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Biology for Health: Building an Educational Curriculum that Supports Community Well-Being Through Ecosystem Understanding

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ABSTRACT
ABSTRACT Ecosystem degradation increasingly threatens public health, especially in vulnerable communities. This conceptual paper proposes a biology curriculum integrating ecosystem understanding to support community well-being. Through a literature review (2019–2024), a curriculum framework is developed emphasizing the interconnectedness of biodiversity, ecosystem services, and human health, aligned with Education for Sustainable Development (ESD). Key elements include experiential learning, community-based projects, and local wisdom. The framework highlights the urgency of ecological health education for awareness and proactive community behavior. Holistic biology education is essential for long-term well-being and sustainability.
Keywords: biology of community, ecosystem literacy, environmental awareness, sustainable curriculum, well-being

150 Introduction

Environmental sustainability and human well-being are becoming increasingly interconnected[1], as both constitute mutually supportive systems essential for human survival. As stated by the United Nations Environment Programme (UNEP) (2025), the loss of biodiversity and natural degradation has far-reaching consequences—not only exacerbating climate change and undermining food security but also threatening communities and societies at large. A visible phenomenon today concerning the global ecosystem condition is the widespread ecosystem degradation occurring across various parts of the world, primarily due to human actions.

Ecosystem degradation-through biodiversity loss, pollution, and climate change-directly impacts public health, especially in communities that depend on natural resources. The resulting risks not only include disease outbreaks and a declining quality of life, but also the loss of vital natural potential, which could lead to future life-threatening disasters. In relation to the education curriculum, particularly in the field of biology education, the study of ecosystems has long been included at all levels of education. However, most biology curricula remain disconnected from the practical implications for public health.

Therefore, there is an urgent need to redesign biology education to reflect the realities of sustainable development and the ecosystem-health nexus. As emphasized by Romulo et al. (2024), implementing interdisciplinary sustainability education to achieve sustainability competencies and prepare graduates capable of facilitating the transformation of global society is a key priority.

This paper proposes a conceptual curriculum integrating ecosystem literacy and public health, aiming to empower learners as agents of sustainable well-being.

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151 Literature Review

Recent years (2019–2023) have seen growing academic interest in connecting biology education, health, and sustainability. UNESCO (2020) defines ESD as transformative learning for a sustainable future, with biology as a strategic subject for embedding sustainability and ecological awareness[2]. [3]Emphasize ecological literacy as essential for sustainability. [4] Argue that understanding ecosystem services and biodiversity fosters public health awareness and proactive community behavior. Empirical reviews show that curricula linking ecosystem content and health outcomes increase student engagement and civic responsibility. Project-based and place-based learning further enhance environmental stewardship.

152 Research Methods

This study uses a conceptual, literature-based methodology to propose a curriculum framework integrating ecosystem understanding into biology education for community well-being.

1. Approach: Qualitative-conceptual, focusing on theory integration and curriculum development.
2. Data Collection: Systematic review of peer-reviewed articles, frameworks, and policy documents (2019–2023) from Scopus, Google Scholar, and ScienceDirect.
3. Analysis: Content analysis on themes: ecosystem literacy, curriculum design, project-based learning, and SDG integration.

153 Result and Discussion

Proposed Curriculum Framework Overview

Table 17: The curriculum is structured around five thematic pillars

No	Thematic Pillar	Description
1	Ecosystem Services & Health	Biodiversity and ecosystem impacts on food, water, disease, mental health
2	Place-Based Learning	Curriculum contextualized to local ecosystems and issues
3	Community-Based Projects	Student engagement in health/conservation efforts
4	Integration of Local Wisdom	Traditional ecological knowledge bridges science and culture
5	Sustainability Action	Student-designed interventions using SDG targets (3, 4, 13, 15)

This framework is adaptable for schools and universities, especially in areas facing environmental and health challenges.

Supporting Empirical Evidence

1. In Albania, integrating health and environmental content in biology improved students' understanding of the ecosystem-health relationship and increased motivation[5].

2. In Indonesia, while environmental knowledge improved, behavioral change was limited without project-based and community learning[6].
3. Citizen science initiatives show that student involvement in local projects enhances scientific literacy and pro-environmental behavior[7].
4.

Implications for Practice

Successful implementation requires:

1. Teacher training in interdisciplinary/contextual methods
2. Collaboration with local environmental and health stakeholders
3. Flexible curriculum design for student autonomy and local adaptation

154 Conclusion

Integrating ecosystem understanding into biology education is urgent for community well-being and sustainable development. The proposed framework-rooted in ecological literacy, place-based learning, and community engagement-offers a transformative model bridging science and health action. Adopting this approach will empower students as change agents for both environmental and public health challenges.

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