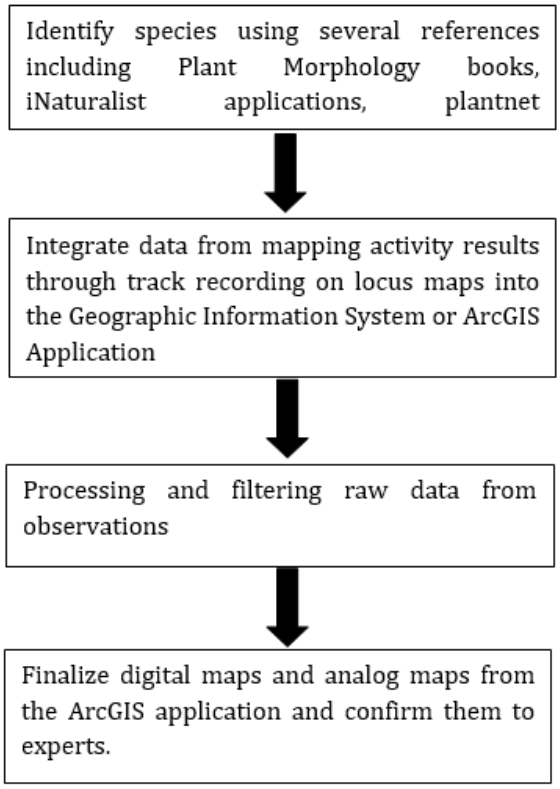

Figure 2. Data collection procedure

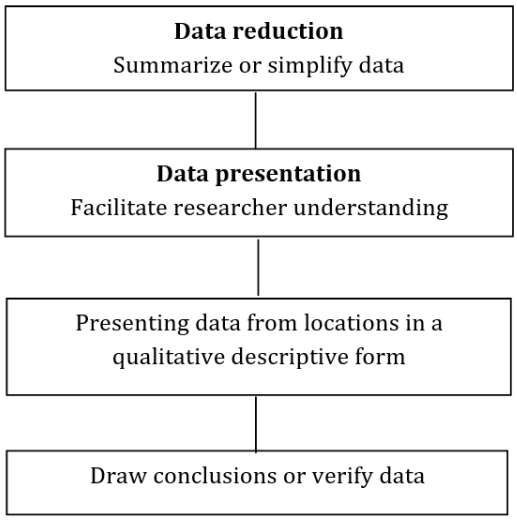

Figure 3. Data analysis procedure

RESULTS AND DISCUSSION

Based on the results of research on the three stations in the Mount Galunggung Area, Tasikmalaya Regency, 2 sub-families, 5 genera, and 6 species were found. presented in the following Table 1. The mapping results and species are presented in Figure 4 and Figure 5.

Table 1. Distribution of Fabaceae Family in Mount Galunggung

No	Species Name	Number of Species		
		Stasiun 1	Stasiun 2	Stasiun 3
1	*Calliandra houtonianan*	678	1016	462
2	*Mimosa pigra*	43	-	-
3	*Mimosa pudica*	174	71	54
4	*Centrosema virginianum*	76	-	-
5	*Desmodium adscendens*	-	-	96
6	*Aeschynomene indica*	-	24	-

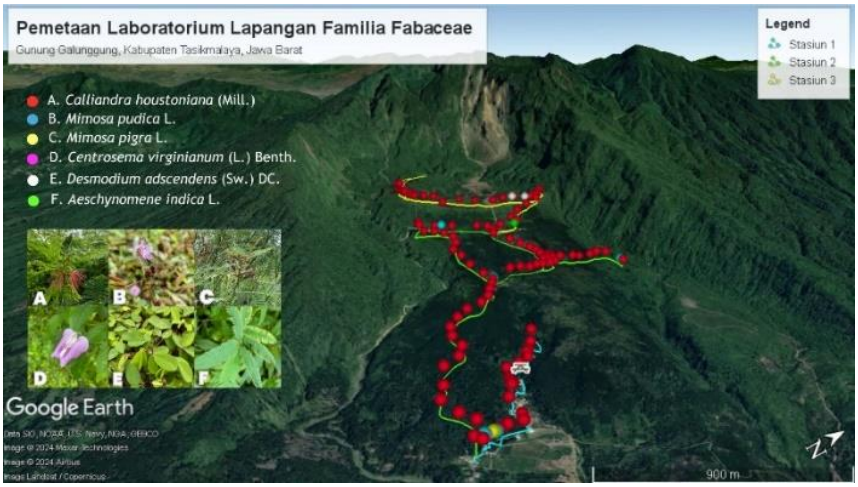

Figure 4. Results of Mapping *of* Fabaceae family on Mount Galunggung

Figure 5. Fabaceae Family Mount Galunggung
(A. *Calliandra houstoniana* (Mill.), B. *Mimosa pigra* L., C. *Mimosa pudica* L., D. *Centrosema virginianum* (L.) Benth., E. *Desmodium adscendens* (Sw.) DC., F. *Aeschynomene indica* L.)

The results of identification and inventory showed that there were 2 sub-families of Fabaceae dominated by the sub-family Caesalpinioideae with a percentage of 93%. Furthermore, there is the Faboideae sub-family with a percentage of 7%.

The most dominant sub-family in the Mount Galunggung area is the sub-family Caesalpinioideae with a percentage of 93% consisting of 2 genera and 3 species, namely *Calliandra houstoniana* with a total of 2156 species located at all three stations, *Mimosa pigra* with a total of 43 species located at station 1, *Mimosa pudica* with a total of 299 species located at all three stations. While the second sub-family is the sub-family *Faboideae* with a percentage of 7% consisting of 3 genera and 3 species, namely *Centrosema virginianum* with a total of 76 species at station 1, *Desmodium adscendens* with a total of 96 species at station 3, *Aeschynomene indica* with a total of 24 species at station 2.

Station 1 is at an altitude of 695 – 753 meters above sea level, showing a relatively low location compared to other stations. Station 2 is located at an altitude of 727 – 1036 meters above sea level, and station 3 is located at an altitude of 1064 – 1151 meters above sea level, which is the station with the highest altitude compared to other stations. Station 1 with a temperature of 25.9 – 30.2°C which shows relatively warm conditions. Station 2 with a temperature of 26.1 – 31.8°C, shows a higher temperature which is affected by altitude. Station 3 with a temperature of 26.5 – 38.4°C, which is the highest temperature among the three stations. Station 1 with a light intensity of 240 – 2867x10 Lux, which shows the variation of lighting from low to high. Station 2 with a light intensity of 345 – 8255x10 Lux, shows a significant increase in light intensity affected by the dimming of trees. Station 3 with 960 – 9425x10 Lux, which shows the highest light intensity compared to other stations that are affected by a more open position. Station 1 with an air humidity of 66.9 – 85.6%, which indicates quite humid conditions. Station 2 with a humidity of 56.6 – 83.2%, and station 3 with a humidity of 42.7 – 71.1%, which is the lowest humidity among the three stations affected by higher altitude and temperature. Station 1 with soil moisture 1 – 4 which shows a fairly wet soil condition. Station 2 with humidity 1 – 2 which shows slightly dry soil conditions. Station 3 with soil moisture 1 – 3 which shows relatively dry soil conditions. Station 1 has a soil pH of 7 – 7.8, indicating more alkaline soil conditions that are influenced by soil composition and rainfall. Stations 2 and 3 have a pH of 6.8 – 7, indicating a neutral to slightly alkaline soil condition. Station 1 has a wind speed of 0 – 1.4 m/s, showing quite calm wind conditions. Station 2 has a wind speed of 0 – 1.7 m/s. Station 3 has a wind speed of 0 – 3.4 m/s, which indicates the highest wind speed affected by altitude.

The results of the research on the mapping of the Fabaceae family field laboratory in the Galunggung Mountain Area produced a map that will be used as a learning medium processed using the ArcGIS (Geographic Information System) application and Google Earth Pro which allows us to see the distribution of various species of the Fabaceae family. The creation of this media can be done through the use of Augmented Reality. AR is used to facilitate technology-based activities with the aim of attracting students' attention and motivation so that interactivity will appear in the learning process (Liu et al., 2023);(Ropawandi et al., 2022);(Pranahadi et al., 2024). Students can view the material only using the camera placed on the map.

In addition, the information presented on this map is its geographical distribution, species names, species images, geographical characteristics and the ecology of each species. Thus, it is possible to better understand how the distribution and characteristics of *the Fabaceae family* in the Galunggung Mountain Area. The mapping results can be accessed via a scan barcode (Figure 4) or a link

https://bit.ly/Pemetaan_familiaFabaceae_GunungGalunggung_2024

Figure 4. Barcode image of Familia Fabaceae

This research is supported by Haka et al. (2020) and Harahap et al. (2024) previous researchers, namely, who stated that the use of learning media by utilizing the surrounding area or the surrounding local potential is able to increase students' motivation and interest in learning. It also Apriansyah et al. (2024) argues that learning media is a supporting tool to optimize learning. It is hoped that this learning media will be more effective and efficient in introducing and learning the diversity of the Fabaceae family in learning activities.

CONCLUSIONS AND SEGGESTION

Based on the results of the research on the Mapping of the Familia Fabaceae Field Laboratory on Mount Galunggung as a Learning Media, it can be concluded as follows. Fabaceae plants in Mount Galunggung, Tasikmalaya Regency, were found in 2 sub-families, 5 genera and 6 types of species identified. At station 1, 678 species were found, namely *Calliandra houtonianan*, 43 *Mimosa pigra, 174 Mimosa pudica* and 76 *Centrosema virginianum*. At Station 2, species such as *Calliandra houtonianan* were found as many as 1016, *Mimosa pudica* as many as 71 and *Aeschynomene indica* as many as 24. At station 3, 462 species of *Calliandra houtonianan*, 54 *Mimosa pudica* and *96* Desmodium adscendens were found. Information related to species can be presented in the ArcGIS (Geographic Information System) and Google Earth Pro applications which are expected to be learning materials to learn about biodiversity, especially the Fabaceae family.

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