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Research on Sustainability in Vocational Education and Training (VET): A Research Workshop Proposal

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Abstract

Context: Sustainability has become a key concern across education systems worldwide, particularly in Vocational Education and Training (VET), where the intersection of education, skills development, labor market and social and environmental demands makes it uniquely positioned to address sustainability challenges (Gamboa et al., 2024; Leal Filho, 2018; Pavlova, 2017; Tilbury, 2011).
Approach: To advance a shared understanding of sustainability in VET, a literature review was conducted, synthesizing findings from peer-reviewed journals, books, and policy documents published over the past two decades. The aim is to provide a frame of reference that supports scientific reflection and debate.
Findings: Three main findings emerged. First, sustainability in VET is a multidimensional and complex field of analysis, often addressed in fragmented ways rather than through comprehensive perspectives. Second, there is a generalized fragmentation and dispersion in the objects of analysis related to sustainability across its three dimensions (social, economic, and environmental), with a greater emphasis on social and economic aspects, than on environmental ones from an ecological ethos rather than an anthropomorphic one. Third, more holistic approaches are gradually emerging, such as the green and circular economy, VET for the Just Transition or Education for the Sustainable Development, which integrate economic, social and environmental sustainability with different emphasis and focus.
Conclusions: Sustainability is a research area within VET that requires further theoretical and empirical development and more in-depth scientific analysis, going beyond the predominantly descriptive and propositional studies. Its multidimensional, multistakeholder and multilevel nature demands a systemic vision and a flexible, comprehensive framework to support the development of this research field. Therefore, it is essential that the scientific community, in collaboration with stakeholders in the VET field, engages in collective reflection and debate to strengthen research and enable its progress and advancement.

Keywords

VET, sustainability, literature review, EU discourse

1 Introduction

Sustainability and its systemic interaction with VET is rooted in sustainable development approaches and literature where a perspective of respect for the planet in environmental terms and its development for generations to come is key (UNESCO, 2022). The main challenges facing Education for Sustainable Development (ESD) are structured according to the main priority action areas in which the ESD framework is fundamentally specified in Transversal core Sustainability competences and ESD-specific learning objectives, highlighting goal 4.7 (Education for sustainable development and global citizenship) (Bianchi et al., 2022; UNESCO-UNEVOC, 2017).

Sustainability in VET has emerged as a critical area of research, addressing the intricate interplay of social, economic, and environmental dimensions within education systems (UNESCO, 2022). In this paper, we want to critically examine the concept of sustainability within VET research through a comprehensive review of theoretical and empirical literature.

2 Method

The literature review synthesizes findings from peer-reviewed journals, books, and policy documents, utilizing systematic search strategies of the scientific and policy literature on sustainability in VET. Searches were conducted in Scopus, Web of Science, ERIC, Google Scholar, and international repositories (UNESCO-UNEVOC, CEDEFOP), covering the period 2003–2024. In total, about 120 documents were identified, of which 82 were retained after applying relevance and quality criteria. These included 56 peer-reviewed articles, 14 book chapters, and 12 international reports. The material was analysed thematically to identify main approaches (social, economic, ecological) and emerging hybrid perspectives. Sources were selected based on relevance, methodological rigor, and theoretical contribution, with a focus on works published in the past two decades. Key themes identified include theoretical underpinnings of sustainability in VET, pedagogy, education for sustainable development, and institutional practices; and policy implications and international frameworks (UNESCO, 2022).

3 Findings and Discussion

3.1 A Multidimensional Field of Research

Sustainability is a multidimensional field of analysis, characterized by significant complexity, which is often approached in a fragmented way by specific areas rather than through a comprehensive perspective. Research on sustainability in VET predominantly aligns with three theoretical paradigms (Table 1). Firstly, sociocultural approaches emphasize the role of VET in fostering inclusive social practices that promote equity. Moreover, existing studies underscore the necessity of equipping learners with the skills and competencies to navigate global sustainability challenges while fostering institutional transformations (Bianchi et al., 2022; Leal Filho, 2018). Secondly, economic approaches focus on the alignment of VET outcomes with labor market needs and sustainable economic growth (Janta et al., 2023; Persson Thunqvist et al., 2023; Vandeplas et al., 2022). Thirdly, ecological approaches highlight the integration of environmental stewardship into curricula and institutional practices (Leal Filho, 2018), cultural awareness and mobilization as well as local development and skill ecosystems (McGrath & Ramsarup, 2024). Moreover, another environmental sustainability approach is grounded in the

concept of the green economy, which emphasizes the importance of sustainable development through the integration of environmental considerations into economic planning and labor market strategies (Janta et al., 2023; Pavlova, 2017; Persson, et al., 2023; Vandeplas et al., 2022), including green occupations and vocational programmes (Gamboa et al., 2024; Moso et al., 2025). The focus of empirical studies includes curriculum development and its role in embedding sustainability principles, teacher training and professional development (Anderson, 2009; Andersson & Sundqvist, 2020), institutional practices and policy alignment (Pavlova, 2017), and students' sustainability consciousness (Olsson & Gericke, 2016). Finally, the literature review shows variations in methodological approaches, ranging from case studies and longitudinal analyses to participatory action research, demonstrating diverse pathways to explore sustainability in VET.

The ecological approach is distinguished by giving absolute priority to the environmental dimension of sustainability, which clearly differentiates it from the social approach (which prioritizes the social dimension) and the economic approach (which prioritizes the economic-productive dimension).

Where the ecological approach evaluates the success of sustainable VET in terms of reducing the ecological footprint and adopting pro-environmental behaviors, the economic approach focuses on indicators of employability or sectoral growth, and the social approach on indicators of equity and social cohesion (Persson Thunqvist et al., 2023; McGrath & Ramsarup, 2024). Likewise, the economic approach prioritizes technical-economic solutions (new qualifications, industrial adaptation) over the profound awareness or educational paradigm shift proposed by the ecological approach (Tilbury, 2011). However, both approaches, social and ecological ones, emphasize more that the transformation towards sustainability requires profound changes in values and structures**,** not just technical adjustments (Langthaler et al., 2021; Ramsarup et al., 2024). Similarly, there is convergence between the ecological approach and the economic approach in recognizing the urgency of climate change and the need to reorient VET towards clean sectors; however, the ecological approach warns against purely technocratic or superficial solutions (greenwashing), advocating for comprehensive cultural change.

In terms of general similarities, all three approaches understand that VET must change to be part of sustainable development, and all value the development of skills for sustainability, although they differ on which skills are key (social and ethical vs. technical and work-related vs. ecological and systemic) (Bianchi et al., 2022).

In summary, the ecological approach provides an ethical-environmental perspective, complementing the economic and social approaches; it insists that without a habitable planet there can be no sustainable economy or society, reminding the other approaches that environmental sustainability is the foundation on which the other pillars of sustainable development are built (Tilbury, 2011; UNESCO, 2022).

Table 1

Comparison of Research Approaches of Sustainability in VET and Key Authors

Sustainability	*Focus of Sustainability in VET*	*Main authors*
Social approaches	Focus on social inclusion, equity and culture: Sociocultural Approach: Sustainability is above all social. Training critical and supportive citizens with values and skills to build sustainable and fair communities. Emphasis on education in values, participation, and empowerment for cultural change toward sustainability. Sociocritical Approach: VET is understood as a tool for social transformation that promotes equity, inclusion, and justice. Emphasis on the integration of the most disadvantaged groups into the VET system (intergenerational justice, human rights, etc.) or ('leaving no one behind'). From a research perspective: Educational and cultural processes within vocational training (classrooms, schools, communities) are analyzed, and their concepts revolve around the social dimension of sustainability: equity, values, participation, and transformation.	Andersson & Sundqvist, (2020), Cedefop (2012), Filho et al. (2020), Bianchi et al. (2022), Gamboa et al. (2023), Kioupi & Voulvoulis (2019), Langthaler et al. (2021), Marhuenda (2025), McGrath & Powell (2016); McGrath & Ramsarup (2024); McGrath, 2012, Moso-Díez et al., 2025, Olsson & Gericke, 2016), Salvá et al. (2024), etc.
Economic and labour market approaches	Focus on labour market and economy: VET supports sustainable economic and labour market development by training human capital for a green economy. The focus is on green skills for future employability and economic growth with reduced environmental impact (strathprints.strath.ac.uk). Sustainability in VET = alignment of VET with emerging productive demands, contributing to innovation and productivity in sustainable sectors, and supporting economic growth with a lower environmental impact. From a research perspective: Main analysis is reflected in curricula aligned with green job demands, in the capacity of training systems to anticipate sectoral changes (e.g., the energy transition), and in ensuring the future employability of graduates in a world shifting toward sustainability. It also includes the financial and operational sustainability of VET institutions themselves, although to a lesser extent.	Albertz & Piltz (2025), Andersson & Sundqvist (2020), Browns et al. (2013), Cabral and Dhar (2020), Cedefop (2019, 2022), Diep & Hartmann (2016), ETF (2021), European Commission. (2022), Fien & Wilson (2005), Fuchs et al. (2025), Goldney et al. (2007), ILO (2019), Janta et al. (2023), Mertineit (2013). Pavlova (2017), Persson-Thunqvist et al. (2023), Sharpe & Martínez-Fernandez (2021), UNESCO, 2022), Vandeplas et al. (2022), etc.
Ecological and educational approaches	Focus on values and ethics: VET integrates ecological principles into the curriculum, pedagogy, and institution. Sustainability in VET = the ability to raise environmental awareness and promote sustainable behaviors in students, preparing them for lifestyles that respect the planet. Focus on ecology and education: VET within the framework of Education for Sustainable Development (ESD). VET is a catalyst for sustainable development, prioritizing the incorporation of Education for Sustainable Development (ESD) at a cross-cutting level (climate, biodiversity, etc.), of "green" practices in VET centers, educational centers (internal management), and with the community. From a research perspective: the main focus is on content, teaching methods, and training environments related to environmental issues in VET. It uses concepts such as: ecological literacy, green skills, environmental awareness, and educational paradigm shift.	Andersson & Sundqvist (2020), Bianchi et al. (2022); Chinedu et al. (2023), ilho et al. (2022); Gamboa et al. (2024), ILO (2019), Janta et al. (2023), Kaiser, F., & Schwarz, H. (2022), Leal Filho (2018), McGrath & Powell (2016); Nielsen (2023), Olsson & Gericke (2016), Ramsarup et al. (2024); Rosenberg et al. (2018), UNESCO (2022), UNESCO-UNEVOC (2017), Pavlova, (2018), Tilbury (2011), etc.

Note. Source: Own elaboration

3.2 A Wide Range of Research Objects and Multi-levels

Each theoretical approach has guided research into sustainability in VET towards certain specific objects of analysis and has developed a particular conceptual apparatus (key concepts, categories) to examine them. Below, we detail which aspects each approach studies (at the macro, meso, or micro levels) (Nägele & Stalder, 2024) and which are the main analytical concepts it employs and objects it analyses. A comparative table summarizing these objects and concepts by school of thought is then presented.

Firstly, as Table 2 shows *sociocultural (social) approach* studies in this line tend to focus on the meso and micro levels, analyzing how VET institutions and teaching-learning practices incorporate the social dimension of sustainability. They mainly analyze educational and cultural processes within VET (classrooms, schools, communities) and concepts used around the social dimension of sustainability: equity, values, participation, and social transformation. Their contribution lies in highlighting who benefits or is left behind in VET, and in proposing pedagogical and institutional changes so that VET contributes to a more just society (Salvá et al., 2024). Methodologically, there are many qualitative case studies (e.g., how a certain technical school incorporated ESD into its curriculum and what effect this had on student awareness) and evaluations of the educational impact on students' attitudes/values (Olsson & Gericke, 2016). Participatory approaches are also used, such as action research with teachers, to introduce and evaluate changes in practices towards sustainability. Surveys and interviews are used to gather perceptions from stakeholders (teachers, students) on issues such as equity or social justice in VET (Andersson & Sundqvist, 2020, ILO & Fundación Once, 2023).

Secondly, as Table 2 shows *the economic approach* focuses primarily on the macro level (TVET systems and public policies) and meso level (TVET institutions in relation to the productive sector), although it also considers impacts at the micro level (individual career paths). This approach often involves policy studies (analysis of national and international strategic documents), surveys of employers or graduates to identify demands and outcomes, and global literature reviews (such as Persson Thunqvist et al., 2023, which identify international trends and discourses). Comparative analyses between regions or countries are also carried out (e.g., how "green VET" differs in Europe vs. Asia vs. Latin America), often using data from organizations such as UNESCO, CEDEFOP, and ILO to compare indicators. In recent years, some socioeconomic impact assessments have emerged that quantify how investing in green VET could lead to economic growth or reduced unemployment (ILO, 2019). These quantitative approaches complement qualitative case studies in institutions.

Thirdly, the ecological approach pays attention to both the meso level (schools, institutions, classroom) and the micro level (individual), although with a different lens than the sociocultural one: here the focus is on the integration of environmental content and practices into VET (Table 2). Macro-level implications are also considered when it comes to national educational reforms to include environmental sustainability in VET. The ecological approach mainly analyses content, pedagogies, and learning environments in relation to environmental topics in VET. It draws on concepts related to the environmental dimension of sustainability in education: ecological literacy, green competencies, environmental awareness, and paradigm shifts in education. Its main contribution is to emphasise the need for change from the ground up (institution, classroom, teachers, trainers and students) to educate generations equipped with the knowledge and values required to face the environmental crisis, thereby complementing the macro-level perspectives of other approaches (Tilbury, 2011; Andersson & Sundqvist, 2020).

Table 2
Objects of Study and Key Concepts in Research in Vet by Sustainability Approaches

Approaches	*Main concepts*	*Main objects of analysis*
Social	– Sustainable citizenship competencies (values, participation, human rights). – Social justice (equity, inclusion in, access to and outcomes of VET). – Empowerment (learners as agents of change in their communities). – Institutional culture (transformation of organisational culture towards sustainable values in VET centres). – Social sustainability indicators (equal access, reduction of gaps between demographic groups).	– Integration of ESD and social issues into VET curricula & programmes (meso level). – Pedagogical practices for equity and inclusion (meso and micro level). – Attitudes and values of teachers/students towards social sustainability (micro level). – Education policies with a social justice approach in VET (macro level).
Economic	– VET and employment policies aimed at economic sustainability: national strategies for "greening TVET" – Alignment between training provision and demand for green skills: a central issue is skills forecasting. – VET outcomes in terms of green jobs: cohorts of graduates are tracked to see how many find employment in green sectors, how long it takes them, under what conditions, etc. – Innovative programs and initiatives: VET-business partnerships for sustainability	–"Green skills" / "green jobs": definitions and classifications (macro level). – Skills ecosystem: VET as part of a network alongside broader industrial, regional, and educational policies (macro level). – Intersectoral and systemic integration: emerging concepts such as greening TVET and the cross-cutting integration of sustainability into all VET subsystems (financing, curricula, teacher training, certification, career guidance) (macro, meso and micro level) –Innovation and collaboration in green VET: concepts such as policy coherence, public-private partnerships, and quality assurance mechanisms with green criteria (macro and meso level)
Ecological	– Ecological literacy (level of environmental knowledge delivered/acquired). – Sustainable awareness (attitudes and environmental commitment of students/teachers). – Green/ESD competencies (sustainability competence frameworks, e.g. GreenComp: systems thinking, anticipation, etc.). – Pedagogical/paradigm change (depth of integration: from superficial adjustments to full educational transformation). – Environmental indicators: institutional green practices (e.g. presence of sustainable campus policies), number of student-led environmental projects, reduction of ecological footprint in schools.	– Environmental content in VET curricula (what sustainability is taught in each specialty?, meso level). – Teaching practices and ESD methodologies in VET (projects, PBL, labs, micro level). – Green VET pilot programmes ("green" schools, demonstrative eco-campuses, meso level). – Environmental management in VET institutions (energy efficiency, waste management on campus, meso level). – Teacher training and capacity-building in sustainability (programmes, needs, meso level).

Note. Source: Own elaboration

Qualitative case studies and participatory action research are predominant. Many researchers collaborate with schools or teachers to pilot innovations (for example, co-designing a green curriculum) and then evaluate the outcomes through observation, interviews, focus groups, etc. Quantitative evaluations of educational impacts are also carried out, such as pre- and post-

intervention surveys to measure increases in environmental knowledge or shifts in attitudes (Olsson & Gericke, 2016). Literature reviews focused on pedagogical experiences and international curriculum comparisons are also employed (Tilbury., 2011). A common tool is participatory environmental audits in schools (where students and teachers assess the ecological footprint of their school), which serve both as a teaching method and as a means of data collection for research purposes.

3.3 Development of Hybrid Research Approaches on Sustainability in VET

It is relevant to mention that the three theoretical strands – social, economic–labour economy, and ecological – offer complementary perspectives for integrating sustainability into VET. While each emphasises different dimensions (social, economic, and environmental, respectively) and employs its own conceptual and methodological frameworks, they all converge on the need to transform VET to meet the challenges of the 21st century. Recent literature increasingly leans towards systemic approaches that combine these pillars, recognising that only a holistic vision will enable VET to play a strategic role in building a sustainable future - one that balances social well-being, low-emission economic prosperity, and planetary health. Those scientific research currents on sustainability in VET have developed to varying degrees, reflecting increasingly integrative approaches. Primarily, three main approaches can be identified.

Firstly, the Education for Sustainable Development (ESD) in VET hybrid approach understands VET as part of a broader education system guided by ESD, embedding values, skills, and awareness across curricula. It encompasses the environmental (climate change), social (citizenship, justice), economic (resource use, sustainability), and cultural (diversity, heritage) dimensions. It is mainly a propositional research focus, based on multilateral definition of "greening VET". The UNESCO ESD framework promotes VET that develops "agents of change" equipped for systemic transformation.

- Combined Dimensions: Social, Environmental, Economic, Cultural.
- Theoretical Foundations: Critical pedagogy, socio-constructivism, transformative learning theory (Tilbury, UNESCO).
- Key Concepts: Sustainability awareness, global citizenship, empowerment, transformative pedagogy, SDG 4.7.
- Research Objects: ESD integration into curricula, institutional practices, teacher training, learner perspectives.
- Methodologies: Participatory action research, longitudinal studies, mixed methods, curricular audits.
- Key *Findings:* ESD enhances learner engagement and sustainability awareness. Institutional commitment and teacher training are essential for systemic change.
- Key authors:
  Bianchi et al. (2022); Bourn et al. (2017, 2021), Gleissner, K. 2012; Majumdar (2011); Olsson & Gericke (2016); Tilbury (2011); UNESCO (2020, 2022).

Secondly, the research hybrid approach related to VET for the Green and Circular Economy aligns VET with green and circular economy transitions, focusing on skills that support sustainable production, eco-design, and resource reuse. It merges the environmental (waste reduction, mitigation and adaptation to climate change, biodiversity protection and restoration), economic (green business), social (decent jobs), and cultural (consumer responsibility, mindset

shift) dimensions. Green VET programmes aim to foster both technical expertise and sustainable values.

4. Combined Dimensions: Environmental, Economic, Social, Cultural.

- Theoretical Foundations: Innovation systems, green economy theory, circularity, sustainable skill ecosystems.
- Key Concepts: Circular economy, eco-innovation, green occupations, sustainable industry, low-carbon development.
- Research Objects: Competency standards, green job profiles, training modules, public-private partnerships.
- Methodologies: Labour market needs analysis, competency mapping, sectoral curriculum reform, cross-national studies.
- Key *Findings:* Green-oriented VET programs improve employability and sector adaptation. However, lack of international standards hinders coherence. Local ecosystems are critical for implementation.
- Selected authors:
  Cedefop; OECD (2015), Fien & Wilson (2005), Fuchs (2024), Gessler et al. (2025); ILO (2019), Gamboa et al. (2024); Janta et al. (2023), Moso-Díez, et al. (2025), Persson-Thunqvist et al. (2023), Sharpe & Martínez-Fernandez (2021), Vandeplas et al. (2022), etc.

Thirdly, VET for a Just Transition links VET to a just transition toward sustainable economies. It focuses on equipping individuals with skills for green jobs while protecting workers and communities as societies shift from polluting industries to clean ones. It integrates economic (employment, innovation), social (equity, inclusion**),** environmental (emission reduction, eco-friendly practices), and even cultural (community values, indigenous knowledge) dimensions.

- Combined Dimensions: Economic, Social, Environmental, Cultural.
- Theoretical Foundations: Political economy of labour, social justice, just transition theory (ILO, UNESCO, CEDEFOP).
- Key Concepts: Green skills, just transition, labor equity, decent work, qualification gaps
- Research Objects: Green curriculum design, national skills frameworks, labor market transitions, policy integration.
- Methodologies: Policy analysis, comparative case studies, stakeholder interviews, graduate surveys.
- Key *Findings:* Inclusive VET is essential for equitable green transitions. Skills mismatch remains a challenge. Policy coordination is key.
- Some authors: Bianchi et al. (2022), Chinedu et al., (2023), Kwauk and Casey (2022). McGrath, and Powell, L. (2016), Ramsarup et al. (2024), etc.

4 Conclusion

Sustainability is an emerging area of scientific inquiry within vocational education and training (VET) that calls for deeper theoretical foundations, robust empirical research, and more analytical approaches — moving beyond predominantly descriptive studies.

Its multidimensional, multistakeholder, and multilevel nature — extending from public policy to the competencies, values, and sustainability-related attitudes of VET students, teachers, and trainers, as well as policymakers, local authorities, business leaders, and vocational

training center executives — intersects directly with pedagogy, institutional practice, and curriculum design.

Addressing this complexity requires a systemic vision and a flexible, integrative research framework that bridges policy, practice, and societal needs. Making sustainability relevant to the VET field means focusing not only on what is taught, but also on how attitudes and behaviors aligned with sustainability awareness are fostered in real-world learning environments. Therefore, it is of utmost importance that the scientific community, in collaboration with key VET stakeholders, engages in collective reflection and debate to strengthen research and enable its progress and advancement.

At the same time, this review faces certain limitations. The fragmented nature of the literature, the variety of conceptual framings, and the restric52.tion to sources mainly in English made synthesis complex and may have resulted in the omission of relevant perspectives. Future research should therefore pursue more integrative frameworks, expand comparative studies across contexts, and deepen analysis of ecological approaches at different levels. Stronger collaboration between researchers, policymakers, and practitioners will be essential to advance this agenda.

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