Contemporary Teaching and Learning Strategies for Future Competencies

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When service learning meets sustainability learning, new integration benefits arise within curricular and extracurricular activities in higher education. By exploring the approach of integrating service and sustainability learning, their potential to enhance student engagement and foster a sustainability culture is revealed. Active learning methodologies, which include digital technology inspired innovations with problem-based learning and community engagement, offer to significantly improve students' understanding of sustainability while developing competencies for future careers. Importance of hybrid pedagogies that intertwine service and sustainability learning with traditionally introduced academic content form contemporary teaching and learning strategies, demonstrating their positive impact on students' engagement and sense of affiliation to community while contributing to building a resilient and sustainable environment. Additionally, the role of extracurricular activities in promoting entrepreneurship as a self-transcendence, self-efficacy and desirable business behaviour among students is evident, illustrating how such activities can enhance their competencies. The need for educators to adopt facilitative roles in creating supportive learning environments by advocating for professional development and fostering teachers to effectively implement these contemporary teaching strategies is explored as well. This paper aims to provide a conceptual framework for integrating service and sustainability learning into educational practices, thereby preparing students to tackle complex sustainability challenges.

DOI
https://doi.org/10.18690/um.epf.5.2025.34

ISBN
978-961-286-984-7

Keywords:
service learning, sustainability learning, higher education, educational practices, competences

JEL:
I23, O31

University of Maribor Press

1 Introduction

Contemporary challenges related to environmental sustainability, including climate change, global warming, biodiversity loss, and environmental pollution, as well as social and economic challenges such as inequalities in employment and income opportunities, access to quality education, and others, require specialized knowledge and skills essential for their resolution. Environmental, economic, and social sustainability cannot be learned as a fixed set of solutions but rather as a process of developing the knowledge and skills necessary to address related challenges and manage them responsibly.

Given the rapid pace of urbanization around the world and the ubiquity of environmental problems, flexible and sensitive approaches that put communities at the center become crucial to recognizing and understanding their needs and improving their context (Cervantes & Hinojosa, 2022). Service learning and sustainability learning are two different but closely related approaches to teaching and learning that bring together sustainability and community issues and require synergistic thinking and action. Sustainability learning implies an approach to teaching and learning that deals with sustainable principles, taking into account different models related to sustainability such as the Sustainable Development Goals (SDGs), Triple Bottom Line, ESG, and RE(use/duce/cycle). Service learning is a teaching and learning approach that intentionally applies knowledge and skills to develop service-based solutions, foster community engagement, and strengthen social connections, ultimately promoting civic responsibility and active citizenship (Cervantes & Hinojosa, 2022).

Service learning and sustainability learning engage students, teachers, and communities through academic content, community activities, and reflection, fostering civic involvement and personal growth (Mitchell, 2020), (Ruiz et al., 2024). These approaches align higher education with societal needs by integrating community engagement, structured reflection, and academic-community partnerships. Recognized in *the European Sustainability Competence Framework* (2022), they support Green Comp's four key areas: Embodying sustainability values, Embracing complexity in sustainability, Envisioning sustainable futures, Acting for sustainability (European Commission, n.d.). The 2022 *Council Recommendation on learning for the green transition and sustainable development* further emphasizes policies

promoting interconnected learning across environmental, economic, and social dimensions for a sustainable future (Council Recommendation of 16 June 2022 on Learning for the Green Transition and Sustainable Development, 2022).

This research, aims to provide insights into learning outcomes and objectives, methods and approaches, as well as the evaluation and impact of service and sustainability learning approaches in higher education. To illustrate best practices, case study based examples describe how these teaching approaches are integrated into both curricular and extracurricular activities.

2 Theoretical Background / Literature Review

Service learning is an innovative pedagogical approach that bridges the classroom and the community, positioning students as key agents in fostering local development (Shahbani et al., 2019). Grounded in John Dewey's pragmatic theory, service-learning emphasizes experiential education and active civic engagement, equipping students with the skills and mindset necessary to navigate societal changes and challenges (Said et al., 2019).

Service learning is based on identifying community needs, where students collaboratively develop innovative solutions to improve quality of life, often based on implementing digital technologies. This holistic approach enhances skills and knowledge through active service initiatives, encouraging critical thinking, action, and reflection. It also engages NGOs, local authorities, industry, and academia to support service-learning projects (Shahbani et al., 2019). Service learning is an educational model where students participate in structured activities to address community needs while reflecting on services. It enhances their understanding of course content, broadens their disciplinary perspective, and fosters civic responsibility (Lounsbury & Pollack, 2001), (Mayhew & Engberg, 2011).

According to Dewey, service learning includes six steps typical for investigative learning approaches (a) encountering a problem; (b) formulating questions; (c) gathering information; (d) formulating hypotheses; (e) testing hypotheses, and (f) making justified claims (Mayhew & Engberg, 2011). As a paradigm, service learning is based on connection, creativity, community, and complexity and is used to develop students' thinking skills through applied community engagement projects,

which combine interactivity and interconnectedness, innovation and insight, and inspiration and intuition, integrative and interdisciplinary thinking (Karakas & Kavas, 2009).

Sustainability learning is a teaching and learning approach that prioritizes the well-being of future generations while emphasizing sustainable economic, environmental, and social principles. It is a transdisciplinary and multi-level concept in which educational objectives are aligned with sustainable development goals (Hansmann, 2010).

Higher education institutions can integrate SDGs into their work in three key ways: (1) Recognition, (2) Opportunistic Alignment, and (3) Organizing and Embedding Principles (Angelaki et al., 2024). Recognition involves identifying and assessing existing university initiatives that contribute to sustainable development. This process not only highlights best practices but also serves as a catalyst for further action. Opportunistic Alignment refers to the integration of sustainability-related issues into specific activities and academic programs, leveraging opportunities as they arise. Organizing and Embedding Principles entail systematically incorporating SDG principles into university governance, ensuring their presence across policies, management structures, and institutional frameworks (Angelaki et al., 2024).

3 Methodology

Aligned with the areas and competencies outlined in the European Sustainability Competence Framework and guided by Bloom's taxonomy of learning outcomes, a literature review was conducted to identify general learning outcomes associated with service and sustainability learning. Furthermore, key components of service and sustainability learning were analyzed, including teaching and learning resources, the learning environment, pedagogical processes, instructional methods and techniques, stakeholder involvement, as well as evaluation and feedback mechanisms. The analysis included articles retrieved using the research query ("service learning" OR "sustainability learning") AND ("teaching practices" OR "learning practices"), filtered by topic, taking into account the title, keywords, and abstract. Only articles available in English were considered. Through case study analysis, this research presents two examples of service and sustainability learning, one integrated into a curricular program and the other within an extracurricular program.

4 Results

This research seeks to provide stakeholders in the academic community with a comprehensive analysis of learning objectives and outcomes, processes of planning, preparation and implementation, learning environment, teaching and learning methods and techniques as well as the broader impact of service and sustainability learning within academic programs, as previously done by Munna & Kalam, 2021. Furthermore, it offers evidence-based guidelines for integrating these approaches across diverse curricular and extracurricular higher education programs. All the elements are described in the next sections, following the structure of our findings as shown in Figure 1.

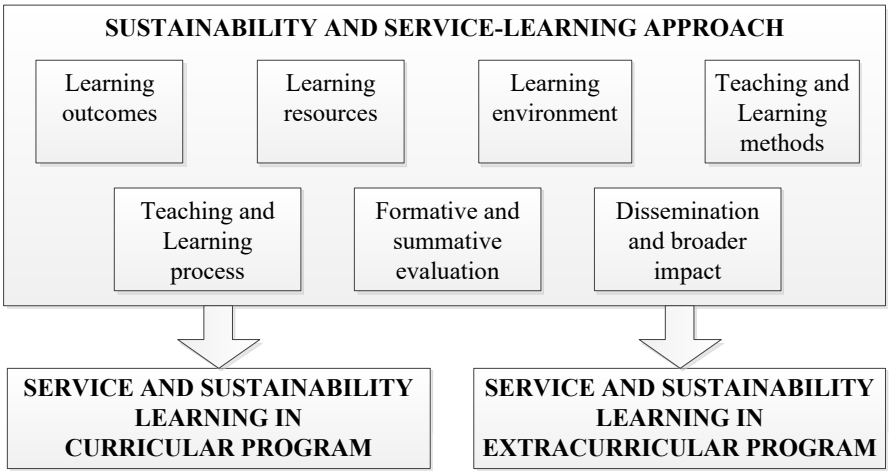

Figure 1: Overview of key elements of the sustainability and service learning approach

4.1 Sustainability and service-learning approach

The learning outcomes for service learning and sustainability, identified through a literature review, align with the competence areas of the European Sustainability Competence Framework. These outcomes, categorized into four key areas, are presented in Table 1.

Table 1: Learning outcomes of service and sustainable learning

Embodying Sustainability Values	Cultivate an understanding of social inequalities and the necessity for a more equitable society while also fostering awareness of environmental, economic, and social challenges (Mayhew & Engberg, 2011), (Yusof et al., 2020)
	Internalize the values of sustainability by engaging in practical actions and reflecting on community needs (Howard et al., 2010), (Shahbani et al., 2019), (Said et al., 2019), (Yusof et al., 2020), (Souza-Alonso et al., 2024), (Hong et al., 2024)
Embracing Complexity in Sustainability	Analyze the interplay between social, economic, and ecological systems and their collective impact on community dynamics (V. M. Smith, 2003), (Mayhew & Engberg, 2011), (Ruiz et al., 2024)
	Apply critical thinking to understand complex community problems and environmental, economic, and social issues (Karakas & Kavas, 2009), (Shahbani et al., 2019), (Yusof et al., 2020), (Ruiz et al., 2024), (Hong et al., 2024)
Envisioning Sustainable Futures	Develop the ability to anticipate future environmental, economic and social challenges (Howard et al., 2010), (Shahbani et al., 2019), (Said et al., 2019), (Yusof et al., 2020), (Ruiz et al., 2024)
	Experiment with innovative solutions in sustainable development and community (Karakas & Kavas, 2009), (Souza-Alonso et al., 2024)
Acting for Sustainability	Initiate and participate in social initiatives for sustainable development (Shahbani et al., 2019), (Souza-Alonso et al., 2024), (Said et al., 2019)
	Demonstrate civic responsibility through concrete actions in the community and environmental, economic, and social actions (Karakas & Kavas, 2009), (Mitchell, 2020), (Ruiz et al., 2024)

Learning resources encompass a variety of teaching materials, including supplementary literature that elaborates on economic, environmental, and social sustainability, as well as contemporary social issues. These resources may include scientific articles, analytical reports, videos, prepared multimedia content, and other relevant visualization materials (Mayhew & Engberg, 2011).

The learning environment should be structured to foster a safe, inclusive and supportive atmosphere, facilitate effective communication with students, and cultivate meaningful relationships with stakeholders. Particular emphasis is placed on engagement with stakeholders whose challenges are being analyzed (Shahbani et al., 2019).

Teaching and learning methods incorporate a diverse range of approaches, including reflective activities, essays discussions, observation, mapping, interviews, field visits, prototypes and direct interaction with stakeholders (Cervantes & Hinojosa, 2022), (Pederson et al., 2018). Additionally, the pedagogical approach prioritizes shorter

instructional segments, commonly referred to as mini-lectures (Day & Lane, 2014), while placing greater emphasis on teamwork and fieldwork.

The learning and teaching process includes planning, preparation, and implementation. Effective planning requires university leadership to raise awareness of sustainability and community engagement, define instructional strategies, design relevant curricula, and structure activities. Preparation involves teacher training, while implementation follows a phased approach: motivation, problem identification, diagnosis, planning, design and prototyping, execution or pitching, documentation, systematization, communication, and evaluation (Maravé-Vivas et al., 2022). Optimizing student learning and time-on-task is crucial, ensuring clear guidelines on timelines, deadlines, and deliverables.

For evaluating students' work, a combination of formative and summative assessments is recommended (E. Smith et al., 2023). Evaluations should encourage diverse demonstrations of understanding, such as raising awareness of social, economic, and environmental issues, group collaboration, and interpersonal skill development (Borkoski & Prosser, 2020). Moreover, reliance on standardized assessments should be minimized due to potential biases (E. Smith et al., 2023).

The dissemination and broad impact of sustainability and service learning are fostered through the exchange of best practices, the development of a training and education network (Souza-Alonso et al., 2024), and the meaningful exchange of ideas in both formal and informal community settings, as well as through active collaboration with the community.

4.2 Service and sustainability learning in curricular program

As part of the curricular program, service and sustainability learning were integrated through the Global Goals Jam (Global Goals Jam, n.d.) event in the course Operations Management. Students were tasked with identifying a local community problem and proposing a solution that aligns with sustainable development principles and social responsibility, supported by digital technologies.

The implementation process included short lectures and discussions, the Global Goals Jam mini-competition, the evaluation of final concepts and prototypes, and dissemination. Lectures and discussions covered key topics in environmental, economic, and social sustainability, introducing students to sustainability concepts and showcasing best practices.

The mini-competition was an intensive two-day event structured into four sprints, where students worked collaboratively to develop sustainable and socially responsible concepts. The four sprints were: 1) Explore it!, 2) Respond to it!, 3) Make it!, and 4) Share it!. The estimated duration of each sprint was 90 minutes. Finally, student teams pitched their solutions through short presentations as well as concept and prototype demonstrations, which were carefully reviewed and evaluated by a "jury" consisting of stakeholders like academic and professional evaluators as well as peers.

To further expand their ideas and inspire broader community engagement, students presented their proposed solutions at conferences and events focused on sustainable development.

4.3 Service and sustainability learning in extracurricular program

As an extracurricular activity, an Erasmus+ Blended intensive program (BIP), titled „Transform to sustain: Sustainable future enabled by digital transformation", was conducted in a hybrid format, through collaboration of five higher education institutions (Faculty of Organization and Informatics, University in Zagreb, 2023). Online sessions over four weeks enabled students to form international, multidisciplinary teams and develop SDG-aligned digital solutions. A week-long onsite program featured interactive workshops complementing online learning with hands-on activities. Students designed digital innovations, refined prototypes, pitched ideas, and explored digital technologies like robotics. A field trip to a remote island allowed testing with real users, providing valuable feedback.

The program aimed to introduce participants to creative methods for customer needs analysis, business improvement, and sustainable digital transformation. It integrated four key business development concepts: Digital Transformation, Sustainable Development, Digital Technologies (AI & Robotics), and Business

Process Management. Teaching methods included problem-based learning, gamification, teamwork, and project-based tasks, fostering a collaborative environment. As the conclusion of the program, student teams presented their solutions, receiving valuable feedback from teachers and peers. Learning outcomes that students achieved were: (1) Comprehend and enforce creative methods, techniques and tools for customer needs analysis and innovative ideas creation, (2) Understand and apply the basic concepts of artificial intelligence, particularly deep neural networks and (3) Propose a new digital and sustainable business model of an organization.

5 Conclusions

Integrating service and sustainability learning into both curricular and extracurricular programs requires significant effort from educators. However, the benefits for all stakeholders - students, teachers, and the broader community - are substantial. One of the primary challenges for educators is finding ways to embed service and sustainability learning within the curriculum while ensuring alignment and coherence across content areas. Additionally, the planning and execution of activities demand careful spatial and temporal coordination. For students, this approach is not only engaging and dynamic but also enhances their understanding of academic content in innovative ways. Moreover, it fosters the development of digital competencies, essential soft skills such as teamwork, critical and creative thinking, and social awareness. By engaging with real-world challenges, students become more attuned to the needs of their communities and learn to approach social, economic, and environmental issues with a problem-solving mindset, positioning themselves as catalysts for meaningful change. Although the proposed integrated approach proves valuable in many educational programs, its application tends to be limited in strictly theoretical disciplines or those lacking a practical, real-world component. Implementing this approach faces organizational and practical challenges, primarily due to a lack of relevant knowledge and skills among educators, many of whom may not have a background in sustainability. Additionally, limited infrastructural capacity, such as inadequate access to appropriate technologies, physical space, and available time, can significantly hinder the development of effective, practice-based solutions that contribute to society and support sustainable practices.

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