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Exploring the Potential of Depati VII Coffee and Resort as a Bio-Edutourism Site in High School Biology Education: A Phenomenological Study

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Abstract: This phenomenological qualitative study explores the use of Depati VII Coffee & Resort as a bio-edutourism destination for high school students, with the aim of addressing the gap in utilizing local ecological and cultural potential, a gap that often results in abstract biology instruction. Bordering Kerinci Seblat National Park, this site offers a rich highland coffee agroecosystem. Data were collected over three months through in-depth interviews, participatory observation, and documentation, then analyzed through the stages of data condensation, horizontalization of significant statements, thematic grouping, and textural-structural description. The research successfully synthesized a Three-Subsystem Bio-Edutourism Framework in which the subsystems are mutually integrated. First, the Ecological Subsystem serves as a natural laboratory with a mountain microclimate, multistrata agroforestry, and biodiversity, facilitating understanding of biological concepts. Second, the Ethnopedagogical Subsystem utilizes traditional architecture (Rumah Basilo), local technologies (jangki, lukah), and Kerinci moral proverbs such as "nature is entrusted to us, not to be destroyed" to foster character and an environmentally conscious attitude. Third, the Pedagogical Subsystem organizes field-based learning strategies grounded in Kolb's experiential learning theory and inquiry-based worksheets. On the other hand, this study reveals real challenges, such as students' divided focus between recreation and learning, time constraints, and the need for structured observation guidelines to prevent the activities from becoming ordinary sightseeing. Overall, this three-subsystem model makes a significant theoretical and practical contribution to strengthening science literacy, environmental awareness, and local cultural identity in a sustainable manner.

Keywords: Bio-Edutourism; Depati VII Coffee and Resort; High School; Phenomenological Study.

Introduction

The Depati VII Coffee & Resort area in Kerinci Regency/Sungai Penuh City, Jambi Province, is a coffee plantation-based ecotourism destination with strong potential as a biology learning resource. This area is situated at an elevation of approximately 1,453 meters above sea level and directly borders Kerinci Seblat National Park, which is characterized by high biodiversity. The mountainous environment and coffee agroecosystem in this area offer a range of biological phenomena that students can observe firsthand. Activities such as cultivation, harvesting, and coffee processing allow students to understand concepts of plant biology and ecosystems in a contextual manner [1]. Furthermore, the integration of tourism, education, and conservation makes this area relevant as an environment-based learning medium [2]. Given these characteristics, Depati VII Coffee & Resort has the potential to be developed as a biological education tourism site for high school students.

Nevertheless, scientific studies on Depati VII Coffee & Resort are still dominated by a tourism perspective rather than a biology education perspective. Previous research has primarily focused on tourist attractions, visitor satisfaction, and the area's economic potential without exploring the educational dimension in depth [3]. The aspect of utilizing the area as a biology learning resource, particularly in the context of high school education, has not been extensively studied. Yet, agroecosystem areas such as coffee plantations hold high scientific value for science education due to their rich ecological interactions [4]. The lack of educational research has resulted in the area's potential as a natural laboratory not being optimally utilized. Therefore, research is needed to comprehensively examine this area from a biology education perspective.methods [5].

In a broader context, coffee plantation agroecosystems have long been recognized as a source of contextual learning in science education [6]. Coffee agroforestry systems support greater biodiversity than monoculture systems, making them suitable subjects for ecosystem-based learning. The interactions between plants, soil, microorganisms, and humans within the agroforestry system provide a concrete example of the interconnections among ecosystem components. Additionally, sustainable agricultural practices in coffee cultivation reflect the application of environmental conservation concepts that can be integrated into biology education [7]. Hands-on experiences in real-world settings have been shown to strengthen the connection between theory and practice in science education [8]. Thus, coffee agroecosystems hold strategic value as a medium for contextual biology education in high schools.

The use of the environment as a learning resource aligns with the demands of 21st-century learning, which emphasizes science literacy and critical thinking [9]. Contextual learning enables students to connect scientific

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concepts with everyday life, thereby enhancing conceptual understanding. Environment-based educational tourism activities have been shown to increase students' motivation to learn, ecological awareness, and scientific literacy [10]. Additionally, out-of-class learning experiences through the outdoor learning model help students build a deeper understanding through direct observation [11]. The integration of educational tourism into learning also supports the development of 21st-century skills such as collaboration, communication, and problem-solving [12]. Therefore, educational tourism has become an innovative approach in biology education that responds to the demands of the times [13].

Nevertheless, the success of using educational tourism in learning is determined not only by the availability of learning resources but also by the experiences of students and teachers. Learning experiences are subjective and influenced by individuals' perceptions and interactions with the learning environment [14]. A phenomenological approach allows researchers to deeply understand the meaning of these experiences, extending beyond cognitive aspects to include affective and contextual dimensions [15]. In the context of biology education, direct experiences in nature can foster conceptual understanding while cultivating positive attitudes toward the environment. The phenomenological approach in science education holds great potential for investigating the learning process as a holistic experience. Therefore, it is important to examine how teachers and students interpret learning experiences in educational tourism areas in order to design more effective and meaningful learning [16].

Based on the above description, this study aims to examine the utilization of Depati VII Coffee & Resort as a biological education tourism site through a phenomenological approach. Specifically, this study seeks to integrate coffee agroforestry ecosystems, bio-edutourism activities, and ethnopedagogical elements rooted in Kerinci local wisdom into high school biology learning. This combination of contextual agroecosystem-based learning, educational tourism, and phenomenological interpretation of teachers' and students' lived experiences represents a distinctive contribution that has not been addressed in previous studies [17]. Analysis is conducted to identify ecological and biological potentials relevant to biology curriculum materials, to describe learning experiences in an authentic natural laboratory, and to examine pedagogical implications for contextual learning and students' ecological literacy from the perspective of 21st-century education [18]. The research findings are expected to contribute to the development of an edutourism-based learning model that is responsive to local potential and integrates ethnopedagogical values, thereby enriching biology learning practices based on local potential in Indonesia and supporting sustainable education goals [19].

Research Methods

Research Approach and Design

This study employs a qualitative approach with a phenomenological design to uncover the meanings of teachers' and students' experiences in utilizing Depati VII Coffee & Resort as a biology educational tourism site. The phenomenological approach allows the researcher to deeply explore participants' lived experiences regarding their interactions with the natural learning environment [20]. A phenomenological design is considered appropriate because it focuses on understanding the meanings and experiences directly experienced by participants through the exploration of their subjective consciousness [21]. In the context of biology learning, phenomenology allows researchers to uncover the affective and cognitive dimensions of learning experiences in nature that shape conceptual understanding as well as attitudes toward the environment [22].

Research Location and Timeframe

The study was conducted at Depati VII Coffee & Resort, located in Sumur Gedang Village, Pesisir Bukit Subdistrict, Kerinci Regency, Jambi Province. This area was selected through purposive sampling because it features coffee ecotourism, vegetation diversity, and a mountainous ecosystem landscape relevant to the high school biology curriculum. This location is approximately 15 km from Sungai Penuh City and borders directly on Kerinci Seblat National Park (TNKS). The research lasted for three months, from January 5 to April 5, 2026, a duration sufficient for in-depth data collection in phenomenological research.

Research Subjects

The research subjects consisted of four groups of informants: (1) high school biology teachers who have integrated or are likely to integrate the site into their teaching; (2) high school students participating in biology learning activities or educational visits; (3) educational tour guides knowledgeable about coffee cultivation and conservation; and (4) managers of Depati VII Coffee & Resort. Informants were selected using purposive sampling based on the participants' direct involvement and experience in educational activities at the research site. In total, the study involved 4 biology teachers, 24 students (grades X–XI), 2 educational tour guides, and 2 site managers, representing both male and female participants from urban and semi-rural school backgrounds. This strategy ensures that the selected participants have relevant experience and can provide in-depth information regarding the phenomenon under study.

Research Implementation Phases

The research was conducted systematically in four main phases. The preparation phase (January 5–20, 2026) involved developing interview instruments and observation sheets aligned with biology competencies (Ministry of Education, Culture, Research, and Technology, 2022). The fieldwork phase (January 21–March 10, 2026) includes site coordination, participatory observation, and in-depth interviews (Abrar, 2021). During this phase, each teacher and guide was interviewed for approximately 60–90 minutes, while student interviews lasted 30–45 minutes per session, and participatory observations were conducted on six separate field visits covering different learning activities. The data verification phase (March 11–March 25, 2026) is conducted via member checking to assess the validity of the interpretations (Candela, 2024). The drafting phase (March

26–April 5, 2026) involves data analysis through reduction, presentation, and drawing conclusions.

Data Collection Methods

Data were collected using three complementary methods to gain a holistic understanding of the phenomenon under study [15]. The first technique is in-depth interviews to explore participants' perceptions and experiences through open-ended, reflective questions. The second technique is participatory observation to directly observe students' activities in the field, such as examining the structure of coffee plants and biotic–abiotic interactions [23]. The third technique is a documentation study, which includes photos of activities and educational materials to enrich the qualitative data. The primary instrument is the researcher themselves (human instrument), assisted by semi-structured interview guidelines and observation sheets.

Data Analysis Techniques

Data analysis was conducted qualitatively using the framework developed by Miles, Huberman, and Saldaña, which involves three main iterative steps. The first step is data condensation, which involves selecting, simplifying, and transforming raw data into more manageable forms [24]. In line with phenomenological procedures, this phase includes horizonalization of significant statements from interview transcripts and field notes, followed by clustering these statements into thematic units that reflect recurring meanings in participants' experiences. The second step is data display in the form of matrices, tables, or narratives that facilitate the interpretation and identification of patterns in the findings, including textural descriptions (what participants experienced) and structural descriptions (how and in what context the experiences occurred). The third step is conclusion drawing and verification through continuous comparison of findings from various data sources, culminating in the synthesis of the essence of teachers' and students' lived experiences at the site. Interview data were transcribed verbatim and coded based on themes such as ecological potential, student learning experiences, teacher perceptions, and science and ecology literacy.

Data Validity Testing

Data validity was ensured through several validation strategies consistent with contemporary qualitative research standards. The first strategy was source triangulation, which involved comparing data from four groups of informants to ensure the consistency and credibility of the findings [25]. The second strategy is methodological triangulation, which combines data from interviews, observations, and documentation to enrich perspectives on the same phenomenon [26]. The third strategy is member checking, which involves verifying interpretations with key informants to ensure accuracy and reduce researcher bias. The fourth strategy is peer debriefing with fellow researchers or methodological experts to discuss findings and strengthen the credibility of interpretations [12] .

Results and Discussion

Based on a qualitative data analysis using the Miles, Huberman, and Saldaña model, the interview results and field notes were organized into main themes related to the experiences of teachers and students. This organization was done to ensure that the findings were more consistent with the phenomenological approach used in the study, which emphasizes the meaning of experiences as directly perceived by the participants. Okay. The analysis revealed four main themes: (1) direct experiences in the coffee plantation environment, (2) a better understanding of biological concepts, (3) learning values and attitudes through local wisdom, and (4) challenges in implementing field-based learning.

Hands-On Experience in a Coffee Plantation Setting

Teachers and students found Depati VII Coffee & Resort to be a learning environment quite different from a classroom, as they could experience the location's natural conditions firsthand. The cool air, high humidity, layered vegetation, and the atmosphere of the coffee plantation allowed students not only to observe biological specimens but also to immerse themselves in the environment they were studying. The matrix of qualitative findings for this theme is presented in Table 1.

Table 1. Matrix of Phenomenological Findings: Direct Experiences in the Coffee Farm Environment

Informant Code	Key Qualitative	Essence of Phenomenological Experience
Teacher A	*"As soon as we arrived at the location, the students immediately remarked that the air here was cool and fresh. From there, I explained that this is a characteristic of a mountain ecosystem. They weren't just reading temperature readings—they were actually feeling it."*	Learning in the coffee plantation transformed their theoretical understanding of microclimates (temperature and humidity) into a concrete, firsthand sensory experience.
Student A	*"In the classroom, an ecosystem is just a picture in a book. Here, I walk among the plants, observing the layers of vegetation from the ground up. So it feels like the ecosystem is truly real—not just a definition."*	Physical contact with the actual vegetation structure enhances students' spatial engagement, enabling them to empirically validate the concept of an ecosystem.

Table 1 shows that the learning experience at this location makes students more directly engaged. They understand the material not only through the teacher's explanations, but also through observation, hands-on experience, and the real-world environment.

Biology Concepts Become Easier to Understand

The second theme shows that the presence of real-world objects at Depati VII Coffee & Resort helps teachers explain biology concepts that have long been considered abstract. Coffee plants, shade trees, medicinal plants, ornamental plants, and several animals on the premises serve as hands-on examples that help students understand the material. A matrix of qualitative findings regarding the ease of understanding this concept is summarized in Table 2.

Table 2. Matrix of Phenomenological Findings: Ease of Understanding Biological Concepts

Informant	Qualitative Quote	Essential Phenomenological Experience
Teacher A	*"I usually have a hard time explaining vegetation layers. Here, I can show them right away: medicinal plants and shrubs are at the bottom, coffee in the middle, and shade trees at the top. Students can see the differences for themselves."*	The presence of macroscopic, multilayered vegetation makes it easier for teachers to conduct contextual demonstrations without artificial visual aids.
Teacher B	*"Explaining the relationship between soil pH and the color of hydrangea flowers is very difficult if you only use pictures. Here, I simply have the students look directly at the flowers, which come in different colors. The students understand the concept right away."*	Environmental biochemical phenomena (such as the effect of pH on plant pigmentation) can be demonstrated instantly through direct observation in the field.
Student B	*"I used to have trouble distinguishing between morphological and physiological adaptations. After observing various plants here, the teacher explained the shape of the leaves, their surfaces, and how plants regulate water. Now I have concrete examples that are easy to remember."*	The availability of living specimens in nature facilitates the formation of students' long-term memory through the differentiation of plants' morphological characteristics.

The results of interviews with two teachers and one student, as shown in Table 2, indicate that Depati VII Coffee & Resort can serve as a natural laboratory. The learning process becomes easier to understand when students connect concepts from their textbooks to objects they observe in the field.

Learning Values and Attitudes Through Local Wisdom

The research findings also show that the learning experience at Depati VII Coffee & Resort is not only related to biological concepts but also to the development of values, attitudes, and environmental awareness through Kerinci's local wisdom. The traditional buildings, local tools, and customary expressions on the site help students see the connections among science, culture, and the ways the community protects the environment. The qualitative data matrix for this theme is presented in Table 3.

Table 3. Matrix of Phenomenological Findings: Internalization of Values and Attitudes Through Local Wisdom

Informant	Qualitative Quote	Essential Phenomenological Experience
Teacher A	*"When we stopped at Rumah Basilo, I not only explained the function of the house but also how the Kerinci people used to work and rest without harming nature. The students came to see that traditional farming methods actually take environmental sustainability into account in many ways."*	Cultural artefacts and traditional architecture serve as a bridge to understanding the concept of sustainability grounded in local wisdom.
Student C	*"There's a saying that essentially states that if we damage nature, we betray a trust. After reading that, I became more careful—I no longer just pick plants or litter."*	Exposure to cultural literacy (traditional moral proverbs) in tourist areas can shift students' self-centered behavior toward greater environmental awareness.
Student D	*"I've just realized that studying biology is also about how we treat nature. A local proverb here reminds us that science should make us more responsible."*	Biology education is transforming from a mere transfer of knowledge into responsible character building.

Table 3 demonstrates that the integration of ethnophilosophy, such as the saying "nature is entrusted to us, not to be destroyed", provides a solid moral foundation for students. This contextualization ensures that ecology and conservation topics are not treated in isolation but are closely intertwined with the Kerinci community's cultural identity and social responsibilities.

Challenges in Implementing Field-Based Learning

Despite the many benefits, teachers and students also reported challenges in implementing field-based learning. The most prominent challenges were balancing focus between learning objectives and the tourist atmosphere, time constraints, and the lack of sufficiently detailed observation guidelines. This matrix of challenges is summarized in Table 4. Table 4 shows that the success of the learning process at Depati VII Coffee & Resort is greatly influenced by the teachers' preparedness in designing activities, the clarity of the worksheets, time management, and the guidance provided during the activities. Without careful planning, field trips can easily turn into mere recreational activities.

Table 4. Matrix of Phenomenological Findings: Challenges in Field Learning

Informant	Qualitative Quote	Essential Phenomenological Experience
Student	*"At first, we found it a bit hard to focus on the worksheets because the atmosphere felt like a holiday spot. We just felt like taking photos in the flower garden or watching the swans."*	The dual function of the area, serving as both a tourist attraction and an educational site, leads to distractions that divert students' academic focus.
Teacher A	*"The potential here is immense, but our time was limited. Since detailed worksheets hadn't been prepared for every aspect, students sometimes spent more time taking photos than making observations."*	Time constraints, combined with inquiry-based worksheets that were not yet fully optimized, may have compromised the rigor of the scientific activities conducted in the field.
Teacher B	*"If students are left unsupervised without strict assignments, they'll just play around. The teacher plays a crucial role in constantly guiding them to stay focused on their observations."*	Teachers require strong pedagogical control to ensure the field activity does not devolve into unstructured recreation devoid of learning outcomes.

The four themes above indicate that Depati VII Coffee & Resort has strong potential as a biology learning resource based on bio-edutourism. These findings demonstrate how teachers and students experience, interpret, and utilize local ecological and cultural potential in biology education. To provide a robust conceptual contribution aligned with the research objectives, data from the physical site inventory (biodiversity, coffee agroforestry, facilities, and culture) were synthesized into a new model called the Three-Subsystem Bio-Edutourism Framework (Figure 1). This model explains how ecological elements, local knowledge, and learning strategies interact with one another, while complementing existing studies on coffee agroforestry, which have traditionally emphasized economic aspects, sustainability, and the green economy over the dimensions of biology education and student learning experiences.

The conceptual model in Figure 1 shows that the successful utilization of agroforestry tourism areas as a resource for biology education requires the integration of three main subsystems. The first subsystem is the ecological subsystem, which provides real-world biological objects in the field. The proximity of the research site to the Kerinci Seblat National Park results in a very rich diversity of flora and fauna. In this context, the multilayered vegetation structure, ranging from primary shade trees to medicinal plants such as Orthosiphon aristatus, serves as authentic learning material for students to explore basic ecological concepts, including material cycles, energy flow, and plant morphological adaptations. These findings align with studies on plant diversity in agroforestry coffee plots, which underscore the importance of multistrata systems for ecological education and conservation, while adding a pedagogical dimension through the design of explicit learning activities [27].

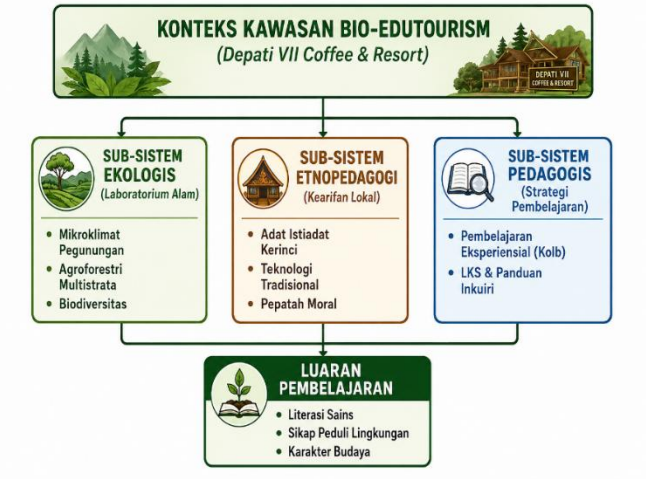

Figure 1. Framework for the Relationships Among Three Subsystems in Contextual Biology Learning.

The second subsystem is the ethnopedagogical subsystem, which serves to provide a social context and moral values to scientific material through the utilization of the local community's culture [28]. The use of traditional modes of transportation, such as the jangki, and traditional fishing gear, such as the lukah, can serve as concrete examples of how humans adapt to their environmental conditions. Meanwhile, the integration of local philosophical values prevalent in the resort area serves to provide a strong ethical foundation for students, enabling them to practice environmental conservation based on their own cultural awareness [29]. Unlike ethno-ecotourism-based environmental education models that focus on tourists or local communities, the ethnopedagogy subsystem in this study is specifically directed at biology students and teachers, thereby linking cultural values to the development of ecological literacy and character within the context of the school curriculum [30].

Next, the third subsystem is the pedagogical subsystem, which serves as the technical framework for conducting learning activities in the field. Drawing on Experiential Learning Theory [31], this subsystem translates the results of physical observations of biological objects into a deep conceptual understanding through four structured stages. These stages include direct concrete experiences in the agroforestry garden, group reflection on challenges encountered during the field trip, conceptualization of the biological material observed, and active experimentation carried out through the completion of inquiry-based Student Worksheets (LKS) [32]. Compared to studies on experiential outdoor learning that emphasize increasing student engagement and knowledge through field trips, the pedagogical subsystem in this model adds components of ethnopedagogy and the context of coffee agroforestry, so that the learning experience cycle not only reinforces scientific concepts but also fosters local identity and environmental awareness [33].

The three-subsystem model developed in this study has significant theoretical and practical implications for science education. Theoretically, this model demonstrates

that harnessing local potential in biology education requires a simultaneous interaction among agroforestry ecosystems, local knowledge, and pedagogical design, thereby expanding the framework of bio-edutourism, which has traditionally separated ecological, cultural, and tourism-related studies [34]. This model also contributes to phenomenological studies in science education by emphasizing that the "essence of the learning experience" in nature is shaped by these three subsystems, not merely by direct contact with biological objects. In practical terms, this model provides actionable guidance for teachers, tourism managers, and policymakers to design ecotourism areas as effective natural laboratories, so that out-of-classroom learning activities can be specifically directed toward improving students' science literacy, fostering an attitude of environmental stewardship, and strengthening local cultural identity in a sustainable manner [4]. However, the phenomenological approach and the specific context of Depati VII Coffee & Resort limit the generalizability of the findings to other areas with different ecological, cultural, and institutional characteristics; therefore, further studies are needed to test this model at agroforestry coffee sites and other forms of bio-edutourism in Indonesia [19].

Conclusion

This study concludes that Depati VII Coffee & Resort has strong potential to be developed as a biology educational tourism site for senior high schools, because it integrates a coffee agroforestry ecosystem rich in biodiversity, Kerinci local wisdom, and experiential, inquiry-based learning activities into a coherent Three Sub-System Bio-Edutourism Framework. In doing so, the site functions simultaneously as a natural laboratory and as an ethnopedagogical learning space that supports place-based biology education, deepens conceptual understanding and science literacy, and fosters students' ecological awareness and cultural identity, provided that its use is supported by structured learning designs and collaboration among schools, site managers, and policymakers. Educationally, the findings imply the development of field-based modules, ethnopedagogical, inquiry-oriented student worksheets, and curriculum-integrated assessment models that embed bio-edutourism activities into biology lessons, while future studies are recommended to refine this framework in other agroforestry and ecotourism contexts and to examine, through phenomenological and mixed-method approaches, the long-term impact of contextual biology learning on students' ecological behavior, scientific literacy, and attachment to local environments.

Author's Contribution

R. Nengsih: Conceived the research idea, designed the phenomenological study, and developed the concept of bio-edutourism in high school biology education. N. Qadariah: Contributing to the design of the research methodology, coordinating the data collection process, and conducting qualitative data analysis. S.Y. Hastutin: Supporting the validation of research instruments, reviewing the development of learning materials, and supervising the entire research process.

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