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INTERDISCIPLINARITY AS A BASIS FOR EDUCATION FOR SUSTAINABLE DEVELOPMENT

In the context of global transformations accompanied by increasing environmental, social, and economic challenges, ensuring sustainable development of society is becoming particularly relevant [1]. In this regard, education plays a key role as a tool for shaping a new paradigm of thinking focused on balanced development, responsible decision-making, and an awareness of interconnections between various spheres of social life.

The concept of education for sustainable development implies not only the integration of relevant knowledge into the content of academic disciplines, but also the transformation of the educational process itself. It is based on the formation of competencies that enable the analysis of complex systems, the assessment of managerial decisions, and effective action under conditions of uncertainty. This approach is aimed at developing a holistic worldview in which economic, social, and environmental processes are considered as interconnected elements of a single system. In accordance with the national development priorities defined by the Decree of the President of Ukraine “On the Sustainable Development Goals of Ukraine until 2030” [2], education is regarded as one of the key instruments for achieving balanced national development. The Sustainable Development Goals (SDGs) establish guidelines for public policy and the modernization of the education system, particularly through the integration of sustainability principles into curricula and educational standards.

In this context, education acquires the features of transformative pedagogy, which involves reorienting the content of education, developing new learning models, and creating sustainable educational environments. In particular, modern approaches emphasize the need to shift from monodisciplinary to interdisciplinary learning, which ensures the integration of knowledge, methods, and practices from different fields and contributes to a comprehensive understanding of sustainable development challenges. In addition, national strategic documents highlight the

importance of aligning educational reforms with the SDGs, which involves the formation of a system of competencies focused on responsible consumption, innovative thinking, environmental awareness, and social responsibility [3]. Thus, education for sustainable development serves not only as a component of educational policy but also as an instrument for implementing national development strategies, ensuring the training of specialists capable of effectively responding to global challenges and uncertainty.

In this context, particular importance is attached to the practical implementation of SDG 4, which aims to ensure inclusive and quality education and promote lifelong learning opportunities, as well as the development of skills necessary for sustainable lifestyles, responsible consumption, respect for human rights, and global partnership. At the same time, education for sustainable development is closely linked to other goals, in particular SDGs 9, 11, and 12, which define the innovative, urban, and resource dimensions of sustainable development. This necessitates the integration of knowledge from different fields and the development of interdisciplinary thinking. To systematize the directions of SDG implementation in the educational process, they are summarized in Table 1.

The practical implementation of sustainable development principles in the educational process involves the use of problem-based learning, case studies, and project-based approaches.

Table 1

**Analytical summary of SDG implementation
in the educational process**

Sustainable Development Goal	Features of implementation in higher education	Practical recommendations for the educational process
SDG 4 Quality Education	Focus on the development of sustainability competencies, integration of inclusivity principles and lifelong learning	Introduction of interdisciplinary courses, development of soft skills, use of problem-based learning
SDG 9 Industry, Innovation and Infrastructure	Emphasis on the digitalization of education, use of innovative technologies, and development of analytical skills	Integration of digital platforms, big data, and AI tools into the educational process, development of digital competencies
SDG 11 Sustainable Cities and Communities	Development of systems thinking and cross-sectoral perspectives on territorial development	Use of case studies on sustainable urban development, project-based learning, modeling of managerial decisions
SDG 12 Responsible Consumption and Production	Formation of environmental awareness and responsible behavior	Integration of environmental aspects into academic disciplines, life cycle analysis, ESG case studies

Table continuation 1

SDG 17 Partnerships for the Goals	Strengthening cooperation between education, business, and society	Stakeholder engagement in the educational process, joint educational projects, practice- oriented learning
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systematized by the authors using AI tools, including ChatGPT (OpenAI, 2026)

[4]

These methods enable the modeling of real-life situations and the development of decision-making skills that take into account economic, environmental, and social aspects. In particular, tasks related to environmental impact assessment, the selection of alternative solutions, and the analysis of resource efficiency are applied, along with case studies on the implementation of ESG practices and sustainable urban solutions.

For example, within educational projects, scenarios of urban traffic management may be modeled in accordance with sustainable development principles, including the reduction of CO₂ emissions, optimization of logistics routes, and improvement of road safety, which correspond to the objectives of sustainable urban mobility. Such approaches are consistent with international initiatives in the field of sustainable mobility and smart city development [5], particularly the European Commission's recommendations on sustainable and smart mobility [6].

These approaches contribute to the development of systems thinking, critical thinking, communication skills, and the ability for cross-sectoral interaction, which involves the integration of knowledge from different fields and consideration of stakeholders' interests.

Therefore, the interdisciplinary approach serves as a key condition for the effective implementation of education for sustainable development, as it ensures the integration of knowledge and methods from various fields, forming a holistic understanding of complex processes. To visualize the proposed approach, a structural and functional model of education for sustainable development is presented (Fig. 1).

Within the educational process, this is reflected in interdisciplinary courses, integrated modules, and collaborative educational projects that combine different fields of knowledge and contribute to the development of comprehensive competencies. Digital technologies play a particularly important role, as they expand the possibilities for implementing the interdisciplinary approach. The use of digital educational platforms, analytical tools, big data, and elements of artificial

intelligence enables the creation of an interactive learning environment that promotes personalized learning, increased engagement, and the development of information literacy skills. At the same time, this requires the formation of a critical attitude toward digital content and the responsible use of technologies.

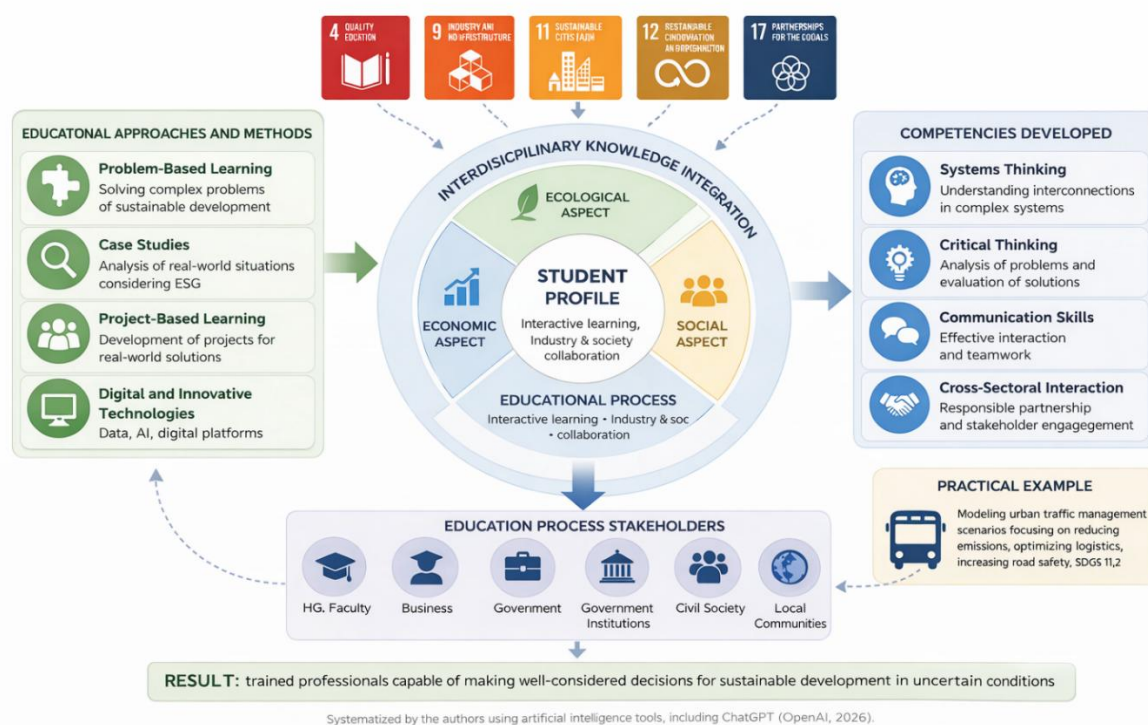


Fig 1. Structural-functional model of education for sustainable development

Thus, interdisciplinarity serves as a fundamental principle for the implementation of education for sustainable development, as it ensures the integration of knowledge from different fields and supports the formation of competencies necessary for effectively addressing global challenges. In particular, it contributes to the development of systems thinking, critical analysis, and the ability to make informed decisions under conditions of uncertainty.

The further development of this approach is associated with improving educational programs, implementing innovative teaching methods, and strengthening the interaction between the educational environment and sustainable development practices, including closer collaboration with external stakeholders.

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