

Digital learning preferences and ecological literacy among students in Indonesian Islamic EFL higher education

Annim Hasibuan^{1*}, Amron Zarkasih Ritonga², Zulpahri Nainggolan³, Arif Bulan⁴

Email: annimhasibuan@gmail.com^{1*}

^{1,2,3}Study Program of Indonesian Language and Literature Education, Universitas Islam Labuhan Batu, Indonesia, ⁴Study Program of English Education, STKIP Yapis Dompu, Indonesia

ABSTRACT

This study examines digital learning preferences and ecological literacy among EFL undergraduate students in an Indonesian Islamic higher education context. It specifically investigates students' preferred digital learning environments, their level of ecological literacy, the relationship between digital learning preferences and ecological literacy, and their perceptions of integrating ecological issues into digitally mediated English language learning. A sequential explanatory mixed-methods design was employed with 49 undergraduate students who completed the Digital Learning Preferences Scale (DLPS) and the Ecological Literacy Scale (ELS), followed by semi-structured interviews with three purposively selected students. Quantitative data were analyzed using descriptive statistics and Pearson correlation analysis, while qualitative data were analyzed through thematic analysis. The findings indicate that students showed strong preferences for mobile devices, multimedia materials, and online learning platforms. The results also showed a relatively strong level of ecological literacy, particularly in relation to environmental awareness, environmental responsibility, and local issues such as deforestation and flooding. Pearson correlation analysis revealed a statistically significant moderate positive relationship between moderate positive association and ecological literacy ($r = 0.493$, $p < .001$), suggesting that students with stronger moderate positive association tended to report higher ecological literacy. The interview findings further highlighted the role of Islamic values in shaping students' environmental responsibility. Overall, the study suggests that integrating ecological themes into digitally mediated English language learning, particularly through an Eco-ELT approach, may support both language development and environmental literacy in Islamic higher education.

ARTICLE INFO

Received 12 March 2026

Revised 9 April 2026

Accepted 22 May 2026

KEYWORDS

digital learning; Eco-ELT; ecological literacy; EFL students; Islamic values

How to cite: Hasibuan, A., Ritonga, A. Z., Nainggolan, Z., & Bulan, A. (2026). Digital learning preferences and ecological literacy among students in Indonesian Islamic EFL higher education. *Pedagogy: Journal of English Language Teaching*, 14(1), 115-135. <https://doi.org/10.32332/joelt.v14i1.13218>

This is an open-access article under the CC BY-SA license <https://creativecommons.org/licenses/by-sa/4.0/>

Introduction

The rapid development of digital technology has significantly transformed teaching and learning practices in higher education, including in English as a Foreign Language (EFL) contexts. Digital learning environments enable students to access learning materials through multiple platforms such as mobile applications, learning management systems, and multimedia resources (Amin & Sundari, 2020; Ardiansyah & Adisan, 2025). These technologies provide opportunities for more flexible, interactive, and student-centered learning experiences. Previous studies suggest that digital learning tools can enhance learner autonomy, engagement, and access to authentic language resources when appropriately integrated into language instruction (Mohebbi, 2025; Salih & Omar, 2024; L. Yuan & Liu, 2025). As a result, understanding students' preferences toward digital learning has become increasingly important for designing effective English language instruction in contemporary higher education.

In EFL classrooms, students' digital learning preferences play a crucial role in determining how effectively technology supports language acquisition. Research indicates that learners often favor digital formats that allow multimedia exposure, collaborative interaction, and self-paced learning opportunities (Bulan et al., 2025; Pikhart et al., 2024; Pratiwi & Trisanti, 2025; Vo, 2025; Xu, 2025; Zadorozhnyy et al., 2025). Mobile learning (Y. Yuan et al., 2025), interactive multimedia (Nurlaela et al., 2024), and learning management systems (LMS) (Duc-Hanh et al., 2025) have become common tools in language education, allowing students to access learning materials anytime and anywhere. However, learners differ in their technological preferences and engagement patterns, which may influence how they interact with digital learning resources. Consequently, identifying dominant digital learning preferences among EFL students is essential for developing instructional materials that align with their learning habits and expectations.

From a theoretical perspective, the relationship between digital learning preferences and ecological literacy can be understood through the lens of constructivist learning theory and technology-enhanced learning. Digital learning environments provide access to rich, multimodal content that can facilitate deeper cognitive engagement and meaning-making processes. When students engage with digital platforms that align with their preferences, they are more likely to interact actively with learning materials, including content related to environmental issues. This increased engagement may support the development of higher-order thinking, critical reflection, and awareness of real-world problems, which are essential components of ecological literacy. Therefore, students' digital learning preferences are not only related to how they learn language, but also to how they process and internalize interdisciplinary knowledge, including environmental concepts.

At the same time, higher education institutions are increasingly expected to contribute to environmental awareness and sustainability education. Ecological literacy, which refers to individuals' understanding of environmental systems, environmental issues, and sustainable behaviors, has become a crucial competence for addressing global environmental challenges (Kazazoglu, 2025; UNESCO, 2012; Zaimoğlu, 2024). Ecological

literacy encompasses not only environmental knowledge but also awareness, attitudes, and pro-environmental behavior (Damico et al., 2020; Micalay-Hurtado & Poole, 2022; Sumarmi et al., 2021). Universities therefore play an important role in fostering ecological awareness among students so that they can actively participate in solving environmental problems in their communities.

Within the field of language education, scholars have begun to explore the integration of environmental themes into English language teaching through approaches such as Eco-ELT (Ecological English Language Teaching) (Bulan et al., 2025; Saiful, 2020, 2023; Stibbe, 2015). Eco-ELT encourages language learning through environmentally relevant topics, enabling students to develop both linguistic competence and ecological awareness simultaneously (Saiful, 2020, 2023, 2024). Through environmentally themed reading materials, discussions, and project-based activities, English classes can serve as a platform for raising students' awareness of environmental issues (Kalsum et al., 2025; Turner-Hill et al., 2021; Xiong, 2014). Integrating ecological themes into digital learning environments may further enhance students' engagement while simultaneously promoting sustainability-oriented values.

The relevance of ecological literacy is particularly evident in regions experiencing environmental challenges. In *Kabupaten Labuhanbatu*, North Sumatra, flooding has become a recurring environmental problem affecting local communities. Such environmental events highlight the importance of environmental awareness and responsible behavior among young people, including university students. In Islamic higher education contexts, environmental responsibility is also closely related to religious values that emphasize stewardship of the Earth (Hajar, 2024; Husamah et al., 2025). Therefore, integrating ecological perspectives into English language learning may not only improve students' language competence but also strengthen their environmental responsibility within a religious and cultural framework.

Despite growing interest in both digital learning and environmental education, few studies have examined how EFL students' digital learning preferences are associated with ecological literacy, particularly in Indonesian Islamic higher education. Previous research has generally examined technology integration in language learning (Bulan et al., 2024; Huang & Liu, 2025; Sari & Abrar, 2024) and environmental education (Jickling & Wals, 2008; Kazazoglu, 2025; Putri, 2018; Rabbianty et al., 2025) as separate areas of inquiry. This separation leaves an important gap in understanding how digitally mediated English learning may support ecological awareness within religious and sociocultural contexts.

To address this gap, the present study is guided by an integrated conceptual framework that connects digital learning preferences, ecological literacy, Eco-ELT, and Islamic values. In this framework, digital learning preferences are understood as learner-related factors that influence how students access, engage with, and respond to digital English learning materials. Ecological literacy refers to students' knowledge, awareness, and sense of responsibility toward environmental issues. Eco-ELT provides the pedagogical approach through which ecological themes are incorporated into English language learning,

allowing students to engage with environmental issues while developing language skills. Islamic values, meanwhile, offer an ethical and contextual foundation for understanding environmental responsibility as part of moral conduct and stewardship. The framework therefore assumes that students' preferred digital learning formats may support their engagement with ecological content, while Eco-ELT structures this engagement pedagogically and Islamic values contextualize it ethically. Through this connection, the study examines digital learning not only as a technological preference, but also as a possible pathway for developing ecological literacy within a value-based EFL learning context.

Accordingly, this study contributes to EFL scholarship by positioning digital learning preferences not merely as a matter of technology use, but as a pedagogical entry point for sustainability-oriented and value-based language education. While previous studies have often examined digital learning and ecological literacy as separate areas of inquiry, this study brings them together within the specific context of Indonesian Islamic higher education. Its novelty lies in exploring how students' preferences for digital learning environments relate to their ecological literacy and how Islamic values may shape their understanding of environmental responsibility in English language learning. By examining these issues, the study offers a more contextualized understanding of how digital English learning materials can be designed to support language development, ecological awareness, and culturally responsive pedagogy. This focus leads to the present study's research questions concerning students' digital learning preferences, their level of ecological literacy, the relationship between the two constructs, and their perceptions of integrating ecological issues into digitally mediated EFL learning.

Based on these objectives, the study addresses the following research questions:

1. What are the dominant digital learning preferences among EFL undergraduates in an Indonesian Islamic higher education context?
2. What is the level of ecological literacy among EFL undergraduates in an Indonesian Islamic higher education context?
3. Is there a significant relationship between EFL undergraduates' digital learning preferences and ecological literacy?
4. How do EFL undergraduates perceive the integration of ecological issues into digitally mediated English language learning in an Islamic higher education context?

Literature Review

The rapid advancement of digital technologies has significantly influenced the landscape of English as a Foreign Language (EFL) education. Digital learning environments provide learners with access to a wide range of online resources, multimedia materials, and interactive platforms that support language acquisition. In many higher education contexts, digital tools such as mobile applications, online learning platforms, and multimedia resources have become integral components of language instruction (Mirza et al., 2025). Digital learning environments can create flexible learning opportunities and support learner-centered approaches, enabling students to access authentic language input and

engage in communication beyond the traditional classroom setting (Kukulska-Hulme, 2009; Kukulska-Hulme et al., 2023).

Furthermore, digital technologies facilitate the development of various language skills through interactive and multimodal learning experiences. Digital platforms enable students to practice listening, reading, speaking, and writing using authentic materials such as videos, podcasts, and online discussions. Digital tools support language learning by providing immediate feedback, promoting learner autonomy, and enabling collaborative learning activities (Noori, 2025; Qosimova & Khamidova, 2025). While these findings confirm the pedagogical benefits of digital learning, most studies primarily emphasize technological effectiveness and language outcomes, with limited attention to how digital learning may support broader competencies such as ecological literacy.

Closely related to the use of technology in language education is the concept of digital learning preferences, which refer to students' tendencies and choices in using digital technologies during their learning process. Learners may demonstrate different preferences regarding the types of digital platforms, learning formats, and technological tools they use. Some students may prefer mobile learning environments, while others may favor multimedia-based materials or structured learning platforms such as learning management systems. Previous studies suggest that aligning instructional strategies with students' learning preferences can increase engagement and improve learning outcomes (Bulan et al., 2025; Kukulska-Hulme et al., 2023).

In this study, digital learning preferences are conceptualized through several dimensions, including preferences for mobile learning, multimedia-based learning, interactive digital activities, online collaboration, and the use of learning management systems. These dimensions reflect students' patterns of engagement with digitally mediated learning environments and their perceived effectiveness in supporting language learning. The Digital Learning Preference Scale (DLPS) used in this study was adapted from previous technology-enhanced learning research that examined students' interactions with digital learning platforms and instructional media (Mizumoto et al., 2016).

Research also indicates that contemporary students tend to favor flexible and technology-mediated learning environments, where mobile devices, multimedia resources, and online collaborative tools support self-directed and interactive learning. However, existing studies on digital learning preferences have mainly focused on engagement, satisfaction, and language performance. Less attention has been given to whether these preferences are related to interdisciplinary learning outcomes such as ecological literacy. This limitation is important because ecological literacy requires not only access to environmental information but also active engagement, reflection, and value formation.

Alongside technological developments in education, the concept of ecological literacy has gained increasing attention in recent years (Bleazby et al., 2023; Bulan et al., 2025; Maghfiroh et al., 2025). Ecological literacy refers to an individual's ability to understand ecological systems and recognize the relationships between human activities and environmental sustainability. In this study, ecological literacy is treated as a

multidimensional construct that encompasses ecological knowledge, environmental awareness, attitudes toward sustainability, and environmentally responsible behavior. Thus, ecological literacy is not limited to cognitive understanding of environmental issues, but also includes affective and behavioral dimensions that influence individuals' ecological responsibility and sustainable actions (Maghfiroh et al., 2025). Individuals with higher levels of ecological literacy are therefore expected to demonstrate not only knowledge of environmental problems, but also positive environmental attitudes and active participation in sustainable practices within their communities.

Ecological literacy is closely connected to environmental education in higher education, where universities play a significant role in promoting sustainability awareness. Environmental education aims to develop students' knowledge, attitudes, and behaviors related to environmental protection and sustainable development. International organizations such as UNESCO emphasize the importance of integrating environmental education into higher education curricula (UNESCO, 2017). However, most studies on ecological literacy are situated within environmental or sustainability education, with limited exploration of how ecological literacy can be developed within language learning contexts, particularly in EFL settings.

In the context of language education, environmental themes have increasingly been integrated into language learning through Ecological English Language Teaching (Eco-ELT). Eco-ELT promotes the use of environmental topics in English instruction, allowing students to develop language skills and ecological awareness simultaneously. Saiful (2020) suggests that environmental themes can make language learning more meaningful and relevant to students' lived experiences. Activities such as reading environmental texts, discussing local ecological problems, and producing digital projects on sustainability can encourage critical thinking and environmental awareness. Nevertheless, Eco-ELT has rarely been examined in relation to students' digital learning preferences, even though digital platforms may provide rich multimodal resources for environmental language learning.

In the context of Islamic higher education, environmental awareness is not only approached from a scientific perspective but is also grounded in theological and ethical principles. Islamic environmental ethics emphasize the concept of *Khalifah* (stewardship), which positions humans as responsible caretakers of the Earth entrusted by God to manage and preserve natural resources sustainably (Afandi & Fuadi, 2025; Salim & Fitriyanti, 2025; Sulaeman et al., 2025). This concept establishes a moral framework in which environmental responsibility is viewed as part of religious accountability.

In addition, the principle of *Mizan* (balance), as highlighted in the Qur'anic worldview, reflects the idea that the natural world is created in a state of equilibrium that must be maintained (Wani et al., 2022). Disruptions to this balance through excessive exploitation or environmental neglect are therefore considered contrary to Islamic teachings. These principles collectively form the foundation of Islamic environmental ethics, which integrate spiritual, moral, and ecological dimensions of human life.

Previous studies suggest that integrating Islamic values into environmental education can enhance students' environmental awareness and promote pro-environmental behavior (Hajar, 2024; Mustofa et al., 2025; Muzakki et al., 2025). Within higher education, particularly in Islamic institutions, these values can be embedded across disciplines, including language education. Therefore, incorporating ecological literacy into EFL learning, especially through approaches such as Eco-ELT and digitally mediated learning environments, provides a contextually relevant framework that aligns environmental education with students' religious and cultural backgrounds.

To address this gap, the present study is guided by an integrated conceptual framework that connects digital learning preferences, ecological literacy, Eco-ELT, and Islamic values. In this framework, digital learning preferences are understood as learner-related factors that influence how students access, engage with, and respond to digital English learning materials. Ecological literacy refers to students' knowledge, awareness, and sense of responsibility toward environmental issues. Eco-ELT provides the pedagogical approach through which ecological themes are incorporated into English language learning, allowing students to engage with environmental issues while developing language skills. Islamic values, meanwhile, offer an ethical and contextual foundation for understanding environmental responsibility as part of moral conduct and stewardship. The framework therefore assumes that students' preferred digital learning formats may support their engagement with ecological content, while Eco-ELT structures this engagement pedagogically and Islamic values contextualize it ethically. Through this connection, the study examines digital learning not only as a technological preference, but also as a possible pathway for developing ecological literacy within a value-based EFL learning context.

Methods

Research design

This study employed a mixed-methods approach using a sequential explanatory design. In this design, quantitative data are collected and analyzed first, followed by qualitative data collection and analysis to explain, elaborate, or contextualize the quantitative findings (Creswell & Creswell, 2018; Creswell & Plano Clark, 2018). This design was appropriate because the study first sought to identify students' digital learning preferences, their ecological literacy levels, and the statistical relationship between the two constructs. The qualitative phase was then used to explore how students interpreted the integration of ecological issues into digitally mediated English language learning. In this study, the quantitative phase provided general patterns, while the qualitative phase supplied contextual explanations related to students' digital learning experiences, ecological awareness, and Islamic environmental values. The integration of the two data sets occurred during the interpretation stage, when interview themes were used to clarify and enrich the statistical results (Fetters et al., 2013).

Participants

The study was conducted in the English Education Study Program at an Islamic university in North Sumatra, Indonesia. The participants were undergraduate students enrolled in the second, fourth, sixth, and eighth semesters. They were recruited through voluntary participation after receiving information about the purpose of the study, the procedures involved, and their right to withdraw at any stage. A total of 49 students participated in the quantitative phase by completing the questionnaire. In the qualitative phase, three students were purposively selected for semi-structured interviews to represent variation in digital learning preferences and ecological awareness. The interviews were not intended to produce qualitative generalization, but to provide explanatory insights into the quantitative findings. Although the number of interview participants was limited, their responses helped clarify how students understood digital learning, ecological literacy, and the role of Islamic values in environmental responsibility. This limited interview sample is acknowledged as a methodological limitation of the study.

Data collection

The quantitative data were collected using two main instruments: the Digital Learning Preferences Scale (DLPS) and the Ecological Literacy Scale (ELS). The DLPS was designed to measure students' preferences for digitally mediated learning and consisted of several dimensions, including mobile learning preference, multimedia preference, LMS-based learning preference, collaborative digital tools, and self-paced digital learning. Each item in the DLPS was measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The Ecological Literacy Scale (ELS) measured students' ecological literacy across four components: environmental knowledge, environmental awareness, environmental attitudes, and pro-environmental behavior. Similar to the DLPS, the ELS used a five-point Likert scale to ensure consistency in responses.

To ensure content validity, the DLPS and ELS were adapted from Mizumoto et al. (2016) and Ocal and Onsuz (2020), respectively, and reviewed by experts in language education and environmental education. A pilot test was conducted before the main data collection to assess item clarity and instrument reliability. Reliability was evaluated using Cronbach's alpha coefficients, which indicated acceptable internal consistency for the scales and dimensions. The exact alpha coefficients for the DLPS, the ELS, and their respective dimensions should be reported in the final manuscript to strengthen methodological transparency.

In addition to the questionnaire, semi-structured interviews were conducted to collect qualitative data. The interviews aimed to explore students' experiences in using digital technologies for learning English and their perspectives on integrating environmental issues into English language instruction. The interview questions focused on three main areas: students' digital learning experiences, their understanding of environmental issues such as flooding, and their perceptions of environmental responsibility within the context of Islamic values. Semi-structured interviews allow

researchers to explore participants’ perspectives in depth while maintaining flexibility in the data collection process (Coe et al., 2025). The interview protocol was developed based on the results of the quantitative phase, ensuring alignment between both stages of the study. The interviews were audio-recorded with participants’ consent and transcribed verbatim for analysis. To enhance credibility, member checking was conducted by allowing participants to review and confirm the accuracy of the interview data.

Data analysis

Quantitative data were analyzed using descriptive statistics and Pearson correlation analysis. Descriptive statistics were used to identify dominant digital learning preferences and students' overall ecological literacy. Because the instruments used five-point Likert scales, item-level means were interpreted using the following criteria: 1.00-2.33 = low, 2.34-3.67 = moderate, and 3.68-5.00 = high. For total scores, the possible score ranges were divided into three equal categories to support a more objective interpretation. Pearson correlation analysis was then conducted to examine the relationship between digital learning preferences and ecological literacy. Qualitative data from the interviews were analyzed thematically through data familiarization, initial coding, theme development, and interpretation. To strengthen trustworthiness, the researchers repeatedly reviewed the transcripts, compared emerging themes with the quantitative findings, and conducted member checking with participants.

Results

Dominant digital learning preferences among EFL undergraduate students

To answer the first research question (RQ1), the researcher employed descriptive statistical analysis on the data obtained from the Digital Learning Preferences Scale (DLPS) questionnaire completed by 49 participants. The analysis aimed to identify the dominant patterns of students’ digital learning preferences. Table 1 presents the descriptive statistics of students’ digital learning preferences.

Table 1. Descriptive Statistics of Digital Learning Preferences					
Variable	N	Minimum	Maximum	Mean	Std. Deviation
DLPS_TOTAL	49	31	75	56.76	8.793
Valid N (listwise)	49				

As shown in Table 1, the mean score for Digital Learning Preferences (DLPS) was 56.76, with scores ranging from 31 to 75. Based on the total score range used in this study, this mean falls within the high category, indicating that the participants generally showed favorable preferences toward digital-based English learning. This interpretation is grounded in the predetermined score classification rather than in a subjective judgment.

The interview findings further indicated that students preferred digital learning environments that incorporated mobile devices and multimedia resources, including

videos, audio, language learning applications, and AI-supported tools. Participants perceived these resources as accessible, flexible, and engaging for English learning. These qualitative findings support the descriptive results by showing how students experienced digital learning in practice.

At the same time, the interviews revealed challenges in digital learning. Respondent A.R. mentioned unstable internet connections, limited data packages, and electricity disruptions, while respondents S.N. and N.A. identified distractions from social media and smartphone notifications. These findings suggest that students' positive preferences for digital learning should be interpreted alongside the infrastructural and self-regulation challenges they experience.

The integration of quantitative and qualitative data therefore suggests that EFL students in this Islamic higher education context generally prefer technology-mediated English learning, particularly through mobile devices, language learning applications, and multimedia materials. The quantitative data show the general level of preference, while the qualitative data explain the practical benefits and challenges associated with digital learning.

Ecological literacy levels and their relationship with digital learning preferences

The second research question aims to examine the level of ecological literacy among EFL students as well as the relationship between digital learning preferences and ecological literacy. To address this question, the researcher employed descriptive statistical analysis and Pearson correlation analysis.

Table 2. Descriptive Statistics of Ecological Literacy					
Variable	N	Minimum	Maximum	Mean	Std. Deviation
ELS_TOTAL	49	24	60	48.73	6.925
Valid N (listwise)	49				

As shown in Table 2, the mean score for the Ecological Literacy Scale (ELS) was 48.73, with scores ranging from 24 to 60. Based on the total score range used in this study, this mean falls within the high category, suggesting that students demonstrated a relatively strong level of ecological literacy. This interpretation is based on the predetermined score classification and the observed distribution of the data.

These findings suggest that students had a reasonable understanding of environmental degradation, awareness of environmental problems, and attitudes and behaviours that support environmental conservation.

Analysis of the relationship between digital learning preferences and ecological literacy

To examine the relationship between students' digital learning preferences and ecological literacy, a Pearson product-moment correlation analysis was conducted. This statistical procedure was selected to identify the strength and direction of the linear association

between the two variables. In this study, digital learning preference scores represented students' tendencies to engage with technology-mediated learning, while ecological literacy scores reflected their understanding, awareness, and responsiveness toward environmental issues. The analysis was intended to determine whether students with stronger digital learning preferences also tended to report higher ecological literacy. The results of the correlation analysis are presented in Table 3.

Table 3. Pearson Correlation Analysis

Variable	DLPS_TOTAL	ELS_TOTAL
DLPS_TOTAL Pearson Correlation	1	0.493**
Sig. (2-tailed)		< .001
N	49	49
ELS_TOTAL Pearson Correlation	0.493**	1
Sig. (2-tailed)	< .001	
N	49	49

Note: Correlation is significant at the 0.01 level (2-tailed).

As shown in Table 3, the Pearson correlation coefficient between Digital Learning Preferences (DLPS) and Ecological Literacy (ELS) was 0.493, with a significance value of $p < .001$. This result indicates a statistically significant positive relationship between the two variables. The coefficient falls within the moderate correlation category, commonly interpreted as a meaningful but not strong relationship. In practical terms, students with stronger digital learning preferences tended to report higher levels of ecological literacy; however, this finding should not be interpreted as evidence of causation.

One possible explanation is that digitally mediated English learning environments may expose students to broader environmental content through online articles, educational videos, multimedia tasks, and learning platforms. However, because this study did not directly measure students' actual exposure to specific environmental resources, this explanation should be treated as an interpretation rather than a causal conclusion.

The interview data reveal that students demonstrate an understanding of environmental issues such as flooding, deforestation, and environmental degradation. They generally associate these issues with human behavior, such as improper waste disposal and land misuse. In addition, students link environmental responsibility with Islamic values, particularly the concept of humans as stewards (*khalifah*) who are responsible for maintaining harmony with nature.

The interview findings are consistent with the quantitative analysis, as students demonstrated awareness of environmental issues and their impacts on community life. These qualitative data help explain the relatively strong ecological literacy scores by showing that students connected environmental problems with both everyday human behavior and moral responsibility.

EFL undergraduates' perceptions of integrating ecological issues into digitally mediated English language learning

In the qualitative phase, thematic analysis was conducted to further explain the quantitative findings regarding students' ecological literacy and its relationship with digital learning preferences. The qualitative data were obtained through semi-structured interviews with three student participants, consisting of one male student and two female students.

The qualitative findings further explained students' perceptions of integrating ecological issues into digitally mediated English language learning. Thematic analysis identified three interrelated themes: developing environmental awareness, making English learning more meaningful, and supporting engagement through digital learning materials. These themes help clarify how students understood the pedagogical value of Eco-ELT and how their responses connected with the quantitative findings on digital learning preferences and ecological literacy.

The first theme, developing environmental awareness, showed that students viewed ecological topics as useful for increasing their understanding of environmental problems. One participant stated, *"It is very necessary because we can learn the language while also learning how to protect the environment."* This response suggests that students did not perceive environmental content as separate from language learning, but as a meaningful context through which English could be learned while also encouraging environmental responsibility.

The second theme, meaningful language learning experiences, indicated that ecological issues made English lessons more relevant to students' real-life experiences. One participant explained, *"Learning English through environmental topics makes the lessons more interesting because they are related to real-life problems."* This finding supports the quantitative results showing a relatively strong level of ecological literacy, particularly in relation to environmental awareness and local environmental issues such as deforestation and flooding. The interview data suggest that students were more engaged when English learning materials were connected to issues they recognized in their own social and environmental contexts.

The third theme, engagement through digital learning materials, highlighted the role of videos, online articles, and other digital resources in helping students understand ecological content. Participants reported that digital materials made environmental topics easier to access, visualize, and discuss. This theme is consistent with the quantitative findings showing students' strong preferences for mobile devices, multimedia materials, and online learning platforms. Taken together, the qualitative findings suggest that digitally mediated Eco-ELT may provide a relevant learning space where students can develop language skills while engaging with ecological issues. However, because the interviews involved only three participants, these findings should be interpreted cautiously as explanatory insights rather than generalizable conclusions.

Furthermore, students emphasized that environmental awareness is closely linked to Islamic values, particularly the concepts of *hablum minallah*, *hablum minannas*, and *hablum*

minal alam, which highlight the relationship between humans, God, and nature. These values reinforce environmental responsibility as both a social and spiritual obligation.

Discussion

The findings indicate that EFL undergraduate students in this study showed favorable preferences for digital learning in English language learning. The descriptive statistical results suggest that students tended to value mobile devices, multimedia resources, and online platforms as supporting tools for English learning. This finding reflects the increasing role of digital technologies in contemporary university language learning. Previous studies have similarly reported that digital technologies can facilitate learner autonomy, engagement, and access to authentic language resources in language learning contexts (Salikhova et al., 2020; Zenouzagh, 2023; Zenouzagh et al., 2023). The preference for mobile-based learning and multimedia materials also reflects the broader trend of mobile-assisted language learning, where learners use smartphones, videos, and online resources to complement classroom instruction.

The qualitative findings further strengthen this interpretation by revealing that students perceive digital tools as practical and accessible learning resources. Students reported frequently using platforms such as YouTube, language learning applications, and digital dictionaries to support their English learning. These findings are consistent with previous research highlighting the role of digital media in providing flexible learning environments and expanding access to diverse learning materials (Jarukasetwit et al., 2024). The integration of multimedia resources such as audio and video appears particularly beneficial in enhancing students' comprehension and engagement. However, the interview data also reveal several challenges associated with digital learning, including unstable internet connectivity, limited data access, and digital distractions such as social media notifications. Similar challenges have been documented in studies on digital learning environments, which emphasize that technological integration in education must be accompanied by appropriate digital literacy and learning management strategies (Asmayawati et al., 2025; Haleem et al., 2022).

In addition to examining digital learning preferences, this study explored the ecological literacy of EFL students. The findings indicate that students demonstrated a relatively strong level of ecological literacy, including awareness of environmental issues and responsibility for environmental protection. Ecological literacy generally refers to the ability to understand ecological systems and apply that understanding to responsible environmental behavior (Saiful, 2023; Stibbe, 2015). The interview data further show that students were aware of local environmental problems such as flooding, deforestation, and improper waste management. This awareness can serve as an important basis for integrating environmental themes into English language learning.

The moderate positive correlation between digital learning preferences and ecological literacy ($r = 0.493$) is another important finding. This result suggests that students who preferred digital learning more strongly also tended to report higher ecological

literacy. Rather than implying that digital learning directly improves ecological literacy, the finding indicates that digital learning preferences may be associated with greater openness to accessing and engaging with environmental content through digital resources. Previous studies have emphasized that digital learning platforms can support environmental education by providing access to environmental knowledge and global sustainability discourse (Hajar, 2024; Riordan & Klein, 2010). Therefore, digital English learning may provide a useful context for integrating linguistic objectives with interdisciplinary goals such as environmental awareness.

Another important qualitative finding is the role of Islamic values in shaping students' environmental awareness. Students emphasized that Islamic teachings promote responsibility for protecting the environment through concepts such as *hablum minallah*, *hablum minannas*, and *hablum minal alam*. These findings highlight that ecological awareness among students is shaped not only by academic knowledge but also by religious and moral values embedded in Islamic education. Previous studies have similarly suggested that religious and ethical frameworks can support environmental responsibility and sustainability awareness in educational settings (Marshall, 2025; Sugiant & Shahrudin, 2025). In Islamic higher education, integrating environmental education with religious values may therefore strengthen students' commitment to environmental stewardship.

Overall, the findings highlight the potential of integrating environmental themes into digital-based English language learning. The combination of digital learning tools and environmental content aligns with Eco-ELT, which seeks to integrate ecological awareness into English language education. By incorporating environmental topics into digital learning materials, educators may support language development while also encouraging ecological awareness. Such an approach is particularly relevant in higher education contexts where interdisciplinary learning and sustainability education are increasingly emphasized. Eco-ELT-oriented digital learning resources may therefore offer a promising pedagogical strategy for fostering both language competence and environmental awareness among EFL learners.

Conclusion

This study investigated digital learning preferences and ecological literacy among EFL undergraduate students in an Indonesian Islamic higher education context. The findings indicate that students showed favorable preferences for digital learning environments, particularly those involving mobile devices, multimedia resources, and online learning platforms. The results also show that students demonstrated a relatively strong level of ecological literacy, including awareness of environmental issues and responsibility for environmental protection. Qualitative findings further indicate that students perceived the integration of environmental themes into English language learning positively because such integration can make language learning more meaningful and connected to real-life environmental concerns.

The correlation analysis revealed a statistically significant moderate positive relationship between digital learning preferences and ecological literacy. This finding indicates that students with stronger preferences for digital learning tended to report higher levels of ecological literacy. However, because the study used a correlational design, this relationship should not be interpreted as causal. The qualitative findings also highlight the role of Islamic values in shaping students' environmental awareness by emphasizing the relationship between humans, God, society, and nature.

These findings suggest that integrating environmental themes into digital-based English language learning, particularly through an Eco-ELT approach, may offer a meaningful direction for pedagogical development in Islamic higher education. Nevertheless, the findings should be interpreted in light of several limitations, including the relatively small sample size, the limited number of interview participants, and the reliance on self-reported questionnaire data. Future studies should involve larger and more diverse samples, report detailed instrument reliability, and examine how specific digital Eco-ELT activities influence language learning and ecological literacy over time.

Acknowledgment

The authors would like to express their sincere gratitude to the English Education Study Program of Universitas Islam Labuhan Batu and the affiliated institutions of the co-authors for their academic support and facilitation of this research. The authors also thank all participants who voluntarily contributed to this study. All data were collected and reported in accordance with research ethics principles to ensure participants' confidentiality and anonymity.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this article.

CRedit Authorship Contribution Statement

Annim Hasibuan: Conceptualization, Data curation, Writing - original draft.

Amron Zarkasih Ritonga: Conceptualization, Methodology, Supervision.

Zulpahri Nainggolan: Investigation, Validation, Resources.

Arif Bulan: Supervision, Project administration, Writing - review and editing.

References

- Afandi, I., & Fuadi, M. H. (2025). Integration of environmental theology in an integrative science curriculum to build ecological literacy among muslim students. *Khazanah: Journal of Islamic Education and Science*, 1(2), 17–31.
<https://doi.org/10.61815/khazanah.v1i2.870>

- Amin, F. M., & Sundari, H. (2020). EFL students' preferences on digital platforms during emergency remote teaching: Video conference, LMS, or messenger application? *Studies in English Language and Education*, 7(2), 362–378. <https://doi.org/10.24815/siele.v7i2.16929>
- Ardiansyah, S., & Adisan. (2025). Digital-based learning innovations to improve student literacy in the society 5.0 era. *Indonesian Journal of Educational Research and Evaluation Global*, 1(1), 36–43.
- Asmayawati, A., Yetti, E., & Yufiarti, Y. (2025). Effects of technological integration and assessment strategies on digital literacy collaborative learning as mediator. *Knowledge Management & E-Learning An International Journal*, 599. <https://doi.org/10.34105/j.kmel.2025.17.028>
- Bleazby, J., Burgh, G., Thornton, S., Graham, M., Reid, A., & Finefter-Ronsebluh, I. (2023). Teaching about climate change in the midst of ecological crisis: Responsibilities, challenges, and possibilities. *Educational Philosophy and Theory*, 55(10), 1087–1095. <https://doi.org/10.1080/00131857.2023.2211260>
- Bulan, A., Ramadhan, R. A., & Wahyuni, N. (2024). Need analysis for developing English teaching materials using the Eco-ELT approach to enhance environmental literacy among high school students in dompu regency. *Jurnal Pendidikan Dan Pembelajaran Indonesia (JPPI)*, 4(1), 72–80. <https://doi.org/10.53299/jppi.v4i1.417>
- Bulan, A., Ramadhan, R. A., Wahyuni, N., & Taufik, T. (2025). Exploring teachers' and students' readiness for the implementation of Eco-ELT in rural Indonesian EFL contexts. *Forum for Linguistic Studies*, 7(11). <https://doi.org/10.30564/fls.v7i11.11677>
- Coe, R., Waring, M., Hedges, L. V., & Ashley, L. D. (2025). *Research methods and methodologies in education*. SAGE Publications.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.
- Damico, J. S., Baidon, M., & Panos, A. (2020). Climate justice literacy: Stories-we-live-by, ecolinguistics, and classroom practice. *Journal of Adolescent & Adult Literacy*, 63(6), 683–691. <https://doi.org/10.1002/jaal.1051>
- Duc-Hanh, L., Tue, H. N., & Nguyen, H. T. T. (2025). Tertiary students' L2 motivational learning experience in the LMS. *Computer-Assisted Language Learning Electronic Journal*, 26(4), 25–47.

- Hajar, A. (2024). Transforming Islamic education for environmental and social sustainability. *Sinergi International Journal of Islamic Studies*, 2(2), 82–95. <https://doi.org/10.61194/ijis.v2i2.601>
- Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, 3, 275–285. <https://doi.org/10.1016/j.susoc.2022.05.004>
- Huang, L., & Liu, M. (2025). The impact of technology on foreign language anxiety: A systematic review of empirical studies from 2004 to 2024. *Humanities and Social Sciences Communications*, 12(1), 1665. <https://doi.org/10.1057/s41599-025-05921-6>
- Husamah, Rahardjanto, A., Permana, T. I., & Lestari, N. (2025). Islam and sustainability issues, how far has the relationship progressed? A bibliometric analysis. *Social Sciences & Humanities Open*, 12, 101703. <https://doi.org/10.1016/j.ssaho.2025.101703>
- Jarukasetwit, N., Sriprasertpap, K., & Sirawong, N. (2024). Development of flexible digital learning environment model to promote information and communication technology skills. *International Journal of Information and Education Technology*, 14(12), 1779–1788. <https://doi.org/10.18178/ijiet.2024.14.12.2209>
- Jickling, B., & Wals, A. E. J. (2008). Globalization and environmental education: Looking beyond sustainable development. *Journal of Curriculum Studies*, 40(1), 1–21. <https://doi.org/10.1080/00220270701684667>
- Kalsum, Humaeroah, & Agussalim. (2025). Eco-ELT: Transforming English language teaching through sustainable and innovative materials. *IDEAS: Journal on English Language Teaching and Learning, Linguistics and Literature*, 12(2), 2350–2360. <https://doi.org/10.24256/ideas.v12i2.5640>
- Kazazoglu, S. (2025). Environmental education through eco-literacy: Integrating sustainability into English language teaching. *Sustainability*, 17(5), 2156. <https://doi.org/10.3390/su17052156>
- Kukulska-Hulme, A. (2009). Will mobile learning change language learning? *ReCALL*, 21(2), 157–165. <https://doi.org/10.1017/S0958344009000202>
- Kukulska-Hulme, A., Giri, R. A., Dawadi, S., Devkota, K. R., & Gaved, M. (2023). Languages and technologies in education at school and outside of school: Perspectives from young people in low-resource countries in Africa and Asia. *Frontiers in Communication*, 8, 1081155. <https://doi.org/10.3389/fcomm.2023.1081155>
- Maghfiroh, A., Harmanto, B., Prayitno, H. J., Tamrin, A., & Lathifah, L. (2025). Ecological education in ELT: How could it promote students' critical thinking skill and

- sustainable behaviour? *Journal of Languages and Language Teaching*, 13(2), 1005. <https://doi.org/10.33394/jollt.v13i2.14330>
- Marshall, H. (2025). Integrating sustainability into religious education. *Journal of Beliefs & Values*, 1–20. <https://doi.org/10.1080/13617672.2025.2504983>
- Micalay-Hurtado, M. A., & Poole, R. (2022). Eco-critical language awareness for English language teaching (ELT): Promoting justice, wellbeing, and sustainability in the classroom. *Journal of World Languages*, 8(2), 371–390. <https://doi.org/10.1515/jwl-2022-0023>
- Mirza, C., Teymoori, H., Khessibi, E., Atashian, S., Mawali, H. A., & Khaldi, M. A. (2025). Implementing interactive language learning mobile Apps in higher education: Students' perceptions and perspectives. *International Journal of Learning, Teaching and Educational Research*, 24(8), 925–941. <https://doi.org/10.26803/ijlter.24.8.41>
- Mizumoto, A., Chujo, K., & Yokota, K. (2016). Development of a scale to measure learners' perceived preferences and benefits of data-driven learning. *ReCALL*, 28(2), 227–246. <https://doi.org/10.1017/S0958344015000208>
- Mohebbi, A. (2025). Enabling learner independence and self-regulation in language education using AI tools: A systematic review. *Cogent Education*, 12(1), 2433814. <https://doi.org/10.1080/2331186X.2024.2433814>
- Mustofa, T., Nurhasan, N., Farida, N. A., Zahra, D. N., & Nurseha, A. (2025). Integrating ecotheological values in the Islamic religious education curriculum: The green Islamic education perspective in karawang secondary schools. *Jurnal Iqra': Kajian Ilmu Pendidikan*, 10(3), 51–65. <https://doi.org/10.25217/ji.v10i3.6589>
- Muzakki, H., Moh. Arif, & Mamah, M. (2025). Integration of Islamic education values and fiqh al-bi'ah in cultivating environmentally responsible character. *Cendekia: Jurnal Kependidikan Dan Kemasyarakatan*, 23(1), 55–70. <https://doi.org/10.21154/cendekia.v23i1.10272>
- Noori, A. (2025). Digital technologies and self-regulated language learning: A systematic review. *Journal of Social Sciences - Kabul University*, 8(1), 243–263. <https://doi.org/10.62810/jss.v8i1.323>
- Nurlaela, D., Santhi, D. D. Y., & Ardiasih, L. S. (2024). The effectiveness of android-based interactive multimedia in improving junior high school students' English learning outcomes and learning motivation. *Premise: Journal of English Education*, 13(1), 388. <https://doi.org/10.24127/pj.v13i1.8925>

- Öcal, E. E., & Önsüz, M. F. (2020). Reliability and validity of ecological literacy scale for primary school students. *European Journal of Public Health*, 30(Supplement_5), ckaa166.103. <https://doi.org/10.1093/eurpub/ckaa166.103>
- Pikhart, M., Klimova, B., & Al-Obaydi, L. H. (2024). Exploring university students' preferences and satisfaction in utilizing digital tools for foreign language learning. *Frontiers in Education*, 9, 1412377. <https://doi.org/10.3389/feduc.2024.1412377>
- Pratiwi, D., & Trisanti, N. (2025). EFL learners' preferences for multimodal learning materials at the secondary school level. *Journal of English Language and Education*, 10(3), 630–637. <https://doi.org/10.31004/jele.v10i3.980>
- Putri, I. G. A. P. E. (2018). Critical environmental education in tertiary English language teaching (ELT): A collaborative digital storytelling project. *Indonesian Journal of Applied Linguistics*, 8(2). <https://doi.org/10.17509/ijal.v8i2.13280>
- Qosimova, M., & Khamidova, D. (2025). A comprehensive review of technology enhanced learning and its impact on language acquisition and teaching. *Open Access*, 3(3), 38–44.
- Rabbianty, E. N., Virdyna, N. K., Mulyadi, Azizah, S., Roda'i, M., & Abdi Shidqi, Z. (2025). Breaking barriers: Integrating padlet to introduce environmental education to pre-service teachers. *PANYONARA: Journal of English Education*, 7(1), 77–102. <https://doi.org/10.19105/panyonara.v7i1.17849>
- Riordan, M., & Klein, E. J. (2010). Environmental Education in Action: How expeditionary learning schools support classroom teachers in tackling issues of sustainability. *Teacher Education Quarterly*, Fall 2010, 119–137.
- Saiful, J. A. (2020). New innovation in English language teaching: Revealing concepts and applications of ECO-ELT. *Tell: Teaching of English Language and Literature Journal*, 8(1), 63. <https://doi.org/10.30651/tell.v8i1.4604>
- Saiful, J. A. (2023). Eco-ELT for environmental research and praxis in ELT. *Journal on English as a Foreign Language*, 13(2), 373–398. <https://doi.org/10.23971/jefl.v13i2.6335>
- Saiful, J. A. (2024). Chirping symphony of nature in the digital art world: How ecomusicology cultivates EFL students' nature connectedness and interests. *Tell: Teaching of English Language and Literature Journal*, 12(1). <https://doi.org/10.30651/tell.v12i1.21678>
- Salih, A. A., & Omar, L. I. (2024). Enhancing EFL learners' engagement in situational language skills through clustered digital materials. *Frontiers in Education*, 9, 1439104. <https://doi.org/10.3389/feduc.2024.1439104>

- Salikhova, N. R., Lynch, M. F., & Salikhova, A. B. (2020). Psychological aspects of digital learning: A self-determination theory perspective. *Contemporary Educational Technology*, 12(2), ep280. <https://doi.org/10.30935/cedtech/8584>
- Salim, A. A., & Fitriyanti, N. (2025). Synergy of environmental theology and green technology in developing a sustainable Islamic values based science curriculum. *Khazanah: Journal of Islamic Education and Science*, 1(1), 95–109. <https://doi.org/10.61815/khazanah.v1i1.868>
- Sari, N. M., & Abrar, M. (2024). Use of technology in English language learning: Challenges and benefits. *Linguistic, English Education and Art (LEEAA) Journal*, 7(2), 362–372. <https://doi.org/10.31539/leea.v7i2.10034>
- Stibbe, A. (2015). *Ecolinguistics: Language, ecology and the stories we live by*. Routledge, Taylor & Francis Group.
- Sugiant, R. N., & Shahrudin, M. S. (2025). Holy earth: Harnessing religious ethics and faith-based action to combat climate change. *Socio Politica : Jurnal Ilmiah Jurusan Sosiologi*, 15(1), 115–124. <https://doi.org/10.15575/socio-politica.v15i1.44852>
- Sulaeman, S., Fattah, A., & Amin, M. (2025). An epistemic coexistence-based integrative pedagogical model of Islam and science in higher education. *Ta'dibuna: Jurnal Pendidikan Islam*, 14(5), 518–535. <https://doi.org/10.32832/tadibuna.v14i5.21454>
- Sumarmi, S., Aliman, M., & Mutia, T. (2021). The effect of digital eco-learning in student worksheet flipbook to environmental project literacy and pedagogic competency. *Journal of Technology and Science Education*, 11(2), 357. <https://doi.org/10.3926/jotse.1175>
- Turner-Hill, B., Ludwig, C., & Böttger, L. (2021). Teaching in the garden: School gardens as a space for environmental and English learning. *Ecozon@: European Journal of Literature, Culture and Environment*, 12(1), 83–106. <https://doi.org/10.37536/ECOZONA.2021.12.1.4007>
- UNESCO. (2012). *Education for Sustainable Development: Sourcebook*. UNESCO.
- UNESCO. (2017). *Education for Sustainable Development Goals: Learning Objectives*. UNESCO.
- Vo, T. H. (2025). Relationship between students' informal digital learning of English and willingness to communicate: Insights from the vietnamese EFL context. *Computer-Assisted Language Learning Electronic Journal: Special Issue AIIDLE*, 26(7), 296–319. <https://doi.org/10.54855/>

- Wani, D. B. A., Wani, S. A., & Qadri, S. A. (2022). The ethical paradigm of Islam and its implications on environmental protection. *Insight Islamicus*, 22, 209–220.
- Xiong, T. (2014). Shallow environmentalism: A preliminary eco-critical discourse analysis of secondary school English as a foreign language (EFL) texts in China. *The Journal of Environmental Education*, 45(4), 232–242. <https://doi.org/10.1080/00958964.2014.943686>
- Xu, W. (2025). Sustainability education through digital platforms: Evaluating digital tools for eco-conscious behavior promotion. *Pakistan Journal of Life and Social Sciences (PJLSS)*, 23(1). <https://doi.org/10.57239/PJLSS-2025-23.1.00111>
- Yuan, L., & Liu, X. (2025). The effect of artificial intelligence tools on EFL learners' engagement, enjoyment, and motivation. *Computers in Human Behavior*, 162, 108474. <https://doi.org/10.1016/j.chb.2024.108474>
- Yuan, Y., Harun, J., Wong, B. Y., & Li, L. (2025). Technology-driven framework for college English courses: If and how mobile-assisted collaborative language learning affects EFL student engagement. *Sage Open*, 15(2), 21582440251329687. <https://doi.org/10.1177/21582440251329687>
- Zadorozhnyy, A., Winsy, L. W. Y., & Lee, J. S. (2025). EFL teachers' ecological barriers to integrating informal digital learning of English. *TESOL Quarterly*, tesq.3400. <https://doi.org/10.1002/tesq.3400>
- Zaimoğlu, S. (2024). Exploring research trends in sustainability in English language education from 2014 to 2024: A bibliometric analysis. *Journal of Language Research*, 8(2), 1–18. <https://doi.org/10.51726/jlr.1537547>
- Zenouzagh, Z. M. (2023). Student interaction patterns and co-regulation practices in text-based and multimodal computer-mediated collaborative writing modalities. *Educational Technology Research and Development*, 71(2), 313–338. <https://doi.org/10.1007/s11423-022-10158-0>
- Zenouzagh, Z. M., Admiraal, W., & Saab, N. (2023). Learner autonomy, learner engagement and learner satisfaction in text-based and multimodal computer-mediated writing environments. *Education and Information Technologies*, 28(11), 14283–14323. <https://doi.org/10.1007/s10639-023-11615-w>