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PHILOSOPHICAL ASPECTS OF THE DEVELOPMENT OF ECOLOGICAL COMPETENCE IN YOUNG PEOPLE THROUGH DIGITAL LEARNING PLATFORMS

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Abstract
The convergence of digital transformation and deepening ecological crises offers both unprecedented challenges and opportunities for environmental education. This article examines the philosophical dimensions of the development of ecological literacy among adolescents through digital learning platforms, with particular attention to the Uzbek context. Based on critical technology theory, posthumanist pedagogy and decolonial perspectives, the study analyzes the ontological, epistemological and axiological foundations of digitally mediated environmental education. The article argues that while digital platforms offer significant potential for scaling environmental education and engaging digitally engaged generations, they also embody fundamental philosophical tensions: the mediation of nature through screens, the risk of techno-solutionism, the tension between behavior modification and autonomous consciousness, and the potential marginalization of traditional ecological knowledge.

Keywords: Ecological literacy, digital learning platforms, environmental philosophy, techno-solutionism, posthumanist pedagogy, Uzbekistan, youth education

Introduction

We inhabit an age of deep paradoxes. At the same time, while ecological crises are intensifying at an unprecedented rate – climate change, biodiversity loss, resource scarcity, and environmental degradation – digital technologies, which

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are increasingly conveying the human experience, are also offering new opportunities for environmental education. Nowhere is this paradox more acute than in the field of youth education. Today's youth, referred to as Generation Z, Zeta and Alpha, have never known a world without the internet, smartphones or social media [citação:Albanbaeva2026]. Their relationship with the natural world is increasingly mediated by screens, algorithms, and digital platforms. But it is precisely these generations that need to develop the ecological awareness necessary to cope with the environmental problems they have inherited.

This article addresses a fundamental philosophical question: What are the philosophical foundations, tensions, and opportunities associated with the use of digital learning platforms to develop ecological literacy among adolescents? More specifically, how can we understand the relationship between technological mediation and authentic ecological awareness? And what does this mean for educational practice in contexts such as Uzbekistan, where digital transformation and environmental challenges meet within a unique cultural and historical landscape?

The concept of "ecological competence" requires careful philosophical elaboration. It goes beyond mere environmental knowledge or awareness and encompasses the cognitive, affective, ethical, and behavioral dimensions of human-nature relationships. Ecological competence includes not only the understanding of ecological systems, but also the development of the values, dispositions and skills necessary for responsible environmental behaviour. It is essentially a philosophical category that touches on fundamental questions of human existence, value, and responsibility.

Digital learning platforms – from massive open online courses to gamified environmental apps, virtual reality nature experiences to AI-personalized learning systems – represent a new kind of educational environment. These platforms are not neutral tools, but shape the very nature of learning, knowledge, and relationship with the world. They embody certain assumptions about knowledge, agency and value. Understanding their role in the development of ecological literacy therefore requires a philosophical analysis of their ontological, epistemological and axiological dimensions.

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The Philosophical Foundations of Ecological Competence

Ecological competence as a multidimensional phenomenon

The term "ecological competence" has gained in importance in the educational discussion, but its philosophical dimensions remain little researched. At its core, ecological literacy refers to the ability to understand, appreciate, and act responsibly in relation to the natural world. It encompasses several dimensions that require philosophical analysis.

The cognitive dimension includes knowledge about ecological systems, environmental processes and the interactions between human activities and environmental impacts. But ecological knowledge is not just factual; it involves understanding complex systems, feedback loops, and non-linear dynamics. This requires what philosophers of science call "systems thinking" – a way of understanding that transcends reductionist approaches.

The affective dimension includes emotional connections to nature, feelings of care and concern for the environment, and what has been called "biophilia" – the innate tendency to connect with living systems. Environmental philosophers have long argued that rational knowledge alone is insufficient for ecological responsibility; emotional connection provides the motivational basis for action.

Epistemological Dimensions: Ways of Recognizing Nature

How do we recognize nature? This epistemological question has a direct impact on how ecological competence should be developed.

Scientific knowledge provides powerful understandings of ecological systems, causal relationships and environmental processes. Climate science, ecology and environmental chemistry provide essential knowledge for tackling environmental challenges. But scientific knowledge is not the only way to know nature, nor is it sufficient for ecological competence.

Traditional ecological knowledge (TEK), developed over generations of direct interaction with specific environments, offers understandings that complement and sometimes challenge scientific perspectives. TEK is typically holistic, qualitative and embedded in cultural practices and values. It does not know nature as an object of study, but as a context of life.

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Experiential knowledge, gained through direct sensory engagement with natural environments, provides a kind of understanding that cannot be fully captured in propositional form. The feeling of earth, the sound of birds, the sight of a landscape – this constitutes a way of knowing that is embodied, affective and personal.

Axiological aspects: values and ecological responsibility

The axiological dimension concerns values – what is worth pursuing, preserving and protecting. Ecological competence includes value judgments about nature, about human-nature relationships and about what constitutes responsible action.

A fundamental axiological question concerns the value of nature itself. Is nature valuable only insofar as it serves human interests (instrumental value), or does it have value independently of human purposes (intrinsic value)? Different answers to this question result in different conceptions of ecological responsibility. Instrumental value frameworks justify environmental protection in terms of human well-being – clean water, stable climate, resources for future generations. Intrinsic value frameworks ground environmental ethics in respect for nature itself, regardless of human benefit.

Intergenerational justice raises questions about our obligations to future generations. What kind of world do we owe to those who will come after us? This includes difficult philosophical questions about the nature of justice over time, the moral status of potential persons, and the limits of our responsibility.

Digital Learning Platforms as Philosophical Artifacts

The ontology of digital platforms

Digital learning platforms are not neutral tools, but constitute an independent type of environment with its own ontological characteristics. Understanding these traits is essential for assessing their role in the development of ecological literacy.

Digital platforms create virtual spaces that mediate between learners and the world. These spaces have their own characteristics – they can be navigated, manipulated, and experienced in ways that are fundamentally different from physical environments. The ontology of virtual space raises questions about presence, authenticity, and the nature of experience. When a learner explores a

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virtual ecosystem or participates in a simulated environmental decision, what kind of experience is it? Is it "real" in any meaningful sense?

Critical Theories of Technology and their Implications

Philosophical reflection on technology provides essential resources for the analysis of digital learning platforms. Martin Heidegger's concept of the "frame" illuminates how modern technology reveals the world as a stock – as resources to be optimized and controlled [citação:Heidegger 1977]. From this perspective, digital learning platforms could inadvertently reinforce an instrumental relationship with nature, even while conveying environmental content.

Andrew Feenberg's critical theory of technology offers a more nuanced perspective, emphasizing that technology embodies social values and can be democratically transformed [citação:Feenberg, 2002]. Technologies are not deterministic, but contain "ambivalences" – possibilities for alternative configurations. This suggests that digital platforms can be designed to foster different types of relationships with nature, depending on the values embedded in their design.

2.3 The Critique of Techno-Solutionism

A growing body of science criticizes "techno-solutionism" – the tendency to frame complex social and environmental problems as technical challenges accessible to technological solutions. In environmental education, techno-solutionism manifests itself as the assumption that digital tools can solve the problem of insufficient environmental awareness or commitment.

Perkins' critical-hermeneutical review shows that science at the intersection of environmental education and digital technology is often dominated by "anthropocentrism, technological solutionism, and behavioral change in children, primarily driven by economic priorities of the Global North" [citação:Perkins2024]. This hegemonic discourse neglects deeper questions about the underlying worldviews and ways of knowing that perpetuate ecological crises.

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The Interface: Philosophical Tensions in Digitally Mediated Ecological Education

The Mediation of Nature: Distance or Connection?

A fundamental tension concerns the question of whether digital mediation brings learners closer to nature or distances them from it. Proponents argue that digital tools can improve environmental education by providing access to ecosystems and phenomena that would otherwise be inaccessible – deep oceans, remote forests, microscopic organisms. Virtual reality can simulate immersion in natural environments and potentially promote connection, even for those who can't experience it directly.

Critics worry that screen-mediated nature is qualitatively different from direct experience.

3.2 Behavior Change versus Autonomous Consciousness

A second tension concerns the goal of environmental education. Should digital platforms aim to directly shape environmental behaviors, or should they promote autonomous awareness that empowers learners to make their own informed decisions?

Many gamified environmental apps take a behaviorist approach that uses rewards and reinforcement to encourage eco-friendly behavior. The NIH Scoping Review on Digital Certificates notes a crucial distinction between "deep and superficial engagement in climate education" and warns that "badges may unintentionally promote superficial compliance instead of transformative learning" [citação:NIH2025]. When external rewards drive behavior, intrinsic motivation can be undermined.

Self-determination theory, as discussed in the same review, suggests that people act based on "personal meanings and interpretations, not simply in response to external stimuli." Extrinsic rewards can undermine intrinsic motivation "if they are perceived as controlling rather than informational" [citação:NIH2025]. This raises philosophical questions about the nature of authentic environmental behavior. Is behavior resulting from gamified reinforcement genuinely ecological? Or does authentic ecological action require autonomous choice based on internalized values?

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Techno-solutionism versus worldview transformation

The most fundamental tension concerns the nature of the environmental challenge itself. If ecological crises mainly result from insufficient information or awareness, then digital platforms that provide information and raise awareness could be adequate solutions. But if crises result from deeper patterns of thought and being—from anthropocentrism, from instrumental rationality, from the ontological separation of humans from nature—then genuine response requires transformative change at the level of worldview.

The Uzbek Context: Philosophical Analysis and Practical Initiatives

Contemporary initiatives in digital environmental education

Uzbekistan has emerged as a significant place for innovation in digital environmental education. Several recent initiatives deserve philosophical analysis.

The localization of the ClimateScience platform in Uzbek and Karakalpak is a groundbreaking initiative [citação:National Committee2025]. This initiative, supported by UNICEF and the Ministry of Ecology, Environmental Protection and Climate Change, makes science-based climate education accessible to Uzbek-speaking youth for the first time.

The Erasmus+ project LESLIE (2024–2027) focuses on education for sustainable land management in Central Asia, with significant Uzbek participation [citação:TIQXMMI2025]. Partners include TIIAME NRU, Fergana Polytechnic Institute, Bukhara Institute of Natural Resource Management, Bukhara State University and International Agricultural University. The project is developing micro-certificates for sustainable land management, creating digital educational tools for BSc and MSc programmes, and establishing a centralised digital repository. The "Future Learning Incubator" applies STEHEAM methods (Science, Technology, Engineering, Environment, Arts, and Mathematics) to teach sustainable land management in an interdisciplinary manner.

Philosophical Analysis of the Uzbek Context

The Uzbek context presents unique philosophical dimensions for digital environmental education. These include the intersection of traditional and

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modern worldviews, the legacy of Soviet environmental policy, and the strategic role of youth in national development.

Uzbekistan has rich cultural and philosophical traditions regarding human-nature relations. Islamic thought, with its concepts of preservation (khalifa) and balance (mizan), provides resources for environmental ethics that are different from Western frameworks. Central Asian nomadic traditions embody relational ontologies that understand people as part of, not separate, natural systems. These traditions provide philosophical foundations for ecological literacy that can align with or challenge the assumptions of global digital platforms.

Towards contextually appropriate philosophical approaches

The development of ecological literacy through digital platforms in Uzbekistan requires philosophical approaches that are both globally informed and locally rooted.

Epistemologically, this means the integration of several ways of knowledge. Scientific knowledge from platforms such as ClimateScience can be supplemented by traditional ecological knowledge from local communities. Digital platforms could potentially facilitate the documentation and transmission of traditional practices and create spaces for dialogue between different epistemic traditions. This requires moving beyond translation to genuine epistemological pluralism.

Axiologically, this means articulating environmental values that resonate with Uzbek cultural traditions while addressing global ecological challenges. Islamic concepts of preservation and balance can ground environmental ethics in terms that are meaningful within local cultural frameworks. This does not mean the rejection of universal ecological values, but rather their rootedness in specific cultural soil.

Philosophical recommendations for digital platform design

Based on the above analysis, this section develops philosophical recommendations for the design of digital platforms that promote true ecological literacy.

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Beyond Information Transfer: Promoting Genuine Understanding

Digital platforms must say goodbye to treating environmental education as information transfer. While knowledge is necessary for ecological literacy, it is not sufficient. Platforms should be designed to foster deep understanding – the kind that integrates cognitive, affective, and ethical dimensions.

This requires pedagogical approaches that actively engage learners with environmental content. Problem-based learning, research-based exploration, and collaborative projects can foster deeper engagement than passive content consumption. Simulation and modeling tools can help learners understand complex system dynamics. Opportunities for reflection and dialogue can support the integration of knowledge with values.

Balancing global perspectives and local relevance

Platforms need to navigate the tension between global environmental knowledge and local relevance. While science-based content from global platforms provides essential foundations, it must be adapted to local contexts and supplemented by local knowledge.

This suggests design principles that enable localization not only of language, but also of content, examples, and case studies. Platforms should include mechanisms for incorporating local environmental data, local ecological knowledge and locally relevant examples. They should enable learners to connect global environmental concepts with their own environments and experiences.

The biosemiotically informed approach [citação:Campbell2021] emphasizes that learning must be understood as embodied/environmental, in/beyond any mediality. This implies that the design of digital learning environments must take into account the environmental and embodied offerings that make learning possible in the first place.

Creation of spaces for questioning and imagining alternatives

Finally, platforms should promote the ability to challenge dominant paradigms and imagine alternative futures. Environmental challenges require not only technical solutions, but also new ways of thinking and being. Education should cultivate the imagination needed to envision and create more sustainable worlds.

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This could include speculative design exercises, utopian/dystopian scenario explorations, or engagement with artistic and creative practices. By fostering imaginative engagement with alternative possibilities, platforms can contribute to the kind of transformative change that true environmental responsibility requires.

Conclusion

The development of ecological competence through digital learning platforms represents one of the most significant challenges and opportunities in contemporary education. This article has explored the philosophical dimensions of this challenge, arguing that digital platforms are not neutral tools, but rather shape the very nature of learning, knowledge, and relationship with the natural world.

The philosophical analysis reveals fundamental tensions that need to be navigated: the mediation of nature through screens, the risk of techno-solutionism, the tension between behavioral modification and autonomous consciousness, and the relationship between global environmental knowledge and local traditions. These tensions cannot be resolved simply by better platform design; they require ongoing philosophical **reflection and dialogue.**

The Uzbek context provides a rich terrain for exploring these tensions in practice. Current initiatives – ClimateScience localization, the LESLIE project, the AI labs of the Green University – demonstrate commitment to digital environmental education. But their ultimate significance will depend on whether they promote genuine ecological literacy or merely superficial environmental awareness. This, in turn, depends on whether they are informed by a philosophical understanding of what ecological literacy really requires.

The theoretical contributions of this analysis include: a philosophical framework for understanding ecological literacy in its ontological, epistemological and axiological dimensions; Integrating critical technology theory with environmental philosophy; Identification of central tensions in digitally mediated environmental education; and the application of these insights to the Uzbek context using German-language philosophical resources, in particular the systems

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theoretical perspective of Ammer [citação:Ammer2008] [citação:Ammer2010] and the agential realism of Wunder [citação:Wunder2020].

In practice, the analysis suggests that platform designers, educators, and policymakers should prioritize transformative learning over information delivery, respect multiple modes of knowledge, design for critical thinking rather than behavior modification, and create spaces for philosophical reflection and imaginative exploration.

For Uzbekistan specifically, the analysis suggests that the country's rich cultural and philosophical traditions provide valuable resources for developing contextually appropriate approaches to digital environmental education. Islamic concepts of preservation (khalifa) and balance (mizan), Central Asian relational ontologies, and the strategic emphasis on youth provide all the foundations for approaches that are both globally informed and locally rooted.

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