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Reconstructing Critical Economic Thinking through Eco-Pedagogy and Digital Sustainability Competence: A Constructivist Grounded Theory Study

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A B S T R A C T

This study develops the Sustainability-Oriented Critical Economic Thinking (SOCET) Framework through a Constructivist Grounded Theory approach. The study explores how eco-pedagogy and digital sustainability competence shape university students' critical economic thinking in Indonesian higher education. Data were collected through in-depth interviews, focus group discussions, and reflective journals involving university students from economics-related disciplines. The findings reveal four interconnected processes: ecological awakening, digital sustainability reflexivity, ethical reconstruction of economic reasoning, and transformative sustainability-oriented economic consciousness. The study contributes to the reconceptualization of critical economic thinking as a socio-ecological and ethically grounded form of sustainability-oriented economic reasoning.

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INTRODUCTION

The accelerating ecological crisis, climate instability, unsustainable consumption patterns, and rapid digital transformation have intensified global concerns regarding the role of higher education in promoting sustainability-oriented citizenship. Universities are increasingly expected not only to produce graduates with technical and professional competencies, but also to cultivate individuals capable of critically evaluating the ecological, social, and ethical consequences of economic decisions (Hassan et al., 2025; Shutaleva, 2023). Within this context, sustainability education has emerged as a central agenda in higher education reform following the global expansion of UNESCO's Education for Sustainable Development (ESD) agenda (UNESCO, 2017). However, many higher education institutions still struggle to integrate sustainability values into disciplinary learning, particularly within economic education, which remains largely dominated by market-centered rationality, productivity, efficiency, and growth-oriented paradigms (Mokski et al., 2022; Singh, 2026; Strachan et al., 2021). Consequently, students may develop strong analytical economic skills while remaining insufficiently prepared to critically evaluate ecological degradation, digital consumerism, and sustainability-related ethical dilemmas.

Recent scholarship has emphasized the importance of transformative pedagogies capable of fostering ecological awareness, ethical reflection, and systemic thinking among learners (Mokski et al., 2022). Within this discourse, eco-pedagogy has gained increasing attention as a critical educational approach rooted in ecological consciousness, social justice, and transformative learning. Drawing upon the critical pedagogical perspectives of Paulo Freire and further developed by Richard Kahn, eco-pedagogy positions education as a means of developing critical ecological consciousness and challenging systems of exploitation and unsustainable development (Kahn, 2010). Rather than treating environmental issues as supplementary topics, eco-pedagogy seeks to reconstruct educational practices toward ethical and sustainability-oriented learning (Lozjanin et al., 2025). Simultaneously, the rapid expansion of digital technologies has transformed students' patterns of communication, consumption, and economic participation, generating sustainability-related challenges such as electronic waste, algorithmic consumerism, and digitally mediated overconsumption (Sambargi & Shubha, 2024).

The Indonesian context provides an important setting for examining these issues. Indonesia continues to face significant ecological-economic crises, including deforestation, mining expansion, marine pollution, and environmental degradation linked to extractive economic practices and unsustainable development. A recent study by Nilan & Maunati (2025) shows that deforestation and land degradation remain major environmental problems, while Indonesia is also among the world's largest contributors to marine plastic waste. At the same time, Indonesia has become one of the largest digital economies in Southeast Asia, with the rapid expansion of e-commerce and online marketplaces significantly shaping consumption behavior and economic lifestyles among young people. Baroto (2026) shows that Indonesia's digital

economy continues to grow rapidly through platform-based consumption and digital financial services. In response, the Indonesian government has promoted sustainability-oriented education through policies aligned with the Sustainable Development Goals (SDGs), UNESCO-ESD initiatives, and the Merdeka Belajar–Kampus Merdeka (MBKM) framework introduced by the Indonesian Ministry of Education. Nevertheless, sustainability education in many Indonesian universities remains fragmented and is often positioned as complementary content rather than as a transformative foundation for economic learning (Imran, 2026).

Another important limitation concerns the conceptualization of critical thinking within economic education. Existing studies generally define critical thinking as analytical reasoning, logical evaluation, or problem-solving competence (Ennis, 2016), while paying limited attention to ecological ethics, sustainability values, socio-environmental justice, and systemic ecological interdependence. Consequently, critical economic thinking is frequently reduced to market-oriented reasoning rather than being understood as a reflective and ethically grounded capacity to evaluate economic activities within broader socio-ecological contexts (Pantazidis & Tsismalidou, 2026; Selje et al., 2026). Furthermore, although previous studies have separately examined sustainability education, eco-pedagogy, and digital competence, limited attention has been given to how eco-pedagogical learning experiences and digital sustainability competence collectively shape students' critical economic thinking, particularly within Global South contexts characterized by environmental vulnerability and rapid digital transformation.

To guide this investigation, the study addresses several research questions. First, how do university students interpret and experience eco-pedagogical learning within the context of economic education? Second, how do students understand and construct digital sustainability competence in their academic and everyday economic practices? Third, how do eco-pedagogical experiences and digital sustainability competence influence the formation of students' critical economic thinking? Finally, how can the interaction between eco-pedagogy, digital sustainability competence, and critical economic thinking be conceptualized into a sustainability-oriented framework for economic education?

This study contributes to the literature in several important ways. First, it proposes a reconceptualization of critical economic thinking from a sustainability perspective. Second, it integrates eco-pedagogy and digital sustainability competence within a unified conceptual framework for economic education. Third, it extends sustainability competence discourse into the domain of digital ethics and ecological responsibility. Finally, this study contributes empirical and theoretical insights from the Global South, particularly within the context of Indonesian higher education, thereby enriching contemporary debates on sustainability-oriented educational transformation.

LITERATURE REVIEW

Eco-Pedagogy and Sustainability-Oriented Education

The growing ecological crisis has intensified debates regarding the role of education in addressing environmental degradation, socio-ecological injustice, and unsustainable development (Sund & Öhman, 2026). In response, sustainability education has shifted from content-based environmental instruction toward transformative approaches emphasizing critical reflection, systems thinking, participatory engagement, and ecological responsibility (Gorski et al., 2023; Rieckmann, 2025). This perspective challenges conventional educational systems that often reproduce anthropocentric and growth-oriented ideologies contributing to ecological destruction and social inequality.

The central concept of conscientização, or critical consciousness, emphasized by Freire (2021), advocates that education should help students understand the structures of social, economic, cultural, and political oppression that affect their lives. This awareness also encourages actions of social transformation, which he calls praxis. One of the most influential approaches within transformative sustainability education is eco-pedagogy, which extends critical pedagogy toward ecological consciousness and planetary responsibility. Drawing upon the ideas of Paulo Freire and Richard Kahn, eco-pedagogy emphasizes reflective engagement with socio-environmental realities, ethical questioning of unsustainable development, and the cultivation of ecological citizenship (Kahn, 2010). In addition, Lozjanin et al. (2025) also argues that to improve the quality and delivery of educational responses to the climate crisis, the integration of project-based, learner-centered, experiential learning, reflective/critical, problem-based, and collaborative learning pedagogies can empower learners to become agents of change and contribute effectively to a more sustainable future. However, its integration into economic education remains limited, as economic learning continues to be dominated by neoliberal assumptions emphasizing competition, productivity, and market efficiency while marginalizing ecological sustainability and ethical reflection.

Digital Sustainability Competence

The rapid expansion of digital technologies has fundamentally transformed contemporary economic, social, and educational practices. While digitalization offers opportunities for innovation and sustainability, it also generates ecological and socio-economic challenges such as electronic waste, excessive digital consumption, surveillance capitalism, and environmentally unsustainable technological practices (Cámara, 2023; Rosário & Dias, 2023). Within educational discourse, digital competence has therefore become increasingly important for preparing students to navigate technology-driven societies. However, existing frameworks generally emphasize technical proficiency, information literacy, and online communication skills while paying limited attention to ecological responsibility and sustainability awareness (Karanfiloğlu, 2025; Lo, 2024).

The concept of digital sustainability competence emerges from the integration of sustainability education and digital literacy, referring to the ability to critically and ethically use digital technologies while considering their environmental, social, and economic consequences (Brown, 2014). This

competence includes awareness of sustainable digital consumption, ethical technology use, critical reflection on digital capitalism, and responsible digital participation. In higher education, digital sustainability competence is particularly relevant because university students are deeply embedded within digitally mediated economic systems characterized by online consumption, platform economies, and algorithmic media exposure (McGarr, 2023). Integrating this competence into economic education is therefore essential for fostering students' critical awareness of the ecological implications of digital technologies and contemporary economic systems.

Critical Economic Thinking

Critical thinking has long been regarded as a fundamental objective of higher education and economic learning. Within economic education, critical thinking is commonly associated with analytical reasoning, problem-solving abilities, and the capacity to evaluate economic phenomena (Ennis, 2016). Critical Economic Thinking (CET) refers to the ability to analyse, evaluate, and make economic decisions in a logical, reflective, and evidence-based manner (Imran et al., 2026). Although these perspectives contribute to the development of students' analytical competencies, they often remain limited to cognitive and market-centered reasoning focused on efficiency, profitability, and economic growth. Freire (2018) considers this kind of conventional learning only perpetuates structures of social oppression because students are not trained to question the social reality around them. Contemporary sustainability challenges reveal important limitations within these conventional understandings of critical thinking. Economic activities are increasingly interconnected with climate change, environmental degradation, resource exploitation, digital consumerism, and socio-environmental inequality. Consequently, critical economic thinking requires broader conceptual foundations capable of integrating ecological awareness, ethical responsibility, sustainability values, and socio-environmental justice into economic analysis. In this context, economic reasoning should not only evaluate economic efficiency but also critically examine the environmental and social consequences of economic systems and digital practices.

This study conceptualizes critical economic thinking as a form of socio-ecological reasoning through which individuals critically evaluate economic issues by considering environmental sustainability, ethical reflection, social justice, and long-term ecological consequences. This perspective aligns with sustainability competence frameworks emphasizing systems thinking, normative reflection, and systemic understanding (Albakri & Wood-Harper, 2025; Rutherford, 2025). However, limited studies have examined how eco-pedagogical experiences and digital sustainability competence contribute to the development of sustainability-oriented economic reasoning among university students.

Theoretical Positioning and Conceptual Direction of the Study

This study is theoretically positioned at the intersection of critical pedagogy, eco-pedagogy, sustainability competence theory, and transformative learning theory. Drawing upon Paulo Freire's critical pedagogy, the study

views education as a transformative process capable of fostering critical consciousness and emancipatory awareness. Through the lens of eco-pedagogy, this transformative orientation is extended toward ecological responsibility, sustainability ethics, and socio-environmental justice (Misiaszek, 2025).

The study also adopts sustainability competence perspectives emphasizing systems thinking, anticipatory competence, normative competence, and strategic sustainability action (Rutherford, 2025). However, this research expands existing sustainability competence discourse by integrating digital sustainability competence as a critical dimension of contemporary economic education. In doing so, the study responds to the growing ecological implications of digital transformation and digital capitalism within higher education contexts.

In addition, the study is informed by transformative learning theory developed by Mezirow (2015), which emphasizes the transformation of learners' assumptions, perspectives, and meaning structures through critical reflection. This theoretical perspective is particularly relevant for understanding how students reinterpret economic reasoning through eco-pedagogical experiences and sustainability-oriented digital engagement.

Based on these theoretical foundations, this study seeks to develop a conceptual model explaining how eco-pedagogy and digital sustainability competence contribute to the formation of sustainability-oriented critical economic thinking among university students. Rather than treating sustainability as an additional component of economic education, this study positions sustainability as an epistemological and ethical foundation for reconstructing economic learning itself.

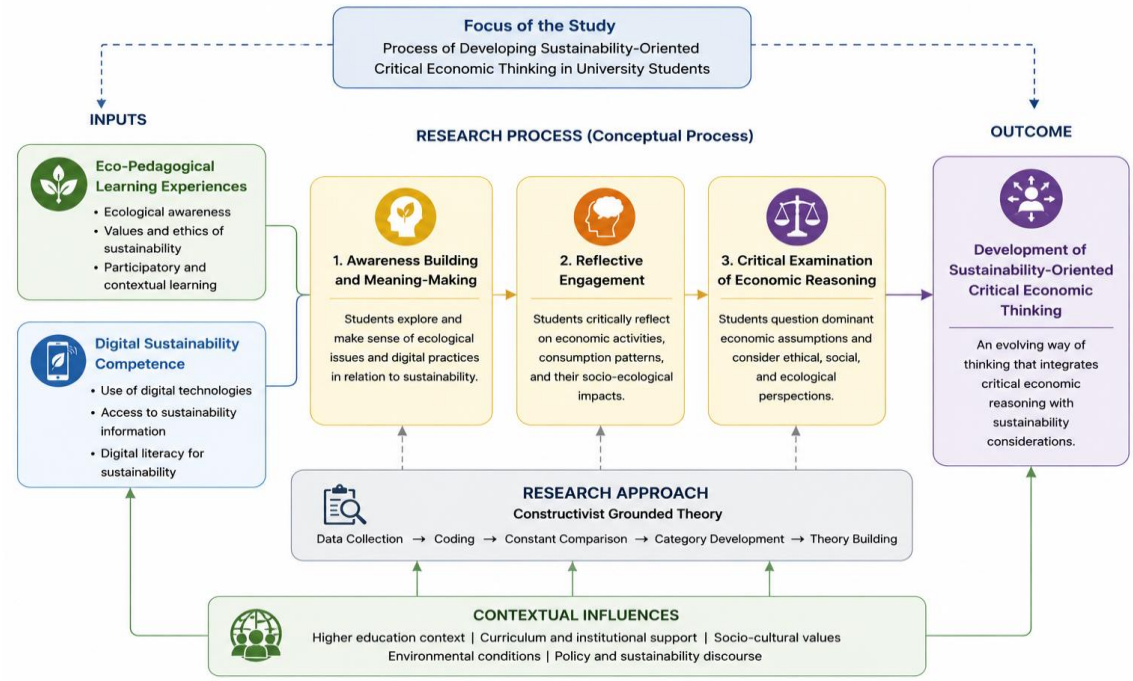

Figure 1. Conceptual Framework

METHODOLOGY

This study employed a qualitative Constructivist Grounded Theory approach developed by Charmaz (2017) to generate an emergent conceptual framework explaining how eco-pedagogy and digital sustainability competence contribute to the formation of sustainability-oriented critical economic thinking among university students. Grounded in a constructivist epistemological perspective, the study involved 24 undergraduate students from economics-related disciplines consisting of 11 male and 13 female participants enrolled in the third, fifth, and seventh semesters. Participants were selected purposively and through theoretical sampling to capture diverse experiences related to sustainability-oriented learning, digital practices, and economic reasoning processes.

Data were collected through semi-structured in-depth interviews, focus group discussions (FGDs), and reflective journals to explore participants' experiences and interpretations regarding sustainability, digital responsibility, and economic learning. Data analysis followed the iterative procedures of initial coding, focused coding, and theoretical coding using constant comparative analysis and analytical memo writing to identify emergent conceptual categories and relationships. To ensure trustworthiness, the study applied triangulation, member checking, reflexive interpretation, and thick description, resulting in the development of the SOCET Framework explaining the integration of eco-pedagogy and digital sustainability competence in fostering sustainability-oriented critical economic thinking.

RESEARCH RESULT

To enhance analytical transparency, the findings are presented through the iterative coding procedures of the Constructivist Grounded Theory approach, moving from participants' verbatim narratives toward focused conceptual categories and theoretical abstraction.

Table 1. Constructivist Grounded Theory Coding Process

Participant Verbatim	Initial Coding	Focused Coding	Theoretical Category
"Before joining this class, I always thought economic success was only about profit and productivity. But after discussing environmental destruction and overconsumption, I realized that economic growth can also damage nature."	Questioning growth-centered economics; recognizing environmental consequences	Reconsidering conventional economic rationality	Ecological Awakening
"I started feeling	Feeling moral	Reflecting	Digital

uncomfortable seeing how often I buy unnecessary products online just because social media advertisements keep appearing."	discomfort toward online consumption	critically on digital consumerism	Sustainability Reflexivity
"At first, I never thought gadget replacement had environmental impacts. I only cared about having the newest technology."	Realizing ecological impact of digital technology	Awareness of technological sustainability issues	Digital Sustainability Reflexivity
"Now I think economic decisions should not only benefit individuals but also consider environmental sustainability and future generations."	Integrating ethics into economic reasoning	Reconstructing economic evaluation criteria	Ethical Reconstruction of Economic Reasoning
"Sometimes I feel conflicted because sustainability values are difficult to apply in everyday life where consumerism is everywhere."	Experiencing tension between values and reality	Negotiating sustainability contradictions	Ethical Reconstruction of Economic Reasoning
"Class discussions made me realize that environmental problems are connected to economic systems, politics, and digital lifestyles."	Connecting ecology, economy, and technology	Developing systemic sustainability awareness	Transformative Sustainability-Oriented Economic Consciousness
"I became more selective in online shopping and started thinking about whether products are environmentally responsible."	Changing consumption behavior through reflection	Sustainability-oriented behavioral awareness	Transformative Sustainability-Oriented Economic Consciousness
"Eco-pedagogy discussions changed the way I see economics. Economics is not only about markets anymore, but also about responsibility toward society and nature."	Transforming understanding of economics	Reconstructing socio-ecological economic consciousness	Transformative Sustainability-Oriented Economic Consciousness

Table 1 illustrates how participants' reflections were systematically transformed into emergent categories that informed the development of the SOCET Framework.

Table 2. Theoretical Coding Integration

Focused Categories	Relationship Identified	Emergent Theoretical Process
Ecological awareness + critical classroom reflection	Sustainability reflection emerges through dialogical learning	Ecological Awakening
Digital consumption awareness + ethical reflection	Students critically reassess digital lifestyles	Digital Sustainability Reflexivity
Ethical evaluation + sustainability reasoning	Economic logic reconstructed through ecological ethics	Ethical Reconstruction of Economic Reasoning
Systems thinking + sustainability consciousness	Integrated socio-ecological worldview formation	Transformative Sustainability-Oriented Economic Consciousness

Table 2 presents the integration of focused categories into broader theoretical relationships that informed the emergence of the SOCET Framework. The theoretical coding process demonstrates how ecological awareness, digital sustainability reflexivity, and ethical economic reasoning were interconnected in shaping sustainability-oriented critical economic thinking among university students.

Ecological Awakening through Critical Learning Experiences

The first major finding demonstrates that eco-pedagogical learning experiences contributed significantly to the emergence of students' ecological awareness and critical reflection regarding contemporary economic systems. Participants described that conventional economic learning had previously positioned economic growth, productivity, and market efficiency as primary indicators of development, with minimal discussion of environmental consequences and socio-ecological inequalities. However, sustainability-oriented learning activities encouraged students to critically interrogate the environmental implications of economic practices, including excessive consumption, extractive industrial activities, resource exploitation, and ecological injustice.

Many participants explained that eco-pedagogical discussions, reflective classroom dialogues, and contextual sustainability cases enabled them to recognize the interconnectedness between economic systems and ecological crises. Rather than perceiving environmental degradation as an isolated environmental issue, students increasingly understood ecological destruction as structurally connected to political-economic systems, consumer culture, and unsustainable development paradigms. This process represented what emerged analytically as an "ecological awakening," referring to the gradual

transformation of students' consciousness from market-centered economic thinking toward socio-ecological awareness.

Importantly, ecological awakening was not merely cognitive in nature. Participants frequently expressed emotional and ethical responses when reflecting on environmental destruction, climate change, waste production, and unsustainable consumption patterns. Several students described feelings of moral discomfort regarding their own consumption habits and digital lifestyles after engaging in eco-pedagogical learning. These findings suggest that eco-pedagogy fostered not only knowledge acquisition but also ethical reflexivity and sustainability-oriented moral consciousness. In this context, eco-pedagogy functioned as a transformative educational process capable of destabilizing previously unquestioned assumptions regarding economic growth and consumerism.

Furthermore, the findings indicate that dialogical and reflective learning environments played an essential role in facilitating ecological awareness. Students emphasized that open classroom discussions, collaborative reflection, and contextual socio-environmental analysis enabled them to critically evaluate dominant economic narratives rather than passively accepting them. Such learning experiences align with critical pedagogical principles emphasizing consciousness formation, reflective engagement, and transformative learning processes.

Digital Sustainability Reflexivity

The second major category emerging from the analysis was digital sustainability reflexivity, which refers to students' growing awareness of the ecological, ethical, and socio-economic implications of digital technologies and digitally mediated lifestyles. Initially, many participants perceived digital technology primarily as a neutral tool supporting communication, learning, and economic activities. However, sustained reflection during learning processes gradually transformed students' perceptions regarding the environmental and social consequences of digitalization.

Participants increasingly recognized that digital practices were deeply connected to sustainability challenges such as electronic waste, excessive online consumption, algorithm-driven consumerism, energy-intensive technological infrastructures, and digital dependency. Several students described how social media platforms, online marketplaces, and algorithmic advertising shaped their consumption behaviors and normalized unsustainable purchasing patterns. Others reflected on the environmental costs associated with frequent gadget replacement, digital waste production, and technology-driven consumer culture.

These reflections generated what the analysis conceptualized as digital sustainability reflexivity. Unlike conventional notions of digital literacy focused primarily on technical competence, this form of reflexivity involved ethical questioning, ecological awareness, and critical evaluation of digital systems. Students began to reconsider the role of technology not merely as a facilitator of efficiency, but also as part of broader socio-economic structures influencing sustainability and environmental degradation.

The findings further revealed that students who demonstrated stronger sustainability reflexivity tended to exhibit more critical evaluations of digital capitalism and platform-driven economic behavior. They questioned the normalization of hyper-consumption within digital environments and recognized the ways digital systems shape desires, economic aspirations, and consumer identities. This indicates that digital sustainability competence extends beyond functional digital skills toward a form of critical ecological consciousness within technologically mediated economic systems.

Moreover, the relationship between eco-pedagogical learning and digital sustainability reflexivity appeared highly interconnected. Eco-pedagogical experiences provided the critical interpretive lens through which students reassessed their digital practices, while digital experiences simultaneously became sites for applying sustainability reflection. Thus, digital sustainability competence emerged not as an isolated technological skill, but as an ethically grounded and ecologically informed dimension of sustainability-oriented learning.

Ethical Reconstruction of Economic Reasoning

Another significant finding concerns the transformation of students' economic reasoning processes. Participants reported that sustainability-oriented learning experiences gradually shifted their understanding of economic decision-making from purely profit-oriented rationality toward ethical and socio-ecological evaluation. Before engaging in eco-pedagogical reflection, many students described economic success primarily in terms of income generation, efficiency, productivity, and market competitiveness. However, subsequent learning experiences encouraged them to critically reconsider these assumptions.

Students increasingly emphasized that economic decisions should also account for environmental sustainability, social equity, intergenerational responsibility, and ethical implications. Economic reasoning therefore became more multidimensional and reflective rather than narrowly instrumental. Several participants explained that they had begun evaluating business practices, consumption patterns, and economic policies based on their ecological impacts and social consequences rather than solely on profitability.

This process was analytically interpreted as an ethical reconstruction of economic reasoning. Rather than rejecting economic rationality altogether, students reconstructed their understanding of economic logic by integrating ethical sustainability considerations into economic evaluation processes. Economic thinking became increasingly connected to ecological responsibility, collective well-being, and long-term sustainability.

Importantly, this reconstruction process often involved internal tensions and contradictions. Some participants acknowledged difficulties in reconciling sustainability ideals with dominant economic realities characterized by consumerism, competition, and economic pressures. Students recognized that sustainability-oriented economic reasoning frequently conflicted with prevailing market norms and digitally mediated lifestyles. These tensions highlight the complexity of sustainability transformation within contemporary

capitalist contexts and demonstrate that critical economic thinking is not a fixed cognitive achievement but an ongoing reflective negotiation process.

The findings also indicate that ethical reconstruction was strongly facilitated by reflective pedagogical practices encouraging students to analyze real-world socio-economic and environmental problems. Case-based discussions, critical questioning, and sustainability-oriented reflection enabled students to connect abstract economic theories with concrete ecological realities. Consequently, economic reasoning evolved from technical analytical thinking toward critical socio-ecological interpretation.

Transformative Sustainability-Oriented Economic Consciousness

The final and most integrative category emerging from the analysis was transformative sustainability-oriented economic consciousness. This category represents the broader transformation through which students reconstructed their worldview regarding economy, technology, sustainability, and social responsibility. Participants increasingly perceived economic systems not as isolated market mechanisms but as interconnected socio-ecological structures embedded within environmental, technological, and ethical realities.

Students demonstrated growing awareness that sustainability challenges require systemic thinking capable of integrating economic, ecological, digital, and social dimensions simultaneously. This systems-oriented understanding distinguished participants' evolving perspectives from conventional economic reasoning approaches centered predominantly on market outcomes and individual rationality. Participants increasingly emphasized collective responsibility, ecological interdependence, and sustainability ethics as essential dimensions of economic understanding.

Transformative consciousness also manifested in participants' personal reflections regarding lifestyle choices, digital consumption habits, and future professional aspirations. Several students expressed intentions to adopt more sustainable consumption practices, support environmentally responsible businesses, and promote sustainability values within their future careers. Although participants acknowledged structural constraints and practical limitations, the findings suggest that eco-pedagogical and sustainability-oriented learning experiences contributed to meaningful shifts in students' moral orientations and economic worldviews.

Importantly, the analysis revealed that transformative consciousness emerged through the interaction between three interconnected processes: ecological awareness formation, digital sustainability reflexivity, and ethical reconstruction of economic reasoning. These processes collectively shaped what this study conceptualizes as sustainability-oriented critical economic thinking. This form of thinking extends beyond analytical economic competence by integrating ecological ethics, digital responsibility, systemic reflection, and socio-environmental evaluation into economic reasoning processes.

Emergent Conceptual Framework

Based on the integration of the four major categories, this study proposes an emergent conceptual framework termed the: Sustainability-Oriented Critical Economic Thinking Framework (SOCET Framework).

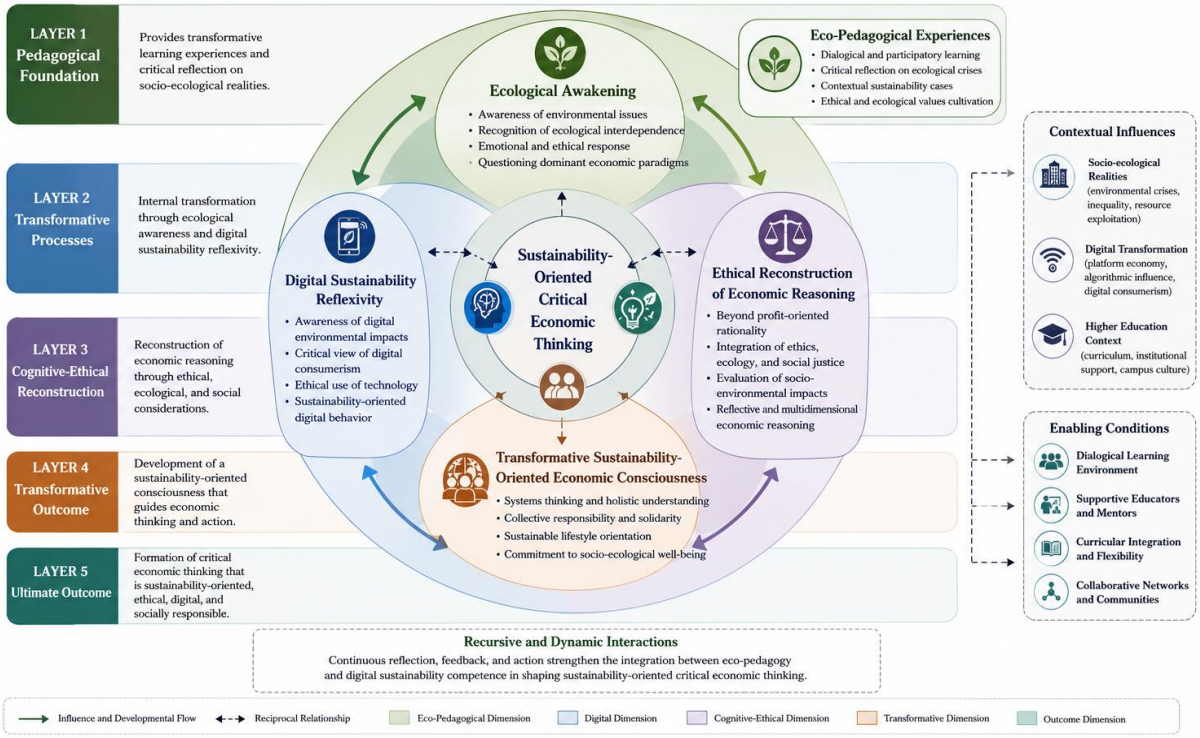

Figure 2. SOCET Framework: Construction of Sustainability-oriented Critical Economic Thinking

The emergent conceptual framework illustrates that sustainability-oriented critical economic thinking among university students develops through a multilayered transformative educational process rather than through isolated cognitive learning. The framework positions eco-pedagogical experiences as the foundational layer that initiates students' engagement with sustainability-oriented learning. Through reflective dialogue, contextual environmental discussions, and critical examination of socio-economic realities, eco-pedagogy encourages students to question dominant market-centered assumptions and recognize the interconnectedness between economic systems, ecological crises, and social responsibility. In this framework, eco-pedagogy functions not merely as a teaching strategy, but as a transformative pedagogical foundation capable of reshaping students' perspectives regarding economy, technology, and sustainability.

The second layer of the framework consists of two interconnected transformative processes: ecological awakening and digital sustainability reflexivity. Ecological awakening refers to the development of students' awareness regarding the environmental consequences of economic activities, consumerism, and unsustainable development practices. Through eco-pedagogical learning experiences, students gradually shift from viewing environmental problems as isolated issues toward understanding them as structurally linked to economic systems, technological expansion, and patterns of human behavior. Simultaneously, digital sustainability reflexivity emerges as students critically reflect on the ecological and ethical implications of digital technologies, including online consumer culture, electronic waste, platform

capitalism, and digitally mediated consumption practices. This reflexive awareness extends the meaning of digital competence beyond technical literacy toward sustainability-oriented digital consciousness.

The third layer of the framework represents the ethical reconstruction of economic reasoning. At this stage, students begin to reinterpret conventional economic rationality through ethical, ecological, and socio-environmental considerations. Economic reasoning is no longer understood solely in terms of efficiency, productivity, and profitability, but increasingly incorporates concerns related to sustainability, social justice, intergenerational responsibility, and ecological well-being. This reconstruction process reflects a significant conceptual shift in students' understanding of economic decision-making, where economic actions are evaluated not only by financial outcomes but also by their long-term environmental and social consequences. The framework therefore demonstrates that sustainability-oriented economic reasoning emerges through critical reflection and ethical transformation rather than through technical economic analysis alone.

The final layer of the framework is transformative sustainability-oriented economic consciousness, which ultimately leads to the formation of sustainability-oriented critical economic thinking. This final stage reflects a broader transformation in students' worldviews regarding economy, society, technology, and ecology. Students develop systems-oriented perspectives that recognize the interdependence between economic development, environmental sustainability, digital practices, and social responsibility. Consequently, critical economic thinking is conceptualized in this study not merely as analytical or cognitive competence, but as a form of socio-ecological consciousness integrating ethical reflection, ecological awareness, digital sustainability reflexivity, and critical evaluation of economic systems. The framework therefore offers a conceptual reconstruction of critical economic thinking within sustainability-oriented higher education and provides an emergent theoretical model explaining how eco-pedagogy and digital sustainability competence collectively foster transformative economic consciousness among university students.

DISCUSSION

The findings of this study demonstrate that sustainability-oriented critical economic thinking emerges through the interaction between eco-pedagogical learning experiences and digital sustainability competence. The results indicate that critical economic thinking cannot be understood solely as a cognitive or analytical skill detached from ecological, ethical, and socio-digital realities. Instead, students' economic reasoning develops through reflective engagement with environmental crises, digital consumer culture, and socio-economic inequalities. These finding is in line with Ghosh & Pearson (2025) study which also challenge conventional economic education paradigms that continue to prioritize market efficiency, productivity, and growth-centered perspectives while marginalizing ecological sustainability and ethical

responsibility. Their research seeks to propose one specific recommendation, namely reforming economics education.

One of the main contributions of this study lies in its reconceptualization of critical economic thinking. Previous studies generally define critical thinking as analytical reasoning, logical evaluation, and problem-solving competencies as indicators formulated by Ennis (2016). However, the findings reveal that such cognitive-centered perspectives remain insufficient for addressing contemporary sustainability challenges. This study proposes sustainability-oriented critical economic thinking as a form of socio-ecological consciousness integrating ethical reflection, ecological awareness, digital reflexivity, and critical evaluation of economic systems and digitally mediated consumption practices. This opens up avenues for more ethical and relational understanding, learning and action that help reconnect the social with nature and align economic education with sustainable development goals (Hantsch, 2026; Imran et al., 2025; Tallgauer & Schank, 2023).

The findings also reinforce the transformative role of eco-pedagogy within sustainability-oriented higher education. Consistent with the critical pedagogical perspectives of Freire (1974) and eco-pedagogical scholarship developed by Kahn (2010), eco-pedagogy functions not merely as environmental instruction but as a transformative educational process capable of fostering ecological consciousness and challenging dominant economic assumptions. The emergence of ecological awakening among participants demonstrates that reflective and dialogical learning environments can reshape students' perceptions regarding consumerism, economic growth, and environmental responsibility. Moreover, Hantsch (2026) has seen in depth and more broadly that economic education is still shaped by the neoclassical paradigm which prioritizes efficiency, rationality and adaptation rather than pluralism, reflection and transformation. Importantly, this study expands sustainability education discourse by integrating digital sustainability competence into economic learning. Unlike conventional digital literacy frameworks that emphasize technical and operational skills, the findings reveal that digital technologies are deeply embedded within ecological and economic structures shaping students' sustainability awareness and consumption behaviour (Brown, 2014; Karanfiloğlu, 2025; Lo, 2024; Rosário & Dias, 2023).

The concept of digital sustainability reflexivity emerging from this study highlights students' critical awareness regarding the ecological and socio-economic implications of digital systems, including online consumer culture, platform capitalism, and algorithmic consumption. This suggests that sustainability-oriented education must move beyond teaching technological efficiency toward fostering critical reflection on how digital systems influence environmental degradation and economic behavior.

Another important finding concerns the ethical reconstruction of economic reasoning among university students. Sustainability-oriented learning experiences encouraged participants to reinterpret economic rationality beyond narrow market-centered frameworks by considering environmental sustainability, social justice, and long-term ecological

consequences. Nevertheless, the findings also reveal tensions and contradictions within students' transformative learning processes. Although participants developed stronger sustainability awareness, many acknowledged difficulties in applying sustainability principles within everyday life shaped by consumerism, economic pressures, and digitally mediated lifestyles. To respond to this, Triantafyllidou & Zabaniotou (2022) can help us by understanding how examples of embedding sustainability in individual consumption behavior and daily decisions are supported by digital technology applications integrated with social innovation marketing models. Their idea is interesting and innovative because the digital application on mobile phones, called "Go Sustainable Living", can be used by consumers to upload their daily sustainable and green actions to collect credits that can then be exchanged for discounts on purchases at local shops and cultural organizations participating in the project. This indicates that sustainability-oriented critical economic thinking emerges as an ongoing process of negotiation between sustainability ideals and structural realities rather than as a linear transformation.

The Indonesian context of this study further enriches sustainability education literature by providing a Global South perspective shaped by environmental degradation, extractive economic practices, digital transformation, and socio-economic inequality. The emergent SOCET Framework therefore contributes theoretically by reconceptualizing critical economic thinking as a multidimensional socio-ecological process integrating eco-pedagogy and digital sustainability competence within a unified transformative educational model. Practically, the findings imply that higher education institutions should integrate sustainability as a foundational perspective within economic education through dialogical learning, interdisciplinary sustainability integration, and reflective digital literacy practices, as various previous studies also confirm this and underline interdisciplinarity as a solution. (Howlett et al., 2016; Lo, 2024; Lozjanin et al., 2025; Strachan et al., 2021). Overall, this study demonstrates that reconstructing economic education through eco-pedagogy and digital sustainability competence is essential for preparing critically conscious graduates capable of addressing contemporary socio-ecological crises.

CONCLUSIONS AND RECOMMENDATIONS

This study developed the SOCET Framework through a Constructivist Grounded Theory approach to explain how eco-pedagogy and digital sustainability competence foster sustainability-oriented critical economic thinking among university students. The findings reveal that students' critical economic thinking emerges through interconnected processes of ecological awakening, digital sustainability reflexivity, ethical reconstruction of economic reasoning, and transformative sustainability-oriented economic consciousness. The study contributes theoretically by reconstructing critical economic thinking beyond conventional cognitive and market-centered perspectives toward a socio-ecological form of reasoning integrating ethical reflection, ecological awareness, and digital sustainability consciousness.

The study further suggests that higher education institutions should integrate sustainability as an epistemological foundation within economic education rather than positioning it merely as supplementary content. Eco-pedagogical learning and sustainability-oriented digital literacy should be strengthened through reflective, dialogical, and interdisciplinary educational practices capable of fostering critical socio-ecological awareness among students.

ADVANCED RESEARCH

This study has several limitations. The research was conducted within the context of Indonesian higher education and may therefore reflect specific socio-cultural and educational conditions. In addition, as a qualitative Constructivist Grounded Theory study, the research focused on conceptual reconstruction rather than statistical generalization, while the long-term behavioral impact of sustainability-oriented critical economic thinking was not examined comprehensively. Future research is recommended to test the applicability of the SOCET Framework across different cultural and disciplinary contexts, as well as to explore its long-term influence on students' sustainability practices, civic engagement, and professional decision-making.

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REFERENCES

Albakri, M., & Wood-Harper, T. (2025). Revisiting critical systems thinking: enhancing the gaps through sustainability and action methodologies. *Systems Research and Behavioral Science*, *42*(1), 157–170.

Baroto, W. A. (2026). Regulating Indonesia's digital economy: Balancing growth, inclusion, and governance. *Data & Policy*, *8*, e17.

Brown, S. A. (2014). Conceptualizing digital literacies and digital ethics for sustainability education. *International Journal of Sustainability in Higher Education*, *15*(3), 280–290.

Cámara, J. A. (2023). Humanity Is Facing Its Sustainability: Will Technological Progress Make the Future Unsustainable? In *Science, Technology and Innovation in the History of Economic Thought* (pp. 241–256). Springer.

Charmaz, K. (2017). Constructivist grounded theory. *The Journal of Positive Psychology*, *12*(3), 299–300.

Ennis, R. H. (2016). Critical Thinking Across the Curriculum: A Vision. *Topoi*, *37*(1), 165–184. https://doi.org/10.1007/s11245-016-9401-4

Freire, P. (1974). *Education for critical consciousness*. Bloomsbury Publishing.

Freire, P. (2018). *Pendidikan Kaum Tertindas*. Jakarta: LP3ES.

Ghosh, E., & Pearson, L. J. (2025). Rethinking Economic Foundations for Sustainable Development: A Comprehensive Assessment of Six Economic Paradigms Against the SDGs. In *Sustainability* (Vol. 17, Issue 10, p. 4567). https://doi.org/10.3390/su17104567

Gorski, A.-T., Ranf, E.-D., Badea, D., Halmaghi, E.-E., & Gorski, H. (2023). Education for sustainability—Some bibliometric insights. *Sustainability*, *15*(20), 14916.

Hantsch, R. (2026). Transformative Economic Education—A Framework for the Integration of Socioeconomic Education and Transformative Learning Theory. *Journal of Transformative Education*, *24*(1), 100–123.

Hassan, M. U., Murtaza, A., & Rashid, K. (2025). Redefining higher education institutions (HEIs) in the era of globalisation and global crises: A proposal for future sustainability. *European Journal of Education*, *60*(1), e12822.

Howlett, C., Ferreira, J.-A., & Blomfield, J. (2016). Teaching sustainable development in higher education: Building critical, reflective thinkers through an interdisciplinary approach. *International Journal of Sustainability in Higher Education*, *17*(3), 305–321.

Imran, A. F. (2026). Ekologi yang Hilang dalam Pembelajaran Ekonomi. In I. M. J. A. Dwipatna (Ed.), *Wawasan Baru Pembelajaran Ekonomi* (1st ed.). Kota Solok: PT. Mafy Media Literasi Indonesia.

Imran, A. F., Idham, A. Z., Yamin, M., Anto, M. A., & Paramita, S. (2026). Sharpening Critical Economic Thinking: Investigating the Impact of Case-based Learning in Higher Education. *Sosioedukasi: Jurnal Ilmiah Ilmu Pendidikan Dan Sosial*, *15*(2), 907–915. https://ejournal.unibabwi.ac.id/index.php/sosioedukasi/article/view/6255

Imran, A. F., Tawe, A., & Rahmatullah. (2025). Development of augmented reality-based environmental economics learning media to improve students' creative thinking skills. *Multidisciplinary Science Journal*, *8*(6), 1–12. https://doi.org/10.31893/multiscience.2026156

Kahn, R. V. (2010). *Critical pedagogy, ecoliteracy, & planetary crisis: The ecopedagogy movement* (Vol. 359). Peter Lang.

Karanfiloğlu, M. (2025). Digital literacy as a catalyst for sustainable

development. In *Digital Literacy as a Catalyst for Critical Thinking: From Media to Artificial Intelligence* (pp. 155–188). Springer.

Lo, N. P.-K. (2024). The confluence of digital literacy and eco-consciousness: harmonizing digital skills with sustainable practices in education. *Platforms*, *2*(1), 15–32.

Lozjanin, A., Chhabra, G., & Mehdian, N. (2025). Exploring green pedagogy for eco-centric praxis-based learning in higher education. *Journal of Applied Learning & Teaching*, *8*(S1), 66–79.

McGarr, O. (2023). Investigating student teachers' responses to including sustainable development as part of their professional digital competence development. *Technology, Pedagogy and Education*, *32*(5), 653–665.

Mezirow, J. (2015). Transformative learning. *Challenging Educational Theories*, *319*.

Misiaszek, G. W. (2025). *Ecopedagogy and the Global Environmental Citizen: Critical Issues, Trends, Challenges and Possibilities*. Taylor & Francis.

Mokski, E., Leal Filho, W., Sehnem, S., & Andrade Guerra, J. B. S. O. de. (2022). Education for sustainable development in higher education institutions: an approach for effective interdisciplinarity. *International Journal of Sustainability in Higher Education*, *24*(1), 96–117. https://doi.org/10.1108/IJSHE-07-2021-0306

Nilan, P., & Maunati, Y. (2025). Climate Change and Environmental Struggles in Southeast Asia. In *Decolonising Social Science Research in Southeast Asia: New Ways of Knowing* (pp. 137–161). Springer.

Pantazidis, S., & Tsismalidou, G. (2026). Social Entrepreneurial Learning in Self-Organized Early Childhood and Primary Education Settings in Greece. *Education Sciences*, *16*(3), 456.

Rieckmann, M. (2025). Transformation-Literate Citizens: Advancing Sustainable Development Through Education. In *Intensive Livestock Production in Transition: Analyses, Concepts and Strategies for Sustainability Transformation of the Livestock Value Chain* (pp. 379–389). Springer.

Rosário, A. T., & Dias, J. C. (2023). The new digital economy and sustainability: Challenges and opportunities. *Sustainability*, *15*(14), 10902.

Rutherford, G. (2025). Relational Competence Building in Sustainable Development: A Systems-Thinking Approach. In *Competence Building in Sustainable Development* (pp. 333–355). Springer.

Sambargi, S., & Shubha, N. S. (2024). Technology and sustainability:

opportunities and challenges. *Nudging Green: Behavioral Economics and Environmental Sustainability*, 189–205.

Selje, T., Klepp, A., & Heinz, B. (2026). The Role of Global Political Economy in Community-Based Adaptation to Climate Change—Practitioners' Experience and Opinions. *Sustainable Development*.

Shutaleva, A. (2023). Ecological culture and critical thinking: building of a sustainable future. *Sustainability*, *15*(18), 13492.

Singh, P. (2026). The poverty of mainstream economics: a systematic critique. *The Japanese Political Economy*, 1–40. https://doi.org/10.1080/2329194X.2026.2645708

Strachan, S., Logan, L., Willison, D., Bain, R., Roberts, J., Mitchell, I., & Yarr, R. (2021). Reflections on developing a collaborative multi-disciplinary approach to embedding education for sustainable development into higher education curricula. *Emerald Open Research*, *1*(9). https://doi.org/10.1108/EOR-09-2023-0007

Sund, L., & Öhman, J. (2026). Revisiting the political in environmental and sustainability education–a global justice-oriented approach. *Environmental Education Research*, *32*(4), 947–963.

Tallgauer, M., & Schank, C. (2023). Rethinking Economics Education for Sustainable Development: A Posthumanist Practice Approach. *Sustainability*, *15*(9018), 1–14. https://doi.org/10.3390/su15119018

Triantafyllidou, E., & Zabaniotou, A. (2022). Digital technology and social innovation promoting a green citizenship: development of the "go sustainable living" digital application. *Circular Economy and Sustainability*, *2*(1), 141–164.

UNESCO. (2017). Education for Sustainable Development Goals (SDGs). In *European Conference on Educational Research 2017*. https://unesdoc.unesco.org/ark:/48223/pf0000247444