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Enhancing Students' Motivation and Learning Outcomes through Educational Field Trips on Socioscientific Issues

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Abstract

The Bogor Botanical Gardens possess considerable potential as a learning resource; however, only a limited number of schools utilise this opportunity. This study aims to examine the impact of the field trip method at the Bogor Botanical Gardens on students' motivation and learning outcomes in the topic Ecosystem Components and Their Interactions. A quasi-experimental design was employed. The participants comprised 22 male and 35 female students, divided into two groups: the control and the experimental groups. The experimental group participated in a field trip, while the control group followed the conventional method typically used by teachers, namely group discussions. During the third session, both groups engaged in discussions based on socioscientific issues. The results indicated no significant difference in overall learning outcomes between the two groups. However, an analysis using Bloom's taxonomy showed that the experimental group performed better in the domains of understanding (C2) and application (C3). In contrast, the control group excelled in the analysis domain (C4). Similarly, there was no significant difference in learning motivation between the two groups. Nonetheless, students in the experimental group displayed enthusiasm, expressed enjoyment, and found the materials easier to comprehend during field-based learning activities. Based on these findings, field trips to the Bogor Botanical Gardens may enhance the affective domain and foster more conscious, meaningful, and enjoyable learning experiences.

Keywords: bogor botanical gardens, discussion of socioscientific issues, field trip

INTRODUCTION

The Bogor Botanical Gardens (BBG) represent a profound resource for enhancing biology education, underpinned by their extraordinary biodiversity. Scholarly inquiries have underscored significant morphological diversity within the gardens, particularly in the Cactaceae family, including varied stem structures and height variations (N. N. Azizah et al., 2023). Moreover, the concentration of rare and endemic flora offers students an unparalleled opportunity to engage directly with the core principles of taxonomy and adaptive biology (Mutiara, 2021).

This immense biological heritage has further been harnessed to catalyse the development of digital pedagogical innovations, such as e-flashcards derived from historical botanical specimens (Fauzia, 2022). Beyond purely morphological studies, the BBG functions as a complex ecological laboratory, providing deep insights into intricate ecosystem dynamics (Handayani, 2020). Ultimately, ecological research conducted within this setting serves as a transformative educational instrument, cultivating environmental stewardship and conservation consciousness among the younger generation (Budiarti, 2009).

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Despite its immense potential, the practical application of this site as a pedagogical asset for ecological studies remains markedly underdeveloped. Current educational initiatives tend to focus exclusively on the biodiversity hosted within the Bogor Botanical Gardens (BBG), often overlooking the intricate interdependencies between organisms and their habitat. Consequently, while field trips are inherently contextual, they frequently lack the analytical rigour required for deep conceptual mastery (Raharjo et al., 2024).

Investigating the dynamic interactions between biotic and abiotic components at the BBG sharpens students' scientific inquiry skills, particularly through empirical observation, precision measurement, and field-based data synthesis (Wayan Suja, 2019). Moreover, such immersive experiences foster environmental stewardship and significantly bolster literacy concerning contemporary ecological dilemmas (Amini, 2015).

Aligned with the *Kurikulum Merdeka* framework, ecological topics are delivered through field-based learning at the BBG to meet prescribed learning objectives. These outcomes demand that students not only cultivate a sophisticated understanding of ecological systems but also manifest a genuine commitment to conservation. Ultimately, the educational impact is far more profound when students engage with phenomena firsthand, effectively transcending the constraints of purely theoretical abstraction (Afriani, 2018).

Contextual pedagogy extends far beyond the mere interaction between students and their physical surroundings; it inherently encompasses the social dimension by integrating the contemporary dilemmas that permeate their lived experience (Sadler et al., 2004; Wongsri et al., 2010). The Bogor Botanical Gardens (BBG), operating at the intersection of rigorous conservation and mass tourism, offer a fertile ground for exploring ecological issues of high curricular relevance. A particularly salient case is the 'Sunset di Kebun' music concert controversy, which has precipitated intense public discourse concerning the potential ramifications for the site's taxonomic collections and conservation ethos. While some advocate for such events as a catalyst to reinvigorate public interest in botanical spaces, others contend that they pose a significant threat to the ecological sanctuary and the BBG's fundamental conservation mandates.

Such issues possess significant potential as discursive material within the Socioscientific Issues (SSI) pedagogical framework. They necessitate not only a robust scientific understanding but also compel students to engage in critical inquiry, weigh multiple perspectives, and evaluate ethical dimensions alongside environmental sustainability. Prior research indicates that student engagement in SSI discussions, when augmented by field trips, can enhance critical thinking, scientific argumentation, and empathy towards ecological challenges (Shoba et al., 2023). Nevertheless, the majority of existing scholarship focuses on academic attainment as measured by summative test scores, with insufficient attention to students' underlying cognitive processes or learning profiles.

Furthermore, conceptual understanding transcends the mere memorisation of information; it encompasses the ability to synthesise disparate concepts, apply knowledge within authentic contexts—such as through field trips—and engage in the reflective abstraction of fundamental principles (Kelitubun et al., 2025) Although field trips and Socioscientific Issues (SSI) have been extensively examined as discrete pedagogical tools, empirical inquiry into their integration via local ecological cases remains notably sparse, particularly within the Indonesian *Madrasah Aliyah* setting. Consequently, there is a significant paucity of research addressing how this integrated approach influences students' motivational trajectories and their cognitive profiles as framed by Bloom's taxonomy.

Consequently, the present study seeks to address these research lacuna by integrating field-trip-based learning at the Bogor Botanical Gardens with socioscientific issues (SSI) rooted in authentic local ecological controversies. Departing from previous literature, this research extends beyond mere academic attainment to examine learning motivation and cognitive profiles across the various levels of Bloom's taxonomy. Furthermore, the study is situated within the *Madrasah Aliyah* context—a setting that remains significantly underrepresented in both field-trip and SSI scholarship. This investigation aims to evaluate the impact of an SSI-oriented field trip on students' motivation and biology learning outcomes, thereby providing novel empirical insights into meaningful, contextually relevant biological education.

RESEARCH METHOD

The research adopted a quasi-experimental methodology, specifically employing a non-equivalent control group design. Under this configuration, participants were divided into two cohorts: an experimental group exposed to the pedagogical intervention and a control group for comparative baseline analysis. Both groups were subjected to rigorous pre-test and post-test assessments to quantify changes in learning outcomes. Distinguishing this from a true experimental framework, the design utilised non-randomised participant allocation, thereby maintaining the integrity of existing classroom settings while addressing the practical constraints of the educational environment. (Abraham et al., 2022).

This study was implemented in two distinct phases, strategically designed to accommodate the school's biology curriculum constraints while maintaining a total field duration of 4.5 hours. The first phase involved systematic field observations at the Bogor Botanical Gardens. During this stage, students documented various ecosystem components using a Student Worksheet (LKPD), which functioned as a rigorous instrument for primary data collection.

The second phase transitioned into a Socioscientific Issues (SSI) deliberation conducted within a classroom setting. The discourse focused on the contemporary controversy of hosting music concerts within the botanical gardens' conservation area. Students, working in collaborative groups, were tasked with articulating a formal claim—either in support or opposition—which had to be substantiated by the empirical evidence gathered during their field observations.

This deliberative framework was specifically engineered to cultivate multi-perspective analysis, requiring students to evaluate the trade-offs between ecological preservation, economic interests, and

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social benefits. Moreover, students were challenged to project the long-term environmental consequences of such activities. This pedagogical flow ensured that, despite the brief field exposure, the intervention facilitated profound analytical depth by bridging the gap between raw empirical data and logical, evidence-based argumentation.

The study population comprised Year 10 students at a *Madrasah Aliyah Negeri* (MAN) in Bogor. Using a cluster sampling technique, intact class units were designated as research participants (Herlanti, 2020), yielding a sample of two cohorts: Class X1 as the control group (n = 28) and Class X2 as the experimental group (n = 29).

Primary data were gathered through two specialised instruments: a learning motivation inventory and a biology achievement test. The former utilised a Likert-scale questionnaire, while the latter consisted of a multiple-choice assessment systematically mapped to competency achievement indicators.

To validate the psychometric properties of these tools, pilot testing was conducted. The motivation scale, tested with 64 Year 10 students in Jakarta, yielded 20 valid items with a reliability coefficient of 0.657, confirming its internal consistency. Simultaneously, the achievement test was piloted with 36 Year 12 students in Bogor, producing 20 valid items with a robust reliability coefficient of 0.848. The conceptual framework of the learning motivation instrument is presented in Table 1.

Table 1. The Learning Motivation Instrument

Indicator	Item Number	Statement	Scale			
			4	3	2	1
Active in Learning	1	I participate diligently in biology learning activities.				
	2	I actively ask questions during biology lessons.				
	3	I always strive to complete the biology assignments given by the teacher accurately.				
	4	I feel free and confident to express my opinions during biology lessons.				
Enjoyment in Learning	5	Biology lessons are highly enjoyable when studying and directly observing nature.				
	6	I feel happy when the teacher praises me.				
	7	I enjoy working collaboratively with my group to complete the tasks set by the teacher.				
Perseverance in Learning	8	I do not easily give up when facing difficulties in learning biology.				
Motivation to Improve	9	I study even harder when I obtain a satisfying mark.				
Persistence in Facing Learning Difficulties	10	I continue to review the material repeatedly until I understand the teacher's explanation.				
Feedback and Response	11	I am interested and feel pleased when completing biology exercises set by the teacher.				
	12	I feel reluctant when given homework.				
Interest in Learning	13	I feel more enthusiastic about learning biology when there are additional learning experiences, such as field trips.				
	14	Direct observation during learning helps me to understand and engage more deeply with biology lessons.				
	15	I am interested in taking part in biology learning				

Indicator	Item Number	Statement	Scale 4	3	2	1
		outside the classroom, such as visits to national parks, botanical gardens, or museums.				
	16	I wish to study various organisms directly in their natural habitats, such as observing plants, animals, or microorganisms more closely.				
	17	I enjoy activities such as recording data, photographing species, or discussing findings with my peers during field trips.				
	18	Learning biology through field trips increases my curiosity about natural phenomena.				
	19	Visiting specific locations helps me to understand biological concepts (e.g., ecosystems, food chains, or life cycles) better than reading books or listening to classroom explanations.				
	20	I agree that field trips should be conducted more frequently to support the understanding of other biology topics.				

The collected data were analysed using both descriptive and inferential statistical techniques. Descriptive statistics were used to summarise students' learning motivation and learning outcomes by reporting mean scores and percentage changes. All statistical analyses were conducted using SPSS software (version 26). Before hypothesis testing, prerequisite analyses were conducted on the pre-test scores for the learning outcomes. The results of the normality test indicated that the data were not normally distributed ($p = 0.254$ for the control group; $p = 0.042$ for the experimental group). Accordingly, a Mann–Whitney U test was applied, which revealed a significant difference in students' initial abilities between the two groups ($p = 0.015 < 0.05$). To minimise potential bias arising from these initial differences, subsequent analyses were conducted using Gain scores, following the approach proposed by Herlanti (2020). The Gain score data met the assumptions for parametric testing, as they were normally distributed ($p = 0.224$ for the control group; $p = 0.235$ for the experimental group) and exhibited homogeneity of variance. An independent-samples *t*-test was therefore applied to examine the difference in the mean Gain scores for learning outcomes between the control and experimental groups.

A similar analytical procedure was applied to the learning motivation data. The results of the normality test showed that the data were normally distributed ($p = 0.124$ for the control group; $p = 0.082$ for the experimental group), and Levene's test confirmed the homogeneity of variances. The independent-samples *t*-test was used to examine differences in students' learning motivation between the control and experimental groups following the intervention.

RESULT AND DISCUSSION

Evidence from observational field notes, synthesised throughout the instructional period, highlights pronounced pedagogical disparities between the two cohorts. While conventional collaborative discussions characterised the control group's learning, the experimental group engaged in an immersive, field-based inquiry at the Bogor Botanical Gardens. Although both groups addressed the curriculum unit 'Components of Ecosystems and Their Roles' across three sessions, distinct variations emerged regarding student engagement, instructional modalities, and interpersonal dynamics during the planning, implementation, and evaluation phases. The specific procedural divergences between the control and experimental groups are comprehensively detailed in Table 2.

Table 2. Description of Learning Activities in the Control and Experimental Classes

	Control	Experimental
Planning	- Applied a group discussion method. - Developed a teaching module, Student Worksheet (LKPD), pre-test, and post-test.	- Applied a field trip method. - Developed a teaching module, Student Worksheet (LKPD), pre-test, and post-test. - Integrated classroom and field-based activities.
Implementation	Three classroom sessions: **a. Session 1:** Pre-test and group discussion in class to complete the LKPD. **b. Session 2:** Presentation of group discussion results in class. **c. Session 3:** Socioscientific issue (SSI) discussion between groups.	Three sessions: **a. Session 1:** Pre-test and field observation. **b. Session 2:** Presentation of group discussion results in class. **c. Session 3:** Socioscientific issue (SSI) discussion between groups.
Evaluation	- Post-test of learning outcomes. - Learning motivation questionnaire.	- Post-test of learning outcomes. - Learning motivation questionnaire.

As illustrated in Table 2, the procedural divergence between the control and experimental groups was confined to Session 1. In this session, students presented group findings derived from information exploration and field observations at the Bogor Botanical Garden. By the third session, both groups engaged in Socioscientific Issues (SSI) discussions. The instructional sequence for the control group commenced with collaborative information retrieval and presentations, culminating in a debate on the 'Sunset Concert' controversy at the Botanical Garden. Such exploratory activities, whether conducted individually or collectively, are essential for consolidating students' prior knowledge before engaging in complex SSI discussions (Herlanti et al., 2023; Mardiati et al., 2022).

The experimental group adopted a distinct approach, beginning with contextual observations within the botanical garden. Students were allowed to explore the garden firsthand and present their findings before engaging in a discussion on the local socioscientific phenomenon: the controversy surrounding the 'Sunset Music Concert' at the Bogor Botanical Garden. This intervention represents a novel contribution to the field; at the same time, previous studies have extensively integrated Socioscientific Issues (SSI) with problem-based learning (Sandy Pamungkas et al., 2025) or laboratory-based inquiry (Putra, 2022). The use of direct, field-based contextual exploration remains less explored.

Descriptive statistical analysis revealed a positive trajectory in learning achievement across both cohorts. Although the experimental group had a higher baseline mean (M = 69.31) than the control group (M = 57.32), both groups showed substantial progress following the instructional intervention. Notably, this advancement was more significant within the experimental group, which reached a post-test mean of 81.55, compared to 76.25 in the control group. These data, as detailed in Table 3, lend

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support to the premise that a field-trip-based pedagogical framework enhances students' biological learning outcomes.

Table 3. Descriptive Statistics for the Pre-test and Post-test

Group	Pre-test				Post-test			
	Mean	SD	Median	Mode	Mean	SD	Median	Mode
Control	57,32	20,25	55	50	76,25	13,30	80	85
Experimental	69,31	16,56	65	60	81,55	18,66	85	100

Preliminary normality assessments indicated that while the control group's pre-test scores followed a normal distribution (p = 0.254), the experimental group's distribution was significantly non-normal (p = 0.042). Furthermore, post-test scores for both the control (p = 0.024) and experimental (p = 0.002) cohorts deviated from normality. Subsequent analysis using a Mann–Whitney U test confirmed a statistically significant difference between the two groups at baseline (p = 0.015), suggesting an initial asymmetry in participants' cognitive starting points. Consequently, to mitigate potential confounding bias arising from these baseline inequalities, the analysis used Gain scores—calculated as the difference between post-test and pre-test outcomes—to ensure a more robust evaluation of the instructional impact.

To ensure the analytical integrity of the findings, the Gain scores underwent rigorous diagnostic testing. Normality assessments confirmed that the Gain data for both the control and experimental cohorts conformed to a normal distribution. Additionally, Levene's test indicated homogeneity of variance between the two groups, satisfying the assumptions for parametric analysis. Consequently, an Independent Samples T-test was performed on the Gain scores to evaluate the significance of the observed disparities. This approach enabled a robust assessment of the instructional efficacy of the field-trip-based intervention, accounting for students' baseline performance while isolating the impact of the experimental treatment on biological learning outcomes.

The absence of a statistically significant divergence between the control and experimental cohorts may be ascribed to several intersecting factors, most notably the temporal constraints of the field-based intervention. Deep, meaningful learning within a scientific inquiry paradigm requires an expansive timeframe to ensure that each stage—from empirical observation to the synthesis of conclusions—is carried out with sufficient depth (Lamatenggo, 2020). Furthermore, a notable asymmetry was observed in the participants' baseline aptitudes; the experimental group exhibited inherently higher entry-level proficiency. This was evidenced by marginally superior pre-test performance and more robust cognitive engagement during the study's introductory phases. A nuanced understanding of these initial learner characteristics is essential, as it enables the differentiation of individual abilities and provides the foundational insights required to orchestrate more sophisticated learning management strategies (Magdalena et al., 2024).

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The evaluation spanned the cognitive hierarchy from levels C1 through C5. Comparative results indicate that both cohorts achieved comparable outcomes within the C1 (Knowledge) and C5 (Evaluation) domains. However, the experimental group demonstrated a marked superiority in the C2 (Comprehension) and C3 (Application) domains, suggesting that the field-trip methodology is exceptionally effective in cultivating contextual understanding and the pragmatic translation of conceptual knowledge. Conversely, the control group outperformed their experimental counterparts in the C4 (Analysis) domain—a divergence potentially attributable to the more rigorous and systematically structured nature of classroom-based collaborative discourse. Collectively, these findings suggest that each pedagogical modality possesses distinct affordances for specific cognitive dimensions, as illustrated in Figure 1.

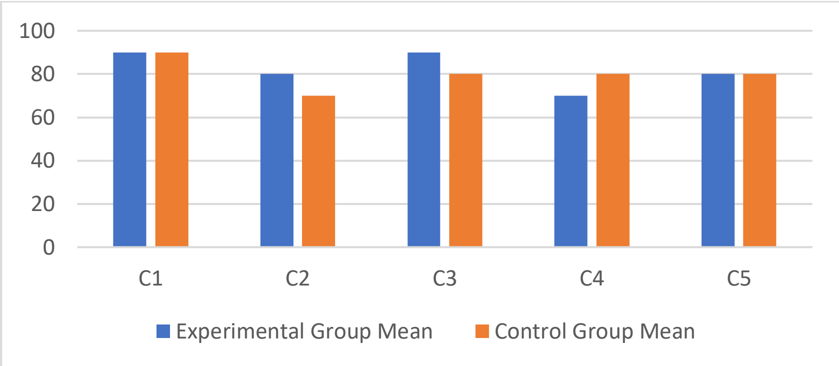

Figure 1. Comparison of mean test scores across cognitive domains

Viewed through a cognitive lens, the distribution of learning outcomes across Bloom's taxonomy (C1–C5), as delineated in Figure 1, highlights a clear pedagogical divergence. The experimental group's marked proficiency in the C2 (Comprehension) and C3 (Application) domains suggests that the field-trip-based intervention significantly catalysed students' ability to internalise abstract concepts and apply them to authentic ecological landscapes. Direct immersion within the ecosystemic complexity of the Bogor Botanical Gardens empowered learners to observe, categorise, and reconcile theoretical constructs with empirical phenomena, thereby consolidating conceptual meaning-making and pragmatic utility. This evidence converges with the principles of Contextual Teaching and Learning (CTL), which postulate that meaningful cognition is achieved by anchoring academic curricula in tangible, real-world experiences (Trisniawati, 2015). Moreover, it underscores Vygotsky's constructivist paradigm, in which knowledge is dynamically co-constructed through social mediation and profound environmental engagement during experiential, field-based inquiries (Tamrin et al., 2011).

Conversely, the control cohort achieved superior scores in the C4 (Analysis) domain, indicating that structured collaborative discourse is arguably more effective at fostering rigorous analytical reasoning. The systematic framework of classroom-based discussions required students to deconstruct complex information, interrogate conceptual interdependencies, and evaluate ecosystemic relationships through symbolic and textual abstractions rather than empirical

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observation. Such guided analytical trajectories provide the essential cognitive scaffolding required to sustain higher-order thinking, particularly when learners are prompted to justify arguments, critique peer perspectives, and collaboratively synthesise disparate data (Novita et al., 2016). Pedagogically, the absence of the multifaceted environmental stimuli inherent in field-based settings may have facilitated a more intensive cognitive focus on abstract logic, thereby enhancing the students' capacity for deep analytical performance.

Furthermore, both cohorts exhibited comparable achievement within the C1 (Remembering) and C5 (Evaluating) domains. This parity suggests that factual retention was effectively facilitated across both instructional modalities; however, the cultivation of evaluative proficiency appears to require more sustained, longitudinal pedagogical interventions. The mastery of reflective judgement and critical appraisal likely requires iterative exposure and protracted opportunities for cognitive refinement—elements that may extend beyond the temporal scope of the field-based inquiries and collaborative discourse sessions conducted in the present study.

The analytical competencies of the control cohort were significantly bolstered through their engagement with a pertinent Socioscientific Issue (SSI)—specifically, the controversial 'Sunset at the Gardens' music concert held at the Bogor Botanical Gardens. Students in the control group exhibited a more pronounced level of discursive enthusiasm during these deliberations than their experimental counterparts. This heightened engagement was quantified by participation metrics: nine students in the control class contributed their perspectives, compared to eight in the experimental group; more critically, the cumulative volume of articulated opinions in the control cohort notably surpassed that of the experimental group. The iterative group discussion protocols established in the preliminary sessions functioned as essential pedagogical scaffolds, effectively equipping students with the rhetorical and evaluative tools required for the formal debate in the final session.

The C4 level constitutes a pivotal juncture in the architecture of critical thinking. Discourse centred on Socioscientific Issues (SSI) serves as a catalyst for higher-order competencies, including rigorous problem deconstruction, the appraisal of evidentiary credibility, and the synthesis of strategic solutions (Chomsun et al., 2024). In this study, SSI deliberations empowered students to critically interrogate the ecological repercussions of the 'Sunset at the Gardens' concert, specifically regarding habitat fragmentation, anthropogenic waste pressures, and acoustic pollution. Such pedagogical frameworks not only elevate environmental literacy but also cultivate profound emotional resonance with contemporary global challenges (Zeidler et al., 2005). Concurrently, descriptive analyses of affective outcomes revealed that the experimental cohort achieved marginally higher motivation scores across several indices than the control group. This disparity underscores the intrinsic potential of field-based inquiries to bolster student engagement and volitional learning, as delineated in Figure 2.

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intrinsic potential of field-based inquiries to bolster student engagement and volitional learning, as delineated in the comparative data in Figure 2.

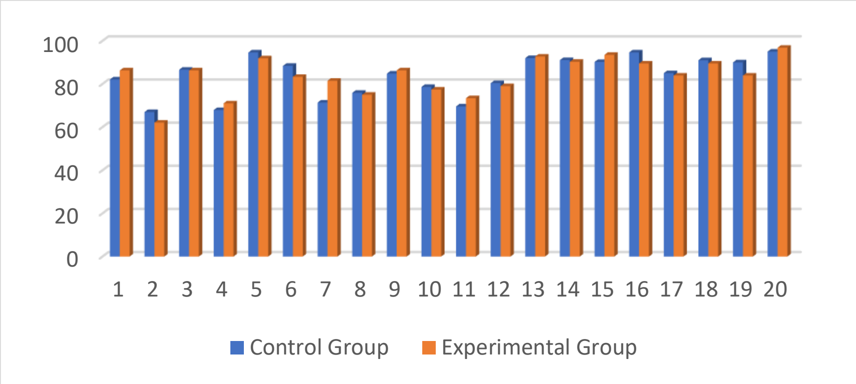

Figure 2. Results of the Learning Motivation Questionnaire

Preliminary normality testing, performed using the Shapiro–Wilk test, confirmed that the datasets for both cohorts followed a normal distribution ($p > 0.05$). Building upon this, an assessment of homoscedasticity was performed using Levene's Test, which established that the variances between the two groups were homogeneous ($p = 0.739 > 0.05$). Consequently, an Independent Samples t-test was conducted; the results showed no statistically significant difference between the control and experimental groups ($p = 0.719 > 0.05$). These inferential statistical parameters are comprehensively detailed in Table 4.

Table 4. Independent Samples *t*-Test Results for Learning Motivation

Levene's Test Sig.	t	df	Sig. (2-tailed)	Mean Difference
0,739	0,362	57	0,719	0,590

To augment the quantitative findings, qualitative insights derived from student interviews were employed as corroborative evidence. Deliberations with five representatives from the control cohort revealed a discernible enthusiasm for participating in field-based pedagogical interventions. While these individuals had previously frequented the Bogor Botanical Gardens, their prior engagements were predominantly recreational, devoid of the rigorous scaffolding provided by formal instructional tools such as structured worksheets. Nevertheless, these informal excursions facilitated early environmental immersion; moreover, exposure to botanical interpretive signage may have catalysed incidental learning, potentially shaping the students' baseline conceptual frameworks before the study.

Consistent with the quantitative evidence, participants in the control cohort demonstrated a coherent understanding of fundamental ecosystemic components, as evidenced by their ability to identify complex interspecies interactions—most notably the commensal relationship between epiphytic orchids and their arboreal hosts. These qualitative findings suggest that prior informal engagement with the Bogor Botanical Gardens may be associated with students' baseline ecological literacy. Nevertheless, in view of the constrained interview sample and the exploratory remit of these

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qualitative enquiries, such observations warrant cautious interpretation; they should not be construed as empirical evidence of a direct causal nexus regarding the students' learning motivation.

Reflections gathered from the experimental cohort suggest that the field-trip intervention was perceived as a profoundly more stimulating pedagogical experience. Participants articulated that the instructional process was considerably more immersive and less repetitive when facilitated through direct engagement with biological phenomena *in situ*. Rather than indicating a definitive quantitative increase in learning motivation, these qualitative insights illuminate students' favourable perceptions of the experiential learning environment. This interpretation is consistent with the tenets of Contextual Teaching and Learning (CTL), which holds that anchoring academic concepts in authentic, real-world contexts is instrumental in catalyzing meaningful cognitive assimilation (Kadir, 2013).

This tendency was further evidenced by the relatively high level of consensus regarding questionnaire items such as: *'I feel enthusiastic about learning biology when supplemented by additional resources, such as field trips'*; *'I am interested in engaging in extracurricular instructional activities'*; and *'Field trips should be integrated more frequently into the curriculum'*. Collectively, these observations suggest that immersive and contextual learning environments are positively associated with favourable motivational orientations. This is consistent with prior scholarship, which indicates that such pedagogical frameworks foster engagement without necessarily implying a direct causal nexus with quantitative shifts in student motivation (N. Azizah et al., 2021).

CONCLUSION

This inquiry evaluated the pedagogical efficacy of integrating a field-trip intervention at the Bogor Botanical Gardens with Socioscientific Issues (SSI) discourse in biology education. Quantitative assessments revealed commendable improvements in learning outcomes across both cohorts, though there was no statistically significant difference between the experimental and control groups. However, a granular analysis based on Bloom's Taxonomy delineated distinct cognitive affordances: the experimental cohort demonstrated relatively superior proficiency in the domains of understanding (C2) and application (C3), whereas the control group exhibited more robust analytical competencies (C4).

Qualitative evidence indicates that the experimental cohort perceived field-based pedagogy as a profoundly more immersive and stimulating experience, thereby facilitating more meaningful cognitive engagement. Nevertheless, no statistically significant divergence in learning motivation was established between the groups. From an instructional standpoint, excursions to the Bogor Botanical Gardens may serve as an effective complementary strategy to bolster contextual comprehension and affective engagement, particularly when integrated with socioscientific discourse. This study is, however, constrained by the relatively brief duration of the field intervention, the modest sample size, and heterogeneities in the students' baseline knowledge—variables that warrant further investigation through more extensive longitudinal research.

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SCIENTIFIC IMPACT AND CONTRIBUTION

This research offers a substantive contribution to the advancement of biological pedagogy. Theoretically, the integration of Socioscientific Issues (SSI) with field-based learning establishes a robust cognitive synergy, in which empirical field observations solidify conceptual comprehension (C2), and SSI-driven deliberation serves as the critical catalyst for elevating students' analytical proficiency (C4). Practically, this instructional design provides a strategic framework for educators to navigate curricular time constraints. It demonstrates that brief, high-intensity field exposure, when paired with authentic SSI discourse in the classroom, yields a profound and cognitively demanding learning experience. Regarding policy, these findings advocate for the strategic re-positioning of local ecological sites, such as the Bogor Botanical Gardens, to be utilised not merely as excursion venues but as 'living laboratories'. Such an approach is essential for fostering scientific literacy that is deeply rooted in both ecological reality and social responsibility.

BIBLIOGRAPHY

Abraham, I., & Supriyati, Y. (2022). Desain Kuasi Eksperimen Dalam Pendidikan: Literatur Review. *Jurnal Ilmiah Mandala Education (Jime)*, *8*(3), 2442–9511. Doi: 10.36312/Jime.V8i3.3800/

Afriani, A. (2018). Pembelajaran Kontekstual (Contekstual Teaching And Learning) Dan Pemahaman Konsep Siswa. *Jurnal Al-Muta'aliyah STAI Darul Kamal NW Kembang Kerang*, *3*.

Amini, R. (2015). Outdoor Based Environmental Education Learning And Its Effect In Caring Attitude Toward Environment. *Jurnal Pendidikan IPA Indonesia*, *4*(1), 43–47. Doi: 10.15294/Jpii.V4i1.3500

Azizah, N., & Alberida, H. (2021). Seperti Apa Permasalahan Pembelajaran Biologi Pada Siswa SMA? *Journal For Lesson And Learning Studies*, *4*(3), 388–395. Retrieved From Https://Ejournal.Undiksha.Ac.Id/Index.Php/JLLS

Azizah, N. N., Zainah, N. Y., & Suprianta, A. (2023). Inventarisasi Tumbuhan Famili Cactaceae Di Kawasan Wisata Kebun Raya Bogor. *Jurnal Insan Pendidikan Dan Sosial Humaniora*, *1*. Doi: Https://Doi.Org/10.59581/Jipsoshum-Widyakarya.V1i3.773

Budiarti, T. (2009). Kebun Raya Bogor Dan Kebun Wisata Ilmiah Dalam Perspektif Wisata Pendidikan Dan Sejarah Pertanian. *Prosiding Seminar Nasional 2009*.

Chomsun, S., Pratiwi, D., & Rosa, F. O. (2024). Membangun Literasi Sains Melalui Pengembangan E-Lkpd Berbasis Socio-Scientific Issues. In Jurnal Pendidikan Dan Pembelajaran IPA Indonesia (Vol. 14, Issue 3).

Fauzia, H. D. (2022). *Pengembangan E-Flashcard Koleksi Tumbuhan Tua Kebun Raya Bogor Sebagai Media Pembelajaran Pada Materi Dunia Tumbuhan Kelas X*. Skripsi. UIN Syarif Hidayatullah Jakarta.

Handayani, T. (2020). *Prosiding Seminar Nasional Biologi FMIPA UNM Kebun Raya Bogor Sebagai Laboratorium Alam Sumber Penelitian Dan Pembelajaran Biologi Tumbuhan Bogor Botanical Gardens As A Natural Laboratory For Plant Biology Research And Learning Resources*. Retrieved From Https://Rumus.Co.Id/Cabang-Cabang-Biologi/

Herlanti, Y., Rustaman, N., Fitriani, A., & Rohman, I. (2023). Utilizing Social Media In Socioscientific Issues Discussion To Improve Argumentative Skills And Microbial Literacy. *Jurnal Inovasi Pendidikan IPA*, *9*(1), 84–94. Doi: 10.21831/Jipi.V8i1.57910

Kadir, A. (2013). Konsep Pembelajaran Kontekstual Di Sekolah. *Dinamika Ilmu*, *13*(3). Retrieved From Http://Irfarazak.Blogspot.Com/2009/04/Model-Pembelajar

Kelitubun, A., Sumampouw, H. M., & I M Ogi, N. L. (2025). Studi Deskriptif Tentang Tingkat Pemahaman Konsep Keanekaragaman Hayati Dan Implikasinya Dalam Pembelajaran Biologi Di SMA Negeri 1 Pineleng. *Jurnal Pendidikan, Kimia, Fisika, Dan Biologi*, *1*(4), 54–71. Doi: 10.61132/Jupenkifb.V1i4.419

Lamatenggo, N. (2020). *Strategi Pembelajaran*. Gorontalo: Universitas Negeri Gorontalo.

Magdalena, I., Sholihats, S. A., Kamila, F. R., & Lubis, R. D. (2024). Mengidentifikasi Perilaku Dan Karakteristik Awal Peserta Didik. *Sindoro Cendikia Pendidikan*, *3*(4), 101–112.

Mardiati, Y., Herlanti, Y., & Qodriyah, A. L. (2022). Student Argumentation Skills' Analysis On The Discussion Of Socioscientific Issues In The Concept Of Viruses. *Jurnal Biolokus: Jurnal Penelitian Pendidikan Biologi Dan Biologi*, *5*(2).

Mutiara. (2021). Pemanfaatan Penggunaan Lingkungan Alam Sekitar Sebagai Media Pendukung Pembelajaran IPA Di MI/SD. *Jurnal Pendidikan Guru Madrasah Ibtidaiyah*, *4*(2), 2021–2104.

Novita, S., Santosa, S., & Rinanto, Y. (2016). Perbandingan Kemampuan Analisis Siswa Melalui Penerapan Model Cooperative Learning Dengan Guided Discovery Learning The Comparison Of Student Analitycal Thinking Between The Implementation Of Cooperative Learning And Guided Discovery Learning Model. *Procceding Biology Education Conference*, *13*(1), 359–367.

Putra, I. M. T. P. (2022). Kajian Literatur Sistematis: Integrasi Model Inkuiri Berbasis Socioscientific Issues Pada Pembelajaran IPA. *Jurnal Pendidikan Mipa*, *12*(3).

Raharjo, P., Yuslim, S., Indrawati, E., & Seanders, O. (2024). Studi Penyediaan Fasilitas Pada Zona Pemanfaatan Sebagai Wisata Edukasi Di Kebun Raya Balikpapan (KRB), Kota Balikpapan, Provinsi Kalimantan Timur. *Jurnal Ilmu Lingkungan*, *22*(5), 1308–1315. Doi: 10.14710/Jil.22.5.1308-1315

Sadler, T. D., & Zeidler, D. L. (2004).). The Morality Of Socioscientific Issues: Construal And Resolution Of Genetic Engineering Dilemmas. *Science Education*, *88*(1), 4–27.

Sandy Pamungkas, Z., Budi Prasetya, F., Aini, M., Dwi Rakhmawan Amrullah, J., Puspita Kartika Sari, E., Dewi Sumiati, I., Artikel, I., & Artikel, G. (2025). Problem Based Learning Bermuatan SSI Sebagai Pemberdayaan Kemampuan Pemecahan Masalah Siswa Pada Pembelajaran IPA: Kerangka Konseptual. *Al Kawnu: Science And Local Wisdom Journal*, *4*, 1–15. Doi: 10.18592/Ak.V4i2.16122

Shoba, T. M., Hardianti, R. D., & Pamelasari, S. D. (2023). Penerapan Pendekatan Socio-Scientific Issue (Ssi) Berbantuan Modul Elektronik Terhadap Kemampuan Berpikir Kritis Siswa. *Seminar Nasional IPA XIII*, 571–579.

Tamrin, M., Fatimah, S., Sirate, S., & Yusuf, D. M. (2011). Teori Belajar Konstruktivisme Vygotsky Dalam Pembelajaran Matematika. *Suara Intelektual Gaya Matematika*, *3*(1), 40–47.

Trisniawati. (2015). Pembelajaran Kontekstual (Contextual Teaching And Learning) Pada Bangun Ruang Sisi Datar Di Sekolah Dasar. *Jurnal Pendidikan Ke-SD-An*, *1*(3), 146–155.

Wayan Suja, I. (2019). Pendekatan Saintifik Dalam Pembelajaran. *Universitas Pendidikan Ganesha*, 1–9.

Wongsri, P., & Nuangchalerm, P. (2010). Learning Outcomes Between Socioscientific Issues-Based Learning And Conventional Learning Activities. *Journal Of Social Sciences*, *6*(2), 240–243.

Zeidler, D. L., Sadler, T. D., Simmons, M. L., & Howes, E. V. (2005). Beyond STS: A Research-Based Framework For Socioscientific Issues Education. *Science Education*, *89*(3), 357–377. Doi: 10.1002/Sce.20048