

# Investigation of student biology teachers' views on field-based plant exploration exercises in a botany course

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**Abstract.** This study examines the views of student biology teachers regarding field-based plant exploration exercises. It is believed that the incorporation of outdoor education into biology education enhances students' knowledge of variety of plant species and strengthens their ecological consciousness. Over the course of an 11-week study, pre-service teachers conducted a botanical education outdoors. The research was carried out with 21 student biology teachers enrolled in a biology teaching program at a public university in Ankara. The data, gathered through semi-structured interviews, were analyzed using thematic analysis. The findings indicated that student biology teachers considered these activities valuable for improving memory retention and learning through hands-on experience. However, factors such as difficult landscape settings and unfavorable weather were identified as obstacles to the implementation of such exercises. All pre-service teachers expressed that they would consider implementing outdoor education in their future teaching practices. These findings suggest that field-based plant exploration exercises can contribute to biology education.

## 1 Introduction

Outdoor education has gained renewed attention in recent years, particularly within the context of environmental and science education. The incorporation of field-based plant exploration exercises into biology education provides unique opportunities for students to engage directly with their natural surroundings, fostering both cognitive and emotional growth. Recent research has emphasized the significant benefits of these activities. For instance, [8] found that outdoor learning environments contribute to reducing stress and improving mental health among students, creating a more conducive atmosphere for learning. Recent research underscores the significant impact of outdoor education on learning plant species and increasing plant awareness. For instance, [5] found that field trips to natural environments substantially enhance students' knowledge and awareness of botanical diversity. Similarly, [1] demonstrated that nature-based education improves primary school students' ability to recognize plant species and fosters greater ecological consciousness.

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These educational approaches not only bolster theoretical knowledge but also cultivate positive attitudes toward nature through direct interaction with plants.

This research aimed to investigate how student biology teachers perceive field-based plant exploration activities. Gaining insight into their perspectives can help reveal both the advantages and challenges of incorporating such practices into biology education. By exploring these viewpoints, the study aims to contribute to the ongoing discussions about the impact of outdoor learning on student achievement.

The research questions guiding this study are:

1. What are the perceived advantages of field-based plant exploration exercises according to student biology teachers?
2. What are the perceived disadvantages of these exercises?
3. How do student biology teachers view the incorporation of outdoor education into their future teaching practices?
4. Which plant species do student biology teachers find most memorable from the field-based plant exploration exercises?

## 2 Method

The study was conducted using a case study design, one of the qualitative research methods. Case studies are used in situations where a contemporary phenomenon is investigated within its real-life context, especially when multiple sources of evidence are available [10].

### 2.1 Study Group

The study group consisted of 21 student biology teachers who are undergraduate students in the biology education program at a state university in Ankara. The characteristics of the participants are presented in Table 1.

**Table 1.** Distribution of characteristics of participants

		<b>f</b>	<b>%</b>
Gender	Female	18	85.7
	Male	3	14.3
The region they live in	Village	7	33.3
	City	14	66.6
Time spent in nature	several times a week	9	45.8
	Once a week	3	14.3
	Several times a month	3	14.3
	Once a month	3	14.3
	Several times a year	2	9.5
	Once a year	1	4.7
How much they love plants	Too much	6	28.6
	Much	6	28.6
	Not too much not too little	7	33.3
	Little	1	4.7
	Not at all	1	4.7

## 2.2 Data Collection Tools

In the study, a semi-structured interview form developed by the researchers was used. The interview form included questions related to personal information (gender, region of residence, the pre-service teachers' affinity for plants, and time spent in nature) and questions regarding the positives and disadvantages of field-based plant exploration exercises, the pre-service teachers' perceptions of outdoor education, and the plant species that were memorable to them from these exercises. In preparing the interview form, a relevant literature review was conducted, and three questions were posed to the student biology teachers: "What are the positives and disadvantages of field-based plant exploration exercises?", "Would you conduct outdoor education if you were a teacher in the future?", and "Which plant species were memorable to you from the field-based plant exploration exercises?".

## 2.3 Data Collection Process

In the study, qualitative data were collected using the "Field-based Plant Exploration Exercises Opinion Form" developed by the researchers. This form was administered through face-to-face interviews with 21 student biology teachers who voluntarily agreed to participate in the study. The data collection process took approximately 20-25 minutes, and the obtained data were transferred verbatim to a digital format.

## 2.4 Data Analysis

In the study, thematic analysis was applied to the data obtained from the partially guided interviews conducted with student biology teachers. Citations were expressed as PT1, PT2, PT3, and so on. The aim of thematic analysis is to reach concepts and relationships that can explain the collected data [10].

## 2.5 Trustworthiness

To minimize bias in the thematic analysis, the data set was analyzed by two researchers. The reliability formula by [7] ( $\text{Reliability} = \frac{\text{Agreement}}{\text{Agreement} + \text{Disagreement}}$ ) was used in the analysis of qualitative data, and the inter-coder agreement rate was found to be 90%.

## 3 Findings

In the study, the distribution of student biology teachers' opinions regarding the positives and disadvantages of field-based plant exploration exercises is presented in Table 2.

According to Table 2, student biology teachers mostly reported that the advantages of field-based plant exploration exercises include enhancing memorability (14 participants, 33.3%) and facilitating learning by doing and experiencing (12 participants, 28.6%). On the disadvantages of field-based plant exploration exercises, student biology teachers predominantly mentioned difficult landscape settings (15 participants, 44.1%) and unfavorable weather conditions (15 participants, 44.1%).

**Table 2.** Opinions of student biology teachers on field-based plant exploration exercises

Theme	Code	f	%
Positive Aspects of Field-based Plant Exploration Exercises	Ensuring learning by doing and living	12	28.6
	Increase retention	14	33.3
	Increasing awareness towards plants	9	21.4
	Ensuring effective learning by using the four senses	3	7.1
	Reinforcement learning by experiencing theoretical knowledge in practice	2	4.8
	Providing collaborative learning	2	4.8
Total		42	100
Negative aspects of Field-based Plant Exploration Exercises	Challenging terrain conditions	15	44.1
	Possibility of adverse weather conditions	15	44.1
	Challenging to follow the flow of information in the field due to the number of people	4	11.8
Total		34	100

Example statements emphasizing the opinions of pre-service teachers are given below:

PT1: *“In outdoor education, variable weather conditions during Field-based Plant Exploration Exercises may not always allow the education to take place in nature.”*

PT12: *“Sometimes having to overcome steep terrain paths and obstacles can be challenging for us.”*

PT19: *“It can be difficult to hear and understand the information taught in large groups.”*

PT20: *“Outdoor education can be challenging in extremely hot weather or on steep terrains.”*

In the study, the distribution of student biology teachers' opinions on whether they would incorporate outdoor education into their teaching when they become teachers in the future is presented in Table 3.

**Table 3.** Pre-service biology teachers' opinions on whether they will conduct outdoor teaching in the future

Would you consider including outdoor education in your teaching in the future?	f	%
Yes	21	100
No	0	0
Total	21	100

According to Table 3, all student biology teachers (21, 100%) stated that they would incorporate outdoor education into their teaching in the future. Example statements emphasizing the opinions of the pre-service teachers are given below:

PT4: *“When I become a teacher in the future, I would definitely consider outdoor education. Students need to experience learning environments outside of the school/classroom. Effective learning occurs.”*

PT7: *“I definitely consider outdoor education. It is necessary for better understanding and learning about plants up close.”*

PT14: *“I would consider integrating outdoor education into my teaching in the future because the acquired knowledge can be more permanent.”*

PT15: *“I would definitely consider it. Students can focus better in nature and learn without getting bored.”*

In the study, the distribution of student biology teachers' opinions on the most memorable plant species from the Field-based Plant Exploration Exercises is presented in Table 4.

**Table 4.** Opinions of student biology teachers on field-based plant exploration exercises

Theme	Code	f	%
Woody plants	<i>Platanus</i>	2	14.3
	<i>Pinus brutia</i>	4	28.6
	<i>Pinus nigra</i>	4	28.6
	<i>Amygdalus</i>	4	28.6
Total		14	100
	<i>Lamium</i>	7	25.9
	<i>Gagea</i>	1	3.7
	<i>Trifolium</i>	4	14.8
	<i>Taraxacum</i>	6	22.2
	<i>Veronica</i>	9	33.3
Total		27	100
General Total		41	100

According to Table 4, student biology teachers mostly found herbaceous plant species to be the most memorable (27 participants, 65.8%). Additionally, the student biology teachers found the following plant species to be the most memorable: Veronica (9 participants, 33.3%), Lamium (6 participants, 25.7%), and Taraxacum (6 participants, 22.2%).

Example statements emphasizing the opinions of the pre-service teachers are given below:

PT13: *“The plane tree, with its trunk shedding at different times and resembling a Dalmatian pattern, is the one that stood out the most in my mind. I also remember the black pine species that we frequently see around.”*

PT16: *“Plant species with different and beautiful appearances generally remained in my memory. Black pine, red pine, lamium, and veronica are some of them.”*

PT19: *“I never knew the almond tree before; now I recognize it thanks to these field trips, and I can identify it when I see it elsewhere.”*

PT21: *“Due to frequently encountering them after the Field-based Plant Exploration Exercises: Gagea, Taraxacum, Trifolium.”*

## 4 Results and Discussion

The findings of this study underscore the importance of integrating field-based plant exploration exercises into biology education. The positive feedback from pre-service teachers highlights the potential benefits of such activities in enhancing student engagement and retention of botanical knowledge. Outdoor education, by allowing direct interaction with

plant species, fosters a deeper understanding and appreciation of botanical diversity. These findings align with existing literature. For instance, [6] noted that learning activities conducted in nature positively contribute to students' cognitive and emotional development. However, the study also identified significant challenges associated with outdoor education. Particularly, terrain and weather conditions can impede the smooth execution of outdoor activities, necessitating careful planning and contingency measures. These challenges are also emphasized by [9] who pointed out that logistical and environmental barriers can affect the success of outdoor education activities.

The difficulties in managing large groups in outdoor settings suggest the need for smaller group sizes or additional support. [3] noted that managing large groups can be challenging for teachers and that working with smaller groups can be more effective.

The unanimous support for incorporating outdoor education into future teaching practices indicates a strong recognition of its value among pre-service teachers. This aligns with contemporary educational approaches that emphasize experiential and hands-on learning as critical components of effective teaching strategies. [4] argued that experiential learning enables students to learn in a more meaningful and lasting way.

Moreover, the specific plant species that were memorable to participants provide insights into the types of plants that may be particularly engaging for students. Understanding these preferences can help educators select plant species that are likely to capture students' interest and enhance the educational impact of outdoor activities. This finding is supported by [2] who reported that students are more receptive to learning through direct experiences, which deepen their understanding.

In conclusion, while field-based plant exploration exercises present logistical challenges, their educational benefits make them a valuable component of biology education. Future research could explore strategies to mitigate the identified challenges and further investigate the long-term impacts of outdoor education on student learning outcomes. These recommendations are consistent with [9] who emphasized the need for continuous research and development to maximize the potential of outdoor education.

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