LITERATURE REVIEW

Perspectives on developing skills and competencies through Education for Sustainable Development: how do we do it, and who is responsible?

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ABSTRACT

The key aim of this paper is to assess the value and effectiveness of how Education for a Sustainable Development (ESD) is integrated in UK Higher Education Institutions (HEIs). The United Nations integration of Sustainable Development Goals (SDGs) in teaching in Higher Education is adapted through the Education for Sustainable Development (ESD) model. However, educators and students have different conceptions of the difference between ESD and Education for Environment or Sustainability. This article focuses on the review of ESD perspectives to further develop skills and competencies for educators, students and employers and the better integration of ESD in Higher Education Institutions (HEIs) in the UK.

To achieve this, the review focuses on 114 articles post-2021 to continue previous work by Advanced HE (Education for Sustainable Development: a review of the literature 2015-2022). The review focuses on perceptions of four key areas: how ESD is defined, the value of ESD competencies, how well ESD is embedded in HEI and the challenges for its adoption. This review argues for an institution wide approach embedding of ESD to prepare students for real-world sustainability issues, aligning academic curricula with the United Nations SDGs. Developing a curriculum that actively engages learners in the process is not just an educational upgrade; it is a fundamental shift towards a future where graduates are conscious of and actively involved in creating a sustainable world.

KEYWORDS

Education for Sustainable Development (ESD), active pedagogies, sustainability competencies, soft skills, interdisciplinary collaboration, competency-based education, Sustainable Development Goals (SDGs)

INTRODUCTION

The significance of Education for Sustainable Development (ESD) has been increasingly recognised in recent years as it has become an integral part of the curricula in the UK's higher education institutions (HEIs). Integrating the ESD learning objectives aims to equip students and graduates with the necessary knowledge and skills to foster sustainable societies. More specifically, this paper argues that such integration will extend traditional soft skills and enrich them with sustainability competencies, creating graduates who are 'sustainability literate', capable and active in addressing global challenges successfully in their future workplaces. With this crucial need for educational reforms that integrate sustainability across all aspects of learning and teaching, this literature review addresses some of the important questions within this ongoing debate: How effective is the integration of ESD in UK HEIs? What are the perspectives of students and academics on ESD? What are employers' perceptions of employability and sustainability competencies (as developed through ESD)? And what are the next steps in implementing ESD within the curriculum to better fulfil learning objectives? Although the acknowledgement of the importance of sustainability in education is systematically featured in recent literature, there remains a lack of comprehensive strategies and cohesive practices across HEIs to fully embed ESD. Hence, by focusing on the transformative potential of ESD, this paper aims to promote a discussion on a sustainable future through education that is as rigorous in its pursuit of sustainability as it is of academic excellence.

METHODOLOGY

Inclusion criteria

The data collection process consisted of a search in one database, Scopus, a primary comprehensive database for hard sciences and social sciences that only shows peer-reviewed articles. We started off with ESD and then expanded to "education for sustainability", "education for sustainable development" and "sustainability education".   We used "student*", "learner* to get students' perspectives. We used "Higher education", "HE", "UK", and "United Kingdom" so that the contexts in the results would be comparable to the Strathclyde context. Furthermore, the search was limited to the timeframe between Jan 2021 and Dec 2024. Published outputs were indeed selected to update the comprehensive literature review on ESD published by Advance HE.

Search process

The scope of the review focused on academics and undergraduate students in UK HEIs. The initial search produced 113 outputs that were a mix of case studies, book chapters and grey literature. The term "employability" was then added to expand this further, producing 14 additional results giving us the employers' perspectives. Our exclusion terms meant that we discarded results on environmental education, results lacking a UK context, and results focused on secondary schools or postgraduates. This gives this paper a sharper focus than the comprehensive Advance HE one. After each person was given a section of the search to screen individually, we all agreed on the 38 articles kept for their relevance. Significant themes were identified for review and discussion. Each theme will be discussed in turn below.

HOW IS ESD DEFINED IN THE LITERATURE?

Environmental Education vs ESD

The distinction between ESD and teaching sustainability or Environmental Education is pivotal within the Scholarship of Teaching and Learning (SoTL). While both concepts aim to integrate sustainable and environmental concerns into educational frameworks, they serve different purposes and approaches (Acosta Castellanos and Queiruga-Dios, 2022).

ESD represents a comprehensive approach that aims to educate about sustainability and transform learning and teaching processes. It empowers learners with the skills, values, and knowledge necessary for promoting sustainable development. The role of ESD in equipping learners with critical thinking skills and a global perspective is essential for addressing modern sustainability challenges (Leicht et al., 2018). ESD's transformative potential highlights the importance of embedding Sustainable Development Goals (SDGs) across higher education curricula that re-orientates more transformational, experiential, and action-oriented methods required for ESD (Strachan et al., 2021).

Conversely, environmental education focuses more narrowly on the content delivery of sustainability topics, building skills that prepare individuals and communities to collaboratively undertake positive environmental action (Ardoin et al., 2020). It often involves integrating sustainability issues into specific courses or disciplines without necessarily adopting a transformative educational approach or focusing on the reflection of the SDGs. Acosta Castellanos and Queiruga-Dios (2022) critique this approach for its potential to remain superficial, advocating for more profound pedagogical changes in HE that align with the principles of ESD and advocating for a transition from environmental education to ESD.

ESD and environmental education's objectives and outcomes in HE differ significantly. ESD seeks to foster a deep understanding of sustainability, enabling learners to act on sustainability challenges based on the SDGs. Environmental education, while foundational, often limits itself to awareness and knowledge dissemination. Oe et al. (2022) emphasises ESD's need to produce informed citizens and active participants in community sustainability. Recent advancements underscore the divergence in pedagogical approaches between ESD and environmental education. ESD encourages participatory, experiential learning and critical engagement with sustainability challenges (Serafini et al., 2022). In contrast, traditional teaching methods may not fully engage learners in transformative experiences, a gap that needs addressing for genuine sustainability education.

A global agenda for ESD curriculum integration

The literature on ESD, course design and learning objectives highlights the importance of transformative learning, competency development, and integrating sustainability principles into educational practices to contribute to the transition towards a sustainable world. It highlights the evolution of the importance of ESD, which has seen the emergence of numerous sustainability courses across the globe and the integration of sustainability into existing curricula, demonstrating ESD's pivotal role as a change agent, initiated over three decades ago with the Brundtland Commission report (WCED, 1987). To build on this foundation, this paper updates the previous comprehensive review of ESD from 2015-2022 by Advance HE, focusing on how ESD integration has evolved within UK HEIs, highlighting contemporary challenges and perceptions. It agrees with the 2015-2022 review's findings on the necessity of clear conceptualisation and effective integration of ESD within HE (Acosta Castellanos & Queiruga-Dios, 2021; Shephard, Rieckmann & Barth, 2019). It also evaluates the importance of ESD competencies in enhancing employability and developing sustainability literacy among graduates, which aligns with and extends the 2015-2022 review's emphasis on the need for competencies that are holistic and align with the United Nations Sustainable Development Goals (SDGs) (Lozano et al., 2019; UNESCO, 2017. And it builds on the Advance HE review by emphasising the need for clearer definitions, competency-based learning outcomes, interdisciplinary collaboration, and holistic evaluation methods. Addressing these gaps will enhance the effectiveness of ESD in higher education, preparing graduates to meet the complex sustainability challenges of the future.

HOW IS ESD GENERALLY PERCEIVED AMONGST EDUCATORS, STUDENTS AND EMPLOYERS?

Several of the research papers and case studies shed light on students' and educators' perceptions of ESD in UK HEIs. Some articles instead focused on the theoretical frameworks of embedding ESD but included remarks on educators and, more often, on students' perspectives (Unuigbe et al., 2023; Preus et al., 2023). Other authors used techniques to directly gather data on ESD perceptions; feedback forms at workshops for staff (Tomasella et al., 2023 for students and Giannopoulos et al., 2023) and questionnaires distributed to students (Gericke et al. 2019) which is explicitly recommended by Giannopoulos et al., 2023 to measure attitudes to sustainability.

A few articles on students' views were not course-specific, such as those by Zhou et al. 2022 but the majority are discipline-specific and showcase many pockets of good practice in ESD.

This does make it difficult to compare results from one experience to another, as one should consider the signature pedagogies of each discipline.

Because sustainability is seen as a well-placed subject in scientific subjects (Goren and Yemini, 2017), engineering is the most reviewed discipline. However, it should be noted that this review covers a variety of disciplines: nursing (Álvarez-Nieto et al., 2022), management (Tomasella et al., 2023), law (Boyle et al., 2024), and psychology (Pownall et al., 2022).

Students' perceptions of ESD

Students are not passive in their education and their opinions and attitudes shape the offerings provided by the sector. HEIs actively engage with students as consumers, as evidenced by initiatives like "you said – we did" campaigns. For that reason, students likely wield considerable influence on the future integration of ESD into university curricula. It is noteworthy, however, that only Boyle et al. (2024) addressed the expectation of fee-paying students to have their opinions considered, recognising their role as consumers and therefore key stakeholders.

When considering students' perspectives on ESD, the Students Organization for Sustainability (SOS-UK) survey emerges as a significant source of insight, given its comprehensive nature. Established in 2019 by the student movement in response to the climate emergency, SOS-UK is a charitable organisation that operates under an international umbrella, striving to drive global systemic change for sustainability. Beginning in the academic year 2010-11, the national survey of UK students' perceptions on sustainable development was expanded to an international scale in 2018-19. (SOS website).

The most recent iteration of this online survey was conducted in October and November 2022, with approximately 9,000 participants from across the UK. Among the respondents, 65% were UK-based students and 68% were undergraduates. It is worth noting that the majority of respondents are undergraduate students from the UK, aligning with the inclusion criteria of this literature review. And unlike the papers retrieved from Scopus, the strength of this survey lies in its broad representation of students who may not have been exposed to ESD in their studies.

The survey encompasses a wide range of questions to provide information on perceptions of sustainability. Questions assess student definitions of sustainable development, their learning aspirations regarding sustainability, their expectations of their educational institutions, and aspirations for sustainability in their future careers (SOS website).

Students are increasingly advocating for integrating ESD into their university learning experience. The SOS-UK survey reveals that they overwhelmingly prefer ESD to be integrated into the curriculum, developing sustainability skills in their courses (SOS Website). Opoku and Egbu (2018) identified dissatisfaction among students regarding the insufficient emphasis on sustainability in their programmes and underscored the importance of sustainability knowledge and skills in enhancing job competitiveness in construction. In addition, a study by Álvarez-Nieto et al. (2022) shows nursing students expressed a strong desire for greater incorporation of sustainability education and indicated a growing interest in the subject. This latter article uniquely emphasises that students' awareness of the SDGs stems from their academic studies and the proliferation of related activities, including formal summits, media coverage, and activist movements, in recent years. The SOS-UK survey showed that knowledge of sustainability deepens as students advance through their degrees and there is a sustained expectation by students to study sustainability and acquire related skills. But the survey results suggest fewer students expressed willingness to pursue this avenue.

As highlighted in the introduction, there is often conflation between the ideas of ESD and environmental education, and this amalgamation must be considered when unpicking student perceptions of ESD. For example, in construction, Unuigbe et al. (2023) note that students are familiar with sustainability, sustainable development, and environmental sustainability. However, this is associated with primary or limited sustainability knowledge. The SOS survey reveals that an overwhelming majority of students recognise that they acquired knowledge about climate change and its mechanisms during their degree programs. However, fewer students demonstrate awareness of the potential ramifications of climate change on daily lives and job prospects, with only 69% and 50%, respectively. Similarly, Preus et al. (2023)'s use of cognitive maps to collect data seems to indicate that business students show silo thinking when tested on Corporate Social Responsibility knowledge and Álvarez-Nieto et al. (2022) showed healthcare students and health professionals are aware of climate change's effects on health but are not prepared to integrate it in their practice. These examples and findings by Zhou et al. (2022) suggest that students do not transform their SDG knowledge into sustainability behaviours. In essence, the results indicate that the teaching methods and curriculum choices provide environmental education rather than enable students to showcase the desired ESD competencies.

According to the SOS-UK survey, students generally hold a positive perception of their institutions regarding sustainability initiatives (SOS website). However, this positivity may not necessarily correlate with robust action for ESD, as some HEIs with greener campuses may have limited engagement in sustainability education. The SOS survey indicates that while many students claim to have a better understanding of sustainability issues and impacts, only half report taking more personal action in response. This underscores the need for more concerted efforts to translate awareness into tangible actions.

Educators' perceptions

The reviewed articles shed light on a notable gap in the literature regarding educators' perceptions of ESD, which Giannopoulos et al. (2023) emphasised as overlooking crucial perspectives from every-day educators. This underscores the necessity for further research, as educators are tasked with ESD's intricate design and delivery to students.

Gonzalez-Buelga et al. (2023) stands out as one of the few papers exploring the perspectives of academic staff, 28 attendees of a workshop on teaching sustainability in Engineering. Similarly, Boyle et al. (2024) present insights from academics in a law department engaged in a Students as Partners (SaP) project to embed ESD in the curriculum. However, voices from educators not directly involved in ESD initiatives remain unheard, highlighting a need for broader inclusion to enhance HEIs' delivery of ESD.

While academic unions undertake educational campaigns and provide learning opportunities across disciplines (Unuigbe et al., 2023), many educators still lack awareness of or involvement in ESD efforts. Some express concerns that current ESD initiatives focus primarily on content, particularly environmental topics, rather than integrating essential skills and competencies into module learning outcomes (Boyle et al., 2024).

Educators have identified barriers to ESD goals, including conservatism, rigid curriculum definitions, accreditation concerns, and institutional ambiguity (Gonzalez-Buelga et al., 2023). Addressing these barriers is imperative for garnering widespread support for ESD among educators within HEIs.

Notably, literature on learning outcomes and assessment in the context of ESD is scarce. Assessing ESD skills such as critical thinking poses challenges (Erikson and Erikson, 2018), highlighting a need for innovative approaches to evaluation. Looking to the future, Pownall et al. (2022) suggest that more skills-based teaching approaches driven by co-creating learning outcomes with students and stakeholders should be embraced in HEIs alongside authentic assessment methods. This forward-looking perspective underscores the potential for transformative change in ESD delivery.

Employer's perceptions

The Association of Employment and Learning Providers (AELP) in the UK are an employers' focused learning body and have recognised 'sustainability' as the "fourth functional skill" alongside English, Maths and Digital, and claimed that "it is becoming clear that sustainability and low carbon should be embedded into every curriculum as the fourth functional skill" (Hay, 2022). This can be seen as a reflection of the increased importance employers place on the sustainability challenges their organisations face and recognises the scale of the challenge required to meet national and international net zero targets and the required upscaling and up-skilling of workforce to meet this challenge. AELP has not only recognised the nexus between employability and sustainability education and skills development but are committed to practical action towards better integration of the two by setting up a "task and finish" group to introduce a sustainability charter for Independent Training Providers (ITPs), to ensure sustainability underpins all their training provisions.

In 2015, the National Union of Students (NUS), Change Agents UK and Higher Education Academy surveyed 79 employers, of which 50 held a senior leadership role, and 29 were involved in recruiting recent graduates (Drayson, 2015). This showed that two-thirds of respondents supported an obligation to develop students' social and environmental skills during their time in higher education. 32% of people in senior leadership roles 'strongly agreed' that developing students' social and environmental skills was the responsibility of HEIs, indicating that many employers expect graduates to be sustainability literate and equipped with sustainability skills before being employed.

WHAT ARE EMPLOYERS' PERCEPTIONS OF SKILLS AND COMPETENCIES FOR EMPLOYABILITY IN VIEW OF GLOBAL SUSTAINABILITY CHALLENGES?

This section of the review considers how employers' focus and the value they place on so-called 'soft skills' traditionally paired with employability, may be shifting to encompass ‘sustainability competencies’ – the development of which, are a central pillar to embedding ESD in HE curricula.

What are competencies?

UNESCO define competencies as “describing the specific attributes individuals need for action and self-organisation in various complex contexts and situations. They include cognitive, affective, volitional and motivational elements; hence, they interplay knowledge, capacities and skills, motives and affective dispositions.” Notably, they go on to say that “Competencies cannot be taught, but have to be developed by the learners themselves” (UNESCO, 2017)

Vitello et al. (2021) have adapted a European Parliament definition of competency as having “the ability to integrate and apply contextually appropriate knowledge, skills and psychosocial factors (e.g. beliefs, attitudes, values and motivations) to consistently perform successfully within a specified domain.”

By comparison, ‘skills’ are often considered to be domain/discipline-specific, i.e. ‘hard skills’, or more general (non-discipline-specific) ‘soft’ skills, such as time management, teamwork and leadership and self-motivation, which are key to employability. Despite the distinctions made by others, the term skills and competencies are often used interchangeably or conjunctively by educators, students and employers.

Employers’ traditional perceptions of top ‘soft’ skills and competencies for employability

An array of skills and competency sets or frameworks are presented as being transdisciplinary and required by the future job market. The “Top Ten Skills of 2023” is a much-cited skill set defined by the World Economic Forum’s (WEF) Future Skills Report (WEF, 2023). In this report, skills are categorised into six different types: Cognitive (C), Self-efficacy (SE), Management (M), Technology (T), Working with others (WO) and Engagement (E). The top two skills, analytical thinking and creative thinking, are C-skills, followed by the SE-skills of resilience, flexibility and agility; motivation and self-awareness; curiosity and lifelong learning; and dependability and attention to detail. Mid-table is the T-skill of technical literacy, and then towards the bottom of this top-ten list are WO-skills, empathy and active listening, and leadership and social influence, with the M-skill of quality control completing the list (WEF, 2023).

The top 10 skills identified by (Indeed, 2024), and mapped to the same WEF skills type classifications above are adaptability (SE), analytical skills and systems thinking (C), communication (WO), computer literacy (T); leadership (WO); listening (WO); organisation (SE); problem-solving (C); resilience (SE); and teamwork (WO).

Others have more broadly defined the types of ‘soft skills’ that employers value as focusing less on the cognitive domain and more on aspects of self-efficacy and working with others, such as tolerance to pressure (SE), organisation and planning (SE), honesty and professional ethics (SE), ability to adapt to changes (SE), capacity for empathy (WO), positive attitude (SE), proactivity (SE), communication skills (WO), conflict resolution (WO) and of course teamwork (WO) (da Silva et al., 2022).

Disruption of employers' perceptions of employability skills and competencies in view of sustainability challenges

Returning to the WEF Future Jobs report on skills mentioned previously, it is acknowledged that employers estimate that 44% of workers' skills will be disrupted in the next five years, with the ever-increasing importance of cognitive skills such as creative and analytical thinking due to the need for more complex problem-solving. Self-efficacy skills will rank above collaborative skills, and socio-emotional attitudes will continue to grow in importance. Systems thinking is a skill that's not in the current top ten list but is a new entry in 'the top ten skills on the rise' (WEF, 2023). Interestingly, despite the rise of AI and some of the risks associated with misuse, misrepresentation and misinterpretation (intended or otherwise) around its use, critical thinking, which would seem vital in the verification, validation or adjustment of AI-generated content or outcomes, appears to be conspicuously absent as a required or rising skill. This disruption may be largely motivated by the need for society to adapt to and mitigate climate change – so-called green skills - and the other interconnected sustainability challenges set out in the UN SDG targets. There is therefore a highly practical requirement to equip graduates and existing employees with sustainability skills and competencies to contribute meaningfully and directly to the net zero transition and green economy, which will require two million new green jobs by 2050 in the UK alone. The International Labour Organization (ILO) define these as jobs that "reduce the environmental impact of enterprises and economic sectors, ultimately to levels that are sustainable… [This includes] work in agriculture, industry, services and administration that contributes to preserving or restoring the quality of the environment…Green jobs play a crucial role in reducing the environmental footprint of economic activity" (Strietska-Ilina et al., 2011). The ILO is explicit that green jobs are not new, that they are ubiquitous, and that they extend beyond the more immediately identifiable practice-based and technical jobs, and that there is no "absolute greenness of a green job" (Lee & van der Heijden, 2019).

While there is clear scope for more systematic research into the alignment of different employability and sustainability skills and competency frameworks, it is clear from the review here that synergies exist between the two, and that context is relevant here. Wiek, et al, 2011 defined 'sustainability competencies' as "complexes of knowledge, skills, and attitudes that enable successful task performance and problem solving with respect to real-world sustainability problems, challenges, and opportunities". The context of applying a competency to 'real-world sustainability problems, challenges and opportunities' is what defines 'sustainability' competencies and distinguishes these from 'general' transdisciplinary competencies.

The definition of individual competencies can also be interpreted through this sustainability lens. For example, the broad definition of 'systems thinking' (a rising employability and soft skill according to the aforementioned WEF Future Jobs Report) requires an ability to approach one understanding of an issue or the underlying and emergent behaviour of 'a system' (i.e. defined as an "interconnected set of elements that is coherently organised in a way that achieves something (Meadows, 2015))", to put in place appropriate interventions to change the system's behaviour and outcome. When applying this to the understanding or addressing of sustainability challenges – through a sustainability lens – this becomes a 'sustainability competency'.

The definition of ‘systems thinking’ as given by UNESCO’s ‘sustainability competency’ framework is “the abilities to recognise and understand relationships; to analyse complex systems; to think of how systems are embedded within different domains and different scales; and to deal with uncertainty” (UNESCO, 2017), the only difference here is that there is an underlying acknowledgement that the ‘systems’ mentioned here relate to societal, environmental and economic systems (i.e. the three pillars of sustainable development) and their interactions.

Therefore, given the importance of sustainability for organisations in terms of their own operations and their broader interactions with society, the environment, and the economy, there is a growing need for them to consider developing traditional soft skills and general competencies in their workforce through this sustainability lens.

WHAT ARE THE NEXT STEPS TO EFFECTIVE INTEGRATION OF ESD INTO HEI CURRICULA?

ESD is multi-faceted and aims to get learners to acquire competencies and knowledge. ESD gives learners across all disciplines the knowledge, skills, attributes and values to contribute to solutions that address environmental integrity, social justice and economic prosperity (Advance HE website). HEIs have integrated this mission into their websites, sustainability modules, and more, to varying degrees, despite the UK government having identified sustainability skills in 2005 as a core competence for graduates (HM Government, 2005).

Universities are recognised as transformative sustainability engines for the SDGs (Purcell et al., 2019); they have the power to influence. Yet, articles, such as Unuigbe et al. (2023), criticise HEIs for not doing enough, citing Sibilla and Kurul (2021), who have found the traditional approach of HEIs unsuited to dealing with the interdisciplinary and emergent demands of sustainability. ESD in HEIs frequently has a top-down approach, originating from organisations outside of the HEIs that provide the guidelines to academic institutions to do so (Giannopoulos et al., 2023) but there is often a level of confusion that exists in HEIs policies and visions. And so, this confusion permeates to educators and students about what ESD is and what it is for.

The literature reviewed shows that there is still no commonly defined ontology for ESD nor a common approach. In such a broad sector it is unsurprising that there is variety in delivery mechanisms from non-credit-bearing workshops open to all students (Davies-Vollum et al. 2023) to Student as Partners (SaP) review of curricula (Boyle et al. 2024) and variety in delivery from one discipline to another (Álvarez-Nieto C, et al. 2022, Gonzalez-Buelga et al. 2023, Tomasella, et al 2023, Bunch, 2020, Pownall, 2022). Gonzalez-Buelga et al. (2023) for example point out a lack of a clearly defined ontology for sustainability in engineering education. The lack of this ontology in other disciplines can mean, for example, too many business schools that still are not effectively addressing corporate social responsibility (CSR) (Preus et al., 2023) sustainability issues (Bunch, 2020). We have seen in in our review of student perspectives above that the varied and inconsistent approach to ESDs across courses leads to students gaining relevant sustainability information but not always the ability to become agents of change. These examples reinforce the SOS-UK article's findings: there remains a need for more comprehensive education to grasp the broader implications of ESD and foster leadership in attitude shifts to empower students to use their knowledge to create change.

Achieving a 'Whole Institution Approach' to embedding ESD in the curriculum

A Whole Institution Approach (WIA) would encapsulate all facets of university operations - curriculum, research, governance, operations, and community engagement within the ESD goals. Even though ESD seems to align well with STEM education, a large body of current literature focussing on educators and students in science and engineering (Hitt et al., 2023; Livada et al., 2023; Luk et al., 2023; Truscott et al., 2023; Truslove et al., 2023) stresses the need to adopt a WIA. While such an approach is systemic and supports a culture change in universities towards sustainability, it might prove challenging to apply across various disciplines and modules. Hence, a greater interdisciplinary collaboration, especially between technical and humanities disciplines, might be crucial in addressing the multi-faceted challenges of sustainability. (Giannopoulos et al., 2023).

While aspirational, implementing a WIA requires practical tools for effective execution. Some examples come from Truslove et al. (2023), which provide the necessary bridge between the ideals of the WIA and actionable steps that can be readily applied within engineering education. As educators seek to imbue their curricula with sustainability principles, the Global Responsibility Competency Compass and the Reimagined Degree Map emerge as valuable resources. Such instruments encourage educators to integrate global responsibility into curriculum design, thereby ensuring that engineering education transcends the technical domain to include ethical, equitable, and sustainable practices. Such an approach aligns with the sustainable development competencies highlighted by UNESCO and responds to the student demand for education relevant to the societal and ecological risks we face. In engineering education for example, this signifies a crucial evolution, where the role of engineers is redefined to include responsibility for the broader impacts of their work, advancing the cause of ESD by preparing students not just as problem solvers but as agents of positive change in a complex world, emphasising the importance of 'soft skills'.

Introduction of competency-based learning objectives in course design

A consensus of competency-based learning objectives would help educators design programmes of study and students to understand the outcomes of ESD. Recognising the growth of curriculum frameworks which have endeavoured to define and mould learning outcomes and competencies specific to ESD and the demand for sustainability professionals, the Brundiers et al. 2021 study emphasises and works towards identifying these key competencies that should be developed in students. The authors build upon the widely cited framework by Wiek et al. 2011 and refine it through a Delphi study involving international experts in sustainability education to create a consensus. According to the authors, learning outcomes for these key competencies should be clearly articulated at various educational levels (bachelor, master, doctoral) to guide the educational process and outcomes. The course design should be competency-based, incorporating pedagogical strategies that enable students to develop the requisite knowledge, skills, attitudes, and values for addressing sustainability challenges. Similarly, the Delphi study also recommends a scaffolding approach to learning objectives, which ensures that students first engage with concepts personally and familiarly before advancing to more complex and abstract ideas (Brundiers et al., 2021). Regarding course design, the study indicates that sustainability education should not be merely about the transfer of knowledge but should be designed to facilitate the development of competencies through active, participatory learning experiences. Such an approach appears in line with UNESCO's framework, which emphasises the need for courses that should provide real-world contexts and problems that require students to apply and integrate their competencies in sustainability problem-solving.

The learning outcomes from these courses are expected to align with the identified competencies, thus ensuring that graduates can demonstrate the abilities needed to work effectively in the field of sustainability. This approach requires a transformation in how courses are traditionally designed, with a move towards interdisciplinary, problem-based, and experiential learning modalities that reflect the complex, interlinked nature of sustainability issues (Brundiers et al., 2021; UNESCO, 2017; UNESCO, 2020).

Student engagement in curriculum development and long-term impact

Looking beyond the educator, Boyle et al. (2024) explore an insightful case study of collaborative curriculum change using the SaP model to update an undergraduate programme in law and incorporate ESD as learning outcomes. The study discusses the benefits of such collaborative processes, including enhanced understanding of student views and needs for staff and increased student confidence and sense of identity. However, the authors also note the potential barriers to student and staff participation in this process, such as the risk associated with changing power dynamics and the perception that student involvement might be a tokenistic compliance with policy rather than a genuine opportunity to influence the curriculum. What could be explored further is the long-term impact of this approach on both the quality of education and the actual implementation of ESD in professional practice. While the study discusses immediate outcomes and perceptions, it does not explore the sustained changes in teaching and learning practices or the lasting impact on student competencies post-graduation. Additionally, the research does not extensively cover how the co-created curriculum translates into tangible actions towards sustainability outside the academic environment. Future research could benefit from a more thorough examination of the mechanisms to support the sustainable inclusion of all student voices, as well as the long-term effects on educational outcomes.

Building on the insights of Boyle et al. (2024) regarding the collaborative curriculum change in law education, Nicholson et al. (2023) present a parallel investigation into the field of geography. While Boyle et al. (2024) pointed to the need for a more comprehensive understanding of how student-staff collaboration impacts the long-term effectiveness of ESD integration, Nicholson et al. (2023) turned the attention to the pedagogical methodologies that can potentially overcome the barriers of resistance to change in HEIs. Through the lens of Enquiry-Based Learning, they illustrate how a Geography module can serve as a microcosm for educational transformation, echoing the need for a holistic approach to sustainability education that is both inclusive and action-oriented. As they navigate through the challenges of implementing ESD, their findings resonate with the need for inclusive dialogue identified by Boyle et al. 2024 and spotlight the critical role of innovative teaching practices in fostering a culture of sustainability within higher education institutions. Despite its promise, the model faces challenges such as resistance to change and infrastructure needs.

Towards a unified strategy for ESD learning objectives' integration

The literature surrounding ESD and learning objectives depicts a need to form a global, interdisciplinary, and action-driven curriculum. This curriculum should strive to forge 'sustainability literate' graduates and empower them as competent change-makers who are well-equipped to navigate the complexities of today's global challenges. The responsibility for cultivating such competencies does not solely lie within the confines of educational institutions but extends to a collaborative engagement involving students, educators, employers, and the broader community. This collective effort ensures the creation of sustainability competencies valued not just academically but equally recognised and sought after in the professional sphere. Thus, as this literature review demonstrates, developing a curriculum that actively involves all stakeholders, including learners, in the process is not merely an educational upgrade; it is an essential pivot towards a future where the graduates are not only aware of but are actively contributing to a sustainable world.

CONCLUSION

This study, which offers a narrower focus and a more up to date review than the vast HEA review (2015-2022), aims to assess the current research on ESD in UK HEI for undergraduates by looking at students' and educators' perspectives, pedagogies, and employers' perspectives. The literature shows that students and employers' representatives know ESD need to be embedded in HEI because graduates need sustainability skills for the 'green' jobs the UK will have for them in the coming years, when ultimately all jobs will be 'green', and require employees to be abreast of and active in the tackling of a broad range of sustainability challenges. This review supports the previous Advance HE findings that ESD should be integral to higher education to ensure graduates are equipped with the necessary skills for sustainability challenges (Lozano et al., 2019). Educators understand the need for ESD to be embedded in the curriculum but often see a lack of clear competency-based learning outcomes and various barriers that exist in HEI. This review further identifies the current barriers to the effective adoption of ESD in HEIs, including the lack of comprehensive strategies, interdisciplinary collaboration, and competency-based learning outcomes, which builds on the gaps identified in the Advance HE review. Further research could be done on educators' views of ESD and the need for clear learning outcomes, and on the institutional barriers existing in HEI when facing the transformational changes needed for a WIA that relies on interdisciplinary and experiential learning pedagogies.

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