

Digital-Pedagogical Framework for Education for Sustainable Development in Social Science

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ABSTRACT

The digital transformation of higher education in Indonesia is increasingly seen as a key strategy to support SDG 4. However, the implementation of digitalization has not been fully integrated with the agenda of Education for Sustainable Development (ESD). This exploratory qualitative study aims to understand the experiences and challenges of social science lecturers in utilizing digital learning as a pedagogical instrument for sustainability. Data were collected through online in-depth interviews with three key informants from different universities and analyzed using reflexive thematic analysis. The findings indicate that digitalization is largely practiced as the transfer of classroom activities into LMS platforms without pedagogical transformation. ESD integration remains implicit and unstructured across learning objectives, digital activity design, and assessment. Major barriers include limited digital-pedagogy competencies, low student digital literacy, academic workload constraints, and weak institutional incentives. Structural inequalities, particularly in disadvantaged and eastern Indonesian regions, further widen disparities in access to education. The discussion highlights a clear gap between institutional sustainability rhetoric and classroom practice, consistent with global literature. Digital learning has yet to be conceptualized as a means for critical reflection, collaboration, and contextual learning for sustainability.

Keywords: Digital-Pedagogical, Framework, ESD, Social Science, Lecture

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INTRODUCTION

In an increasingly digitalized era, information technology has become an integral component of higher education. Universities worldwide are undergoing digital transformation in both instructional methods and curriculum management through app-based learning platforms, online learning management systems, and digital learning resources. However, this transformation does not automatically guarantee that digital learning in higher education effectively supports the achievement of the *Sustainable Development Goals* (SDGs), particularly point 4: Quality Education, which emphasizes equitable access, relevant content, and meaningful learning outcomes for all (United Nations, 2015). SDGs 4 requires more than technological availability; it demands quality, contextualization, and learning outcomes aligned with sustainability (Yanuarto et al., 2025).

Within the framework of *Education for Sustainable Development* (ESD), universities hold a strategic mandate to graduate students who are not only academically competent but

also capable of addressing social, economic, and environmental challenges holistically (Tafese & Kopp, 2025). ESD—an educational paradigm grounded in knowledge, skills, values, and attitudes that orient learners toward sustainable action—requires a fundamental shift in instructional practice, including the pedagogical purpose of technology within the curriculum (Tafese & Kopp, 2025).

Yet, the gap between technological potential and real implementation remains substantial. Recent studies indicate that although universities have adopted digital tools extensively, the integration of digital learning with ESD goals remains weak and largely instrumental focused on content delivery rather than building sustainable competencies (Hamadi & El-Den, 2023). Conceptual texts attempting to merge digital learning with sustainability frameworks often stop at the level of tool adoption rather than transformative pedagogy, producing little improvement in environmental awareness or social-environmental literacy both central components of ESD (Hamadi & El-Den, 2023).

This challenge grows more complex given that many university lecturers are not pedagogically prepared to integrate digital technologies into transformative learning practice. Studies on pedagogical readiness show that although digital platforms are present, instructional planning remains routine and procedural, lacking reflection on how learning cultivates students' critical engagement with social and environmental issues or connects outcomes to ESD expectations (Ning & Danquah, 2025). This condition reflects a broader systemic failure in higher education to respond to the global mandate for transformative and sustainability-oriented education (Leal Filho, Shiel, Paço, & Mifsud, 2023).

Despite the rapid expansion of digital technologies in higher education, social science teaching often remains confined to a narrow, content-delivery paradigm that treats Learning Management Systems and apps as neutral tools rather than critical spaces for engaging with social, political, and environmental issues. In practice, digital platforms in courses such as social geography, sociology, political science, public administration, and citizenship education are frequently used to upload materials, manage attendance, and administer online quizzes, but are rarely designed as environments where students interrogate issues such as environmental justice, social vulnerability, or governance responses to climate and sustainability crises (Al Mdawi et al., 2024; Alotaibi, 2022). This disconnect indicates that digital learning in social science has not yet been systematically aligned with ESD or with the transformative aspirations of SDG 4 on quality education.

Trevisan et al. (2024) identify digital transformation towards sustainability as an emerging research field but note that most work focuses on institutional strategies and “smart campus” initiatives rather than on disciplinary pedagogies and classroom-level practices, especially in the social sciences. At the same time, frameworks for embedding ESD in curricula such as the CoDesignS model have demonstrated how sustainability can be integrated into course design, yet they seldom discuss in detail how digital environments in specific disciplines like social science can be used to cultivate critical, value-laden engagement with sustainability challenges (Ahmad et al., 2023).

Without a deliberate rethinking of pedagogy, ESD initiatives in higher education tend to produce modest or inconsistent results. Analyses of ESD implementation emphasize that sustainable development goals will not be achieved merely by inserting sustainability content into syllabi; instead, pedagogical approaches, assessment strategies, and learning environments including digital ones must be transformed to support critical thinking, participation, and action (Sari, 2023; Vioreza et al., 2023). Research on digital literacy and sustainability also shows that while digital skills can expand access to information, they do not automatically translate into deeper sustainability awareness or responsible action unless they are framed within a broader educational purpose, such as ESD (Savitri, 2025). This pattern indicates a systemic shortcoming: higher education is embracing digital tools, but often without a conceptual and pedagogical lens that connects digital practices to sustainability-oriented social science learning.

The position of digital learning in ESD remains ambiguous because it is still treated as a content-delivery mechanism rather than a transformation driver. In many cases, digital tools are viewed instrumentally rather than as enablers for problem-based learning, global collaboration, environmental simulations, or civic-environmental decision-making. In contrast, ESD demands instructional approaches that integrate knowledge, values, and action—an area in which digital tools should function as strategic media for inquiry, project-based learning, and sustainability-driven decision-making (Leal Filho et al., 2023). The implications for SDG 4: Quality Education are profound. SDG 4 emphasizes not only access but also inclusive and relevant learning quality. When digital platforms exist without pedagogical readiness or alignment with sustainability purposes, universities risk producing graduates who are technologically fluent but lack reflective competence to address socio-environmental problems. Thus, despite increased publications and widespread adoption of digital tools, *quality education* within the ESD agenda remains underachieved (Yanuarto et al., 2025).

Accordingly, there is an urgent need for research that conceptualizes and proposes an integrated digital-pedagogical framework for ESD in higher education. Current literature explicitly linking digital pedagogy, sustainability, and university teaching is scant. Recent analyses confirm that most ESD-themed studies still cluster around environmental or economic dimensions, while the social dimension including transformative digital learning remains marginal (Tafese & Kopp, 2025). This study therefore responds to a clear academic and practical necessity: expanding ESD scholarship in a university context by positioning digital pedagogy as a transformative driver. Its central focus is to conceptualize and propose a Digital-Pedagogical Framework for Education for Sustainable Development in Social Science, offering theoretical and practical contributions to sustainability-oriented teaching in support of SDG 4.

METHOD

Study Design

This qualitative inquiry represents one phase within a broader mixed-methods design, which collectively aims to investigate how social science lecturers across multiple universities experience, interpret, and confront the challenges of digital teaching within the framework of *Education for Sustainable Development* (ESD). The selection of an exploratory qualitative approach was based on the recognition that digital pedagogy, ESD, and SDG implementation constitute complex and contextual phenomena shaped by lecturers' subjective experiences; thus, they require a methodological strategy that allows deep meaning-making (Creswell & Plano Clark, 2018; Creswell, 2014). The study specifically targeted lecturers teaching social science subjects including social science education, social geography, sociology, public policy, and citizenship who had recent experience with digital teaching platforms. The semi-structured interview guide was developed through a critical appraisal of peer-reviewed literature addressing lecturers' experiences with digital instruction, critical pedagogy, and ESD integration in higher education, as well as institutional and governmental policy documents related to digital transformation in Indonesian universities. Prior qualitative studies on lecturers' and students' experiences with online and blended learning in Indonesia provided a conceptual basis for identifying priority areas of inquiry particularly lecturers' practices, barriers, pedagogical readiness, perceptions of instructional quality, and their views on aligning digital learning with ESD and SDG 4 (Hidayati et al., 2025; Astri, 2024; Masrukhin et al., 2024; Rahiem, 2020). From this synthesis, the researcher identified several key dimensions requiring further investigation, such as pedagogical preparedness, meaning-making regarding ESD, perceived institutional support, and discrepancies between digital learning policies and classroom realities. Based on these priorities, approximately 10–12 open-ended questions

were formulated as a semi-structured interview guide, sufficiently flexible to enable probing of emergent issues raised by participants (Creswell, 2014).

Employing an exploratory qualitative design using in-depth interviews was deemed most appropriate for this study because it aligns with the objective of uncovering nuanced and sometimes unpredictable experiences that cannot be captured adequately through quantitative surveys. The approach is also consistent with recommended mixed-methods sequencing, where qualitative phases generate interpretive insight that informs subsequent tool development and conceptual modelling in quantitative stages (Creswell & Plano Clark, 2018). Participants were selected purposively based on the following criteria: (1) social science lecturers in public or private universities, (2) experience teaching using digital platforms (LMS, video conferencing, or app-based environments), and (3) willingness to provide detailed accounts of their experiences. Similar selection logic has been adopted in prior qualitative research on digital culture and blended learning practices in Indonesian higher education (Suryanto, 2025; Hidayati et al., 2025).

Data Collection

Data collection was conducted between May and September 2025 through online, audio-recorded in-depth interviews using video-conferencing platforms (e.g., Zoom). Each interview lasted approximately 60–75 minutes, following open-ended prompts that encouraged participants to articulate their experiences with digital learning, attempts to integrate ESD and SDG 4 into online teaching, institutional support or constraint, and their reflections on success and failure narratives. The use of open questioning is widely recommended for capturing rich and participant-driven narratives in qualitative explorations of digital learning and emergency remote teaching (Rahiem, 2020; Venus et al., 2025).

Data Analysis

Audio recordings were transcribed verbatim using a paid artificial-intelligence transcription service to ensure accuracy and completeness. Data were analyzed using reflexive thematic analysis as outlined by Braun and Clarke (2006, 2019), which includes familiarization with data, initial coding, theme construction, reviewing and refining themes, defining and naming themes, and producing the interpretive narrative (Braun & Clarke, 2006; Braun & Clarke, 2019; Ahmed et al., 2025). The analytic process followed qualitative trustworthiness principles by documenting an audit trail of decisions, conducting iterative discussions across research members, and repeatedly validating theme alignment with raw data (Nowell et al., 2017; Christou, 2023). The primary researcher led initial coding and theme formulation, while the co-researchers reviewed coded material, refined thematic structures, and reached consensus regarding final interpretations and theme labels. This collaborative process helped maintain rigour, consistency, and interpretive depth, in line with best-practice recommendations for thematic qualitative research (Braun & Clarke, 2019; Nowell et al., 2017).

FINDINGS AND DISCUSSION

Findings

The analysis of in-depth interviews with social science lecturers across three universities generated a set of recurring patterns that illustrate how digital learning is interpreted, implemented, and challenged in relation to SDG 4 and the broader agenda of Education for Sustainable Development (ESD). The findings are presented thematically to capture convergent and divergent perspectives across institutional and regional contexts.

The qualitative analysis of interview data reveals that digital learning within Indonesian higher education is perceived simultaneously as a transformative imperative and as an underdeveloped pedagogical practice. Across three key informants representing diverse

geographic and institutional contexts Dr. Silvi Nur Afifah (Universitas Negeri Surabaya), Nurul Rahmawati, M.Pd. (Universitas Negeri Malang), and Dr. Dahri, M.Pd. (STKIP Ternate) there is a consistent acknowledgement that digital course delivery constitutes more than the relocation of classroom procedures to a virtual interface. Rather, it implies a paradigmatic reorientation towards flexible, student-centered, and sustainability-driven higher education. Notwithstanding this recognition, interview evidence suggests that digitalization has not yet matured into a coherent pedagogical culture, particularly in relation to the aspirations of SDG 4 and ESD.

Here, framework about Digital–Pedagogical Framework for Education for Sustainable Development (ESD) in Social Science can be seen at figure 1 below.

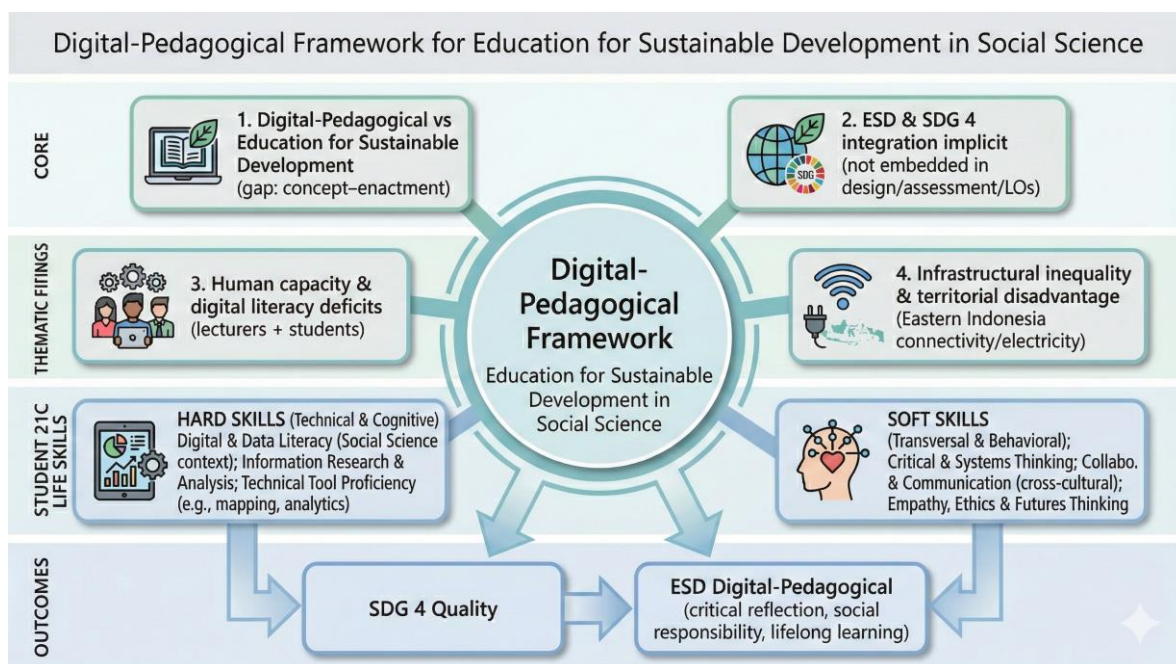


Figure 1. Digital–Pedagogical Framework for ESD in Social Science

1. Digital Learning as Transformative Space, Yet Pedagogically Underdeveloped

Participants articulated an aspirational interpretation of digital learning as a space for epistemic change. As asserted by Dr. Silvi, digital learning should be understood as *“transformation in the way of thinking and interacting in learning,”* indicating a shift in instructional logic rather than mere technological substitution. She rejects simplistic models of online replication, stating that digital learning must not be *“simply transferring learning processes from physical classrooms to virtual spaces,”* but must instead cultivate twenty-first-century competences such as critical inquiry, collaboration, and digital literacy.

While these ideals are shared across informants, they also acknowledge that implementation remains procedural and administrative. Dr. Silvi observes that many lecturers remain confined to minimal LMS utilization, noting that they *“fixated on basic features such as uploading materials and giving assignments,”* with limited exploration of collaborative or dialogic functions. This pattern suggests that digital infrastructures have not yet been operationalized as transformative learning ecologies. Similarly, Nurul frames digitalization as *“an inevitability”* that aligns with generational demands, but concedes that such change requires *“mental, cultural, and systemic readiness across the academic community.”* Consequently, the study demonstrates a critical gap between conceptual endorsement and pedagogical enactment. Digital teaching remains disconnected from instructional innovation, and thus fails to generate meaningful differentiation from conventional, face-to-face teaching.

2. ESD and SDG 4 Integration is Implicit Rather than Instructionally Embedded

Although the discourse of sustainability has gained institutional salience, its operational presence in digital course design remains minimal. According to Dr. Silvi, sustainability-oriented values in higher education are *“increasingly understood conceptually,”* yet *“in practice remain implicit and unstructured.”* Instead of explicit pedagogical intentionality, sustainability is subordinated to compliance with course completion and academic administration.

Nurul’s remarks further reinforce this finding. She argues that sustainable education remains policy-dominant rather than practice-dominant, stating that *“The concepts of quality and sustainable education appear more in institutional policies and documents than in real practice in digital classrooms.”* She observes that lecturers continue to prioritize material coverage, noting that *“learning orientation is still focused on completing material and administrative tasks,”* a disposition that constrains critical reflection, social responsibility, and lifelong learning—three pillars central to ESD. From an analytical standpoint, these comments illuminate an unresolved contradiction: sustainability is acknowledged rhetorically at the institutional level yet remains structurally absent in digital course design, assessment rubrics, and learning outcomes. Digital learning, therefore, has not advanced toward a sustainability-literate pedagogy.

3. Human Capacity and Digital Literacy Deficits as Structural Barriers

Lecturer capacity emerges as a recurrent barrier inhibiting the pedagogical development of digital learning. Participants highlighted a widespread unfamiliarity with sustainable digital pedagogy. As Dr. Silvi underscores, *“limited understanding of sustainable digital pedagogy”* inhibits lecturers from linking instructional content to real-world sustainability discourses such as environmental justice, equitable development, and ethical technology use. She notes that lecturers *“are not yet accustomed to linking course material with real issues such as environmental sustainability and social justice.”*

These pedagogical limitations are compounded by resource-intensive demands of digital material design. As Silvi explains, creating high-quality content multimedia, interactive modules, digital assessments—requires *“time, planning, and specific skills,”* without which the instructional burden shifts back onto lecturers. She also indicates that student literacy constraints exacerbate the problem: *“digital learning becomes an additional burden for lecturers,”* requiring intensive scaffolding and *“detailed instructions and intensive support.”*

Nurul confirms this pattern, reporting that many academics and students *“the level of students’ digital learning literacy is still relatively low,”* and warns that without pedagogical and technical mentoring, LMS usage *“have the potential to become an administrative burden rather than a tool for improving learning quality.”* Taken together, these insights point to digital competence not digital infrastructure as the immediate constraint on ESD-aligned instructional reform.

4. Infrastructural Inequality and Territorial Disadvantage in Eastern Indonesia

The most acute structural restraint is articulated by Dr. Dahri, whose institutional context situates him within the infrastructurally marginalized Eastern Indonesian region. He frames digital teaching as a mechanism for national equalization, insisting that it *“should become a means of equalizing access to education, rather than widening disparities.”* However, he documents systemic disruption arising from inadequate connectivity, stating that *“access to internet networks and electricity supply remains a major obstacle.”*

These infrastructural deficits directly impair the viability of LMS-based learning, undermining stability, participation, and assessment integrity. According to Dahri, such conditions risk *“reproducing educational injustice between western and eastern Indonesia,”* a

trajectory that contradicts the distributive ethos of SDG 4. Moreover, he critiques centralized institutional mandates that impose homogeneous digital models, claiming that policy actors “*replicate models from universities with sufficient infrastructure without local adaptation.*” This uniformity fails to accommodate regional variation in digital access, thereby conflating modernization with educational equity. From an equity perspective, these interview insights affirm that infrastructural inequality is not a peripheral obstacle but a structural determinant of digital sustainability implementation.

5. Institutional Misalignment: Absence of Incentives, Recognition, and Adaptive Governance

A further structural constraint identified across interviews concerns the institutional architecture governing digital learning. Nurul notes the absence of formal performance indicators recognizing LMS-based innovation, stating that “*there are no performance instruments that measure and appreciate LMS use,*” resulting in low lecturer motivation and abated innovation.

Silvi identifies procedural inconsistencies, such as misalignment between asynchronous LMS assessment mechanisms and formal campus templates, which require “*manual adjustment*” and thereby reduce instructional efficiency. In Eastern regions, Dahri critiques managerial directives that overlook lecturer readiness, arguing that such policies can impose “*academic fatigue and resistance to online learning.*” Collectively, this evidence underscores that digital sustainability requires not only technological affordances but organizational governance frameworks capable of supporting behavioral change, incentivising pedagogical redesign, and formalizing recognition mechanisms.

6. Strategic Opportunities for Sustainability-Oriented Digital Pedagogy

Despite chronic barriers, participants retain an optimistic orientation toward the potential of LMS platforms to support sustainability-anchored pedagogies. Silvi highlights that LMS infrastructures “*provide space for reflection, cross-perspective discussion, and real problem-based projects,*” reaffirming their conceptual compatibility with ESD pedagogies.

Nurul additionally suggests institutional-performance integration as a catalyst for change, stating that lecturers will be more willing to embed SDG-aligned digital teaching if “*LMS implementation were connected to performance indicators and professional development.*” From the eastern-regional viewpoint, Dahri identifies a distinct pathway for contextualized sustainability teaching, observing that “*sustainability, cultural, and environmental issues in Eastern Indonesia are very relevant to be integrated into asynchronous learning.*” This localization strategy situates ESD not as imported discourse but as region-specific learning capital.

The results of data analyses can be presented in tables, graphs, figures, or any combination of the three. Tables, graphs, or figures should not be too long, too large, or too many. The writer is advised to use decent variation in presenting tables, graphs, or verbal descriptions. All displayed tables and graphs should be referred to in the text. The format of the tables is shown in Table 1. Tables do not use column (vertical) lines, and row (horizontal) lines are used only for the head and tail of the table. The font of the table entry may be reduced. Figures in the table should not be over-repeated in the narration before or after the table. All figures and tables should be cited in the main text, such as Figure 1, Table 1, etc.

Discussion

The findings of this study indicate that digital learning in Indonesian higher education is rhetorically positioned as a mechanism for flexibility, inclusion, and twenty-first-century competencies, but remains pedagogically underdeveloped. The lecturers’ descriptions that LMS platforms are primarily used to upload materials and assign tasks reinforce global criticisms that higher education institutions are still operating in a stage of *digitization*—

that is, transferring administrative routines into online systems without meaningful pedagogical transformation. This aligns with constructivist and transformative learning theories, which emphasize critical reflection, dialogic interaction, and authentic problem-solving rather than a mere shift of delivery modes. Within the ESD agenda, Leal Filho et al. have warned that without holistic and intentional integration, sustainability becomes “complementary rhetoric” that never materializes in teaching practice (Leal Filho et al., 2023). When participants state that digital learning is “the same as offline, only through LMS,” their remarks illustrate exactly the implementation risks identified in the global literature.

The limited explicit integration of ESD and SDG 4 into digital teaching also mirrors recent bibliometric evidence showing that SDG content in higher-education curricula remains fragmented and uneven. Curriculum-mapping studies reveal that sustainability topics appear sporadically, more visible in policy texts than in classroom design (Marrucci et al., 2022). Global surveys by Leal Filho, Lange Salvia, and Eustachio demonstrate a similar pattern: although institutions increasingly reference the SDGs in strategic discourse, the translation into everyday pedagogy remains weak and non-systematic (Leal Filho et al., 2024). Participants’ remarks that quality and sustainable-education concepts “appear more in institutional documents than in digital classrooms” affirm the international finding that sustainability is a *rhetorical policy* rather than an *instructional reality*.

From the standpoint of educational theory, this condition reflects a failure to translate ESD into concrete pedagogical design. Paul Pace argues that many universities adopt ESD terminology without providing learning experiences that build students’ socio-ecological awareness, global citizenship, and social-justice orientation (Pace, 2021). The participants’ admission that lecturers are “not accustomed to linking course material to real issues such as environmental sustainability and social justice” underscores this operational failure. This is particularly striking in social-science contexts, where critical pedagogy, systems thinking, and socio-environmental analysis should be central epistemic spaces but remain absent in digital practices.

Findings regarding lecturer capacity and student digital-literacy deficits further clarify why this disconnect persists. Leal Filho et al. (2023) emphasize that staff readiness is a determining factor in SDG implementation in higher education and that many academics still lack confidence and institutional support to enact competence-oriented sustainability teaching. In geography and environmental-education studies, Raath and Hay demonstrate that explicit training in systems thinking and cooperative learning is vital if future teachers are to embed ESD in practice (Raath & Hay, 2022). The present findings suggest a similar need among social-science academics: without systematic professional development in digital pedagogy and ESD (e.g., online problem-based learning, critical discussion forums, authentic LMS-based assessment), online environments will remain administrative spaces rather than transformative ones.

At the same time, digitalization is not solely a pedagogical concern—it is also an organizational and socio-technical process. The theme of “digital transformation without governance and incentives” aligns strongly with Leal Filho’s work on SDG governance, which evidence that leadership, adaptive policy, and internal incentive systems shape whether universities mobilize the SDGs effectively (Leal Filho et al., 2022). When a participant notes the absence of “performance instruments that appreciate LMS use,” the comment corroborates international findings that, without recognition mechanisms, academics default to minimum compliance and delay innovation. From a social-science perspective, this is a problem of organizational culture: sustainability circulates symbolically but is not embedded in reward systems or academic labor conditions.

Structural and territorial constraints emerged as a distinctive empirical contribution of this study, particularly because much of ESD scholarship remains Global-North dominated. Systems approach to sustainability education stress that curriculum, infrastructure, governance, and cultural context must function as interconnected ecologies;

without contextual sensitivity, ESD risks reproducing inequality (Mifsud et al., 2023). When an interviewee from Eastern Indonesia reports that unstable electricity and internet “reproduce educational injustice,” it shows how digital learning can generate territorial inequity rather than accessibility, placing SDG 4 at risk. In this regard, the study extends Manolas and Leal Filho’s account of “lessons from leading institutions” by foregrounding conditions in *non-leading institutions*, where structural barriers intensify the probability of implementation failure (Manolas et al., 2023).

The findings also connect directly with emerging debates on digital transformation for sustainability. Trevisan, Eustachio, Leal Filho and colleagues show that digital-transformation research in HEIs clusters around three domains: *digitalization for sustainability competencies*, *smart and sustainable campuses*, and *digital theorization of sustainability*. However, they highlight a theoretical and empirical gap concerning how digital transformation reshapes teaching practice. The present study provides concrete evidence of this gap, as lecturers in social-science fields continue to use LMS platforms primarily for repositories and submissions rather than reflective, interactive, inquiry-based sustainability learning. In response, the proposed *Digital-Pedagogical Framework for ESD in Social Science* becomes timely—addressing global calls for conceptual models linking ESD competencies (systems thinking, critical reflection, collaboration, ethical digital citizenship) to digital instructional delivery.

Finally, these findings align with the broader literature that positions HEIs as *key actors* in achieving the SDGs and as potential *living laboratories* for sustainability (Leal Filho et al., 2020; Salvia et al., 2022; Eustachio et al., 2023). Whereas much of this scholarship emphasizes institutional strategy and macro-level engagement, the present qualitative evidence zooms into micro-level conditions lecturer experience, pedagogical readiness, infrastructural access, and organizational culture which determine whether SDG-aligned digital learning can succeed. In doing so, the study contributes a social-science perspective that frames digital learning for sustainability not as a technical upgrade but as a social-institutional practice shaped by power, habitus, labor precarity, and spatial inequality.

CONCLUSION

This study concludes that digital learning in Indonesian higher education remains in a transitional stage and is not yet pedagogically mature enough to support *Education for Sustainable Development* (ESD) and SDG 4 on quality education. Although LMS platforms and digital tools have been widely adopted, they are generally used in minimalist ways mainly for uploading course materials, assigning tasks, and handling administration rather than as learning ecosystems that stimulate critical reflection, collaboration, and socio-environmental literacy. Thus, digitalization appears more as a shift in medium than a genuine transformation of learning paradigms. The integration of ESD and SDG 4 into digital teaching remains largely implicit. Principles of sustainability, equity, and lifelong learning are present at the policy level, but they have not been translated explicitly into learning objectives, digital activity design, or LMS-based assessment. As a result, digital learning continues to prioritize content completion and administrative compliance, while the transformative pedagogical potential of ESD remains unrealized.

Capacity gaps among lecturers and students including limited digital literacy, insufficient online-pedagogy competence, and weak skills in designing interactive content serve as major barriers. Meanwhile, infrastructural inequality in 3T regions and Eastern Indonesia means that LMS usage may reproduce educational injustice rather than promote equitable access, contradicting the mandate of SDG 4. The absence of performance instruments and incentives to encourage digital-teaching innovation further weakens ESD integration. Overall, digital learning holds considerable potential as a vehicle for sustainability education, but this potential remains latent. Therefore, a Digital-Pedagogical

Framework for ESD in Social Science is required to bridge technology, pedagogy, and sustainability so that digitalization becomes a fair, contextual, and transformative educational practice.

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