

Cross-Disciplinary Educator Training Approaches for Education for Sustainable Development in a Post-digital Perspective

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Abstract: The call for Education for Sustainable Development (ESD) connects with the agenda for addressing the anthropogenic challenges, aiming at a transition towards a sustainable future for planet Earth, humanity, and all living beings. As part of this agenda, educators play a vital role in developing and implementing ESD in their teaching. In recent years, there has been a focus on developing digital teaching and learning resources to support educators in their work on developing and delivering ESD. In a post-digital era with digital technology intricately woven into education and teaching, educators must excel in both designing and orchestrating teaching to effectively support ESD learning experiences. This implies that educators must acquire both pedagogical, technological, and sustainability knowledge to make informed pedagogical decisions on designing for ESD. Thus, pointing to a need for focused educator training and adequate learning materials to empower educators. This study investigates an international cross-disciplinary project, focusing on developing, integrating, and scaling ESD in Higher Education Institutions (HEI) and Vocational Education and Training (VET) educations, by developing and delivering educator training, supported by a digital ESD Academy (i.e., an online learning platform (OLP)). An ethnographic study of a series of educator training was carried out, focusing on; (1) “What are the educators taught about the key sustainability competencies and ESD. (2) “How are the educators taught to teach for such competencies”. Field notes, pictures, and documents, such as programs, slides, and hand-outs, were collected to address the research questions. This paper discusses how educator training handles the interplay of the components; knowledge, skills, affective dispositions, and actions toward sustainable development when designing for ESD. Findings from this study show a disposition for the knowledge dimension when teaching the key sustainability competencies in educator training and further reveal challenges in addressing the pedagogical choices for teaching these and delivering action-oriented teaching. When designing an OLP to support educators in developing and delivering ESD, this study points to a need for an awareness of the complexity of teaching key sustainability competencies and calls for reflections on both knowledge of pedagogy, technology, and the key sustainability competencies.

Keywords: Education for Sustainable Development, Post-digital Learning, Learning Design, Educator Training, Higher Education, Vocational Education.

1. Introduction

Education for Sustainable Development (ESD) has become a means to address the anthropogenic challenges and support the transition towards a sustainable future for planet Earth, humanity, and all living things (Leicht, Heiss and Byun, 2018). Research has pointed to teaching for key sustainability competencies as important in this transition. Likewise, several pedagogical approaches applied for teaching these competencies have been identified, although with limited research into the connection between the two (Lozano et al., 2017; Lozano and Barreiro-Gen, 2022). As educators are expected to play an important role in developing and implementing teaching for ESD, knowledge is needed on how to build the capacities of educators delivering ESD. The current ethnographic study investigates a series of ESD educator training in Higher Education Institutions (HEI) and Vocational Education and Training (VET), carried out as part of TEACH4SD, a cross-disciplinary international project. Part of the project is designing and developing an online learning platform (OLP) to support the educators in designing and delivering ESD. As Fawns (2019, 2022) highlights, there is always a digital aspect of any educational activity in HEI, as well as digital education also always being material, social, and embodied. Hence, in a post-digital era, where digital technology is entangled in complex ways in formal and informal teaching, educators need to be good at both designing and orchestrating teaching (Fawns, 2019), including when delivering ESD. To inform the development of the OLP, a study was carried out pursuing two objectives, namely, (1) “What are the educators taught about the key sustainability competencies and (2) “How are the educators taught to teach such competencies” in educator training. This article presents and discusses the findings of the study to inspire and inform future development of an OLP and to support educators in designing and delivering ESD.

2. Designing for an ESD OLP

As ESD is complex and educator training can be interpreted broadly, it is important to develop knowledge on how to design an ESD OLP to support educators in designing for and teaching ESD. In previous studies, the B-ESD framework and workshop (Jensen and Pilgaard, 2022) have been applied to support the design of a blended ESD training course and the design and development of an ESD OLP. The B-ESD framework (Figure 1) is inspired by the field of research of Learning design (LD) and is developed based on an understanding of LD as a methodology (Conole, 2013, 2014), facilitating educators in the process of making informed decisions in designing for learning, using digital technologies. The framework's structure intends to facilitate design reflections and decision making by addressing; **WHY**, which relates to identifying overall objectives for the design, **WHO** are the learners, **WHAT**, relating to identifying and sorting ideas and topics, using the three categories knowledge, attitudes, and actions, which originates from the three domains; the cognitive, socio-emotional and behavioural domain of learning objectives for SDGs (UNESCO, 2017) and **HOW**, relating to what pedagogical approaches is being applied to teach **WHAT**. The categories, knowledge, attitudes, and actions should not be understood as independent categories or learning objectives, but rather as a framework that provides educators with the opportunity and space to reflect on pedagogical choices regarding teaching activities for teaching the **WHAT**. From a post-digital perspective, and considering the entanglement of pedagogy and technology, where learners engage with technology in diverse, context-dependent ways (Fawns, 2019, 2022), it should also be acknowledged that online and on-site learning activities should not be seen as being inherently tied to either knowledge, attitudes, or actions.

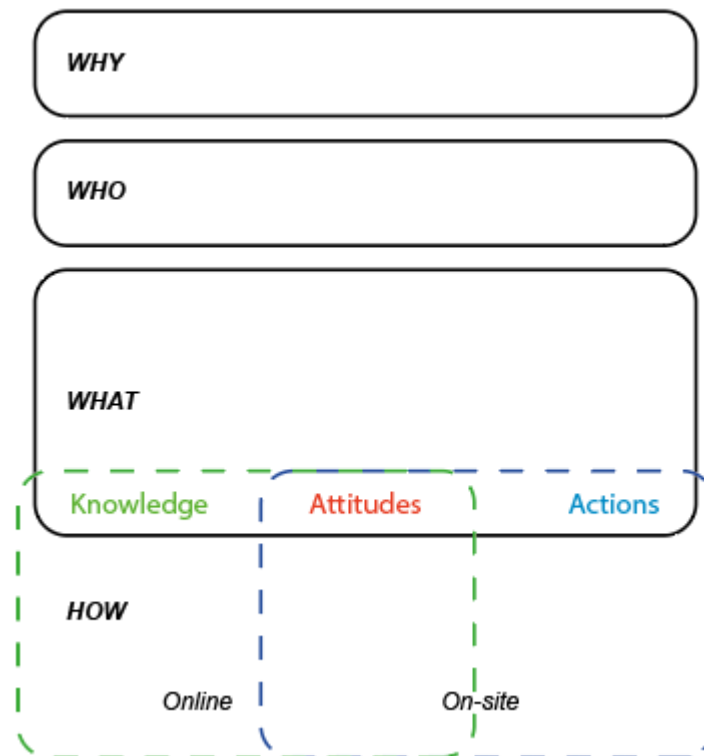


Figure 1: The B-ESD Framework (Jensen and Pilgaard, 2022)

2.1 WHY Key Sustainability Competencies in Education for Sustainable Development

There is general agreement that a fundamental transformation of education, supporting the attainment of key sustainability competencies, is an important element in achieving a sustainable future for all livings. Competencies are relatively abstract and encompass the ability to integrate and apply contextually-appropriate knowledge, skills, and psychosocial factors (e.g., beliefs, attitudes, values, and motivations) to consistently perform tasks and problem solve successfully in a given context (Sterling, Cullingford and Blewitt, 2004; Brundiers, Wiek and Redman, 2010; Wiek, Withycombe and Redman, 2011; Vare, Lausset and Rieckmann, 2022). Key sustainability competencies are differentiated, while not necessarily distinct from (other) 'regular' competencies in different academic or professional fields, by their critical importance for sustainability. Thus, they require translation into specific learning outcomes to be operationalized, such as for curriculum

development or assessment. Significant work has been done within the academic community to define such key sustainability competencies (Vare, 2022; Bianchi, Pisiotis and Cabrera Giraldez, 2022; Rieckmann, 2012; Wiek, Withycombe and Redman, 2011). To aid educational institutions in operationalizing ESD, academic efforts have led to the development of several frameworks, such as the OECD's and UNESCO's descriptions of key sustainability competencies (UNESCO, 2017; Rieckmann, 2018). Recently, the European Commission introduced the GreenComp framework (Bianchi, Pisiotis and Cabrera Giraldez, 2022), which distinctively highlights the interdependence of humans and nature. Outlining 12 interrelated competencies across four areas; embodying sustainability values, embracing complexity, envisioning sustainable futures, and acting for sustainability. Describing a sustainability competence as follows: *"A sustainability competence empowers learners to embody sustainability values, and embrace complex systems, in order to take or request action that restores and maintains ecosystem health and enhances justice, generating visions for sustainable futures"* (Bianchi, Pisiotis and Cabrera Giraldez, 2022, p. 12). The GreenComp sustainability competency framework was taught in the educator training courses, investigated in the current article. When dealing with educating educators for ESD, there is an additional level to WHY, besides WHY the key competencies. It also includes WHY choosing specific pedagogical approaches to teach for the key sustainability competencies and support transformative learning.

2.2 WHO are the Drivers of the new Sustainable Future

There is a broad consensus that sustainability themes need to be embedded in lifelong learning, including in HEI and VET education programmes, as they educate the future workforce and professionals (UNESCO, 2021). The implementation of ESD in education places a high demand on educators and presupposes that they themselves have dealt with the concept of sustainability and ESD, as well as how transformative actions occur and align their pedagogical practice to teach within the ESD concept (Vare, Lausset and Rieckmann, 2022). Therefore, it is imperative that ESD also extends to educator training, to build the capacity of educators, and to successfully implement ESD in HEI and VET. As always in designing education, attention to WHO the learners are is necessary, including the diversity of educators between and within HEI and VET.

2.3 WHAT and HOW it Should be Taught

[Models and frameworks of educator ESD competency building support a](#) dual focus on both subject matter content ("what should be taught") and pedagogical approaches ("how it should be taught") (Lozano et al., 2017; Lozano and Barreiro-Gen, 2022; Rieckmann and Barth, 2022). Addressing "what should be taught": Target 4.7 of the Sustainable Development Goal (SDG) 4, aims to ensure that all learners acquire the knowledge and skills needed to promote sustainable development (UNESCO, 2017), with SDG 4 being recognized as a pivotal goal, essential for the achievement of the other 16 SDGs. Hence, ESD should address the interrelated environmental, social, cultural, and economic sustainability aspects across various topics and disciplines, emphasizing their interactions and contingencies in time and space, at local, regional, and global levels. ESD should equip learners with the knowledge, skills, and attitudes to think, plan, and act to tackle interconnected global challenges, with sustainability in mind (Leicht, Heiss and Byun, 2018; Salas-Zapata, Ríos-Osorio and Cardona-Arias, 2018; Bianchi, Pisiotis and Cabrera Giraldez, 2022). Knowledge is frequently perceived as value-neutral grounded, however, our values and worldviews continuously shape our perception and understanding of the world, including our comprehension of sustainability issues. ESD should therefore, beyond simple declarative knowledge, aim to impart affective elements related to the know-how and skills specific to sustainable development, which are essential for initiating long-term behavioural transformation (Sossé, Wagner and Hopper, 2021). In continuation of this, it is described how ESD places more emphasis on socio-emotional dimensions (values), together with crucial behavioural change practices (taking action) (Leicht, Heiss and Byun, 2018). Inspiring for developing agencies to act sustainably both as individuals and collectively, as well as both personally and professionally.

Addressing "how it should be taught": The choice of pedagogical approaches in teaching depends on the educational goals and the specific learning context, as well as addressing the diversity of the learners. There are ample proposals on pedagogical approaches for teaching the key sustainability competencies, with Lozano (2017) having proposed a framework linking these in HEI, aimed to support the design of ESD (Lozano et al., 2017, 2019; Lozano & Barreiro-Gen, 2021). As educators participating in educator training themselves are being taught how to teach ESD ("how to teach, how it should be taught"), it provides an additional (meta) layer to HOW that needs to be handled when designing and delivering ESD educator training. Despite the aforementioned myriads of pedagogical practices for teaching the key sustainability competencies and efforts to link these, previous studies have shown that designing ESD educator training is challenging and calls have

been made to reform or refine such programmes to equip educators with ESD teaching competencies (Rieckmann and Barth, 2022). Additional complexity is added with the demand for ESD educator materials, including digital resources (Leicht, Heiss and Byun, 2018), and previous research having shown that developing and delivering such digital ESD learning material and OLPs is difficult (Jensen, Baagø and Pilgaard, 2024). This together with teaching in a post-digital world, where digital technology is entangled with teaching and learning (Fawns, 2022), educators need to possess knowledge, relating to not only content knowledge (key sustainability competencies), but also pedagogical knowledge (making informed choices in pedagogical approaches to achieve these), and technological knowledge (how to approach and integrate such digital ESD resources). While TPACK (Mishra and Koehler, 2006) serves to delineate the broad domains of knowledge required by individual educators, entangled pedagogy is inherently a collaboratively enacted approach (Fawns, 2022), which should be kept in mind, when designing an OLP, to support ESD educator training.

3. Context

The TEACH4SD project involves HEI, VET, and industry partners from five professional domains (health, textile, construction, trade, and entrepreneurship) and countries. It aims to develop ESD practices, including developing an OLP for supporting educator training at HEI and VET. The research presented in this article investigates three educator training courses, developed and conducted as a part of the TEACH4SD project (Figure 2); One three-day international training course developed and carried out by project-appointed trainers. In succession, two five-day national educator training courses (National-HEI and National-VET), within the health domain, were developed and carried out by educators who had attended the international training course. Furthermore, educators from the National-HEI supported the National-VET educators in their planning and provided lectures during the National-VET course. The data collection was carried out from September to December 2024.

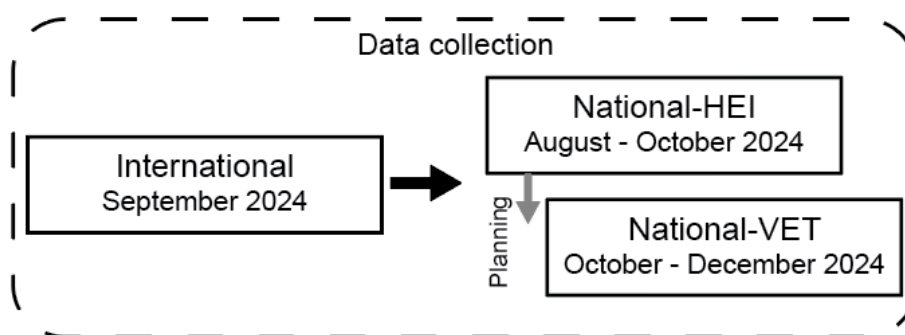


Figure 2: Timeline for the study

4. Methods

To address the research questions, the study draws on an ethnographic research approach studying the educator training courses (Figure 2). The authors coordinated their participation across the three educator training courses and collected the empirical data through field notes and photographs. Documents such as programs, slides, and handouts were also collected. The empirical studies and the documents were sorted and coded, focusing on identifying which aspects of sustainability and ESD were addressed, such as concepts, theory, and teaching methods. Furthermore, the teaching activities applied were sorted and coded, focusing on how they were introduced and conducted, and if any pedagogical arguments connected to the specific teaching activities were conveyed to the course participants. During the analysis, the authors identified and discussed the experiences, perceptions, and insights of how the courses were conducted; topics addressed in the course program, teaching activities conducted, teaching methods, materials, resources being used, and finally choice of locations.

5. Findings and Discussion

5.1 ESD and Key Sustainability Competencies

The overall aim of the TEACH4SD project is to develop, integrate, and scale ESD in HEI, VET, and GreenComp (Bianchi, Pisiotis and Cabrera Giraldez, 2022) was chosen as the sustainability competency framework for the project. It was observed that WHY ESD and GreenComp were addressed during both the international and

national courses. In both national courses, a lecture on WHY ESD, included a presentation of a scenario-building tool, adapting the use of the three key sustainability competencies, systems thinking, futures literacy and critical thinking to support addressing the need for developing ESD. The scenario-building tool was introduced to support educators in critically examining the origins of their values, professional orientation, and the pedagogical principles they apply. However, participants did not engage with the tool or reflect on WHY ESD is relevant to their own teaching and subject areas during the course. At the National-VET course the educators applied a teaching activity addressing WHY sustainability and ESD, where the course participants were instructed to construct something with small building blocks, representing “what they are grappling with”. This was followed by a session where they presented their creations and shared their experiences and motivations for ESD and sustainability, both professionally and personally. During this teaching activity, it became evident that participants had a range of different reasons and motivations for enrolling in the ESD training course. Acknowledging this diversity may be relevant in the context of ESD educator training and could be considered a fundamental condition that should be addressed early in an ESD training course, to support continued engagement of the course participants.

Participants in the international course were from HEI and VET and different countries, representing different domains, thus constituting a heterogeneous group of WHO (are the learners). This introduced a diversity of WHO, including their previous knowledge of ESD and cultural understanding of education, ESD, etc. The observational data did not yield clear findings on how the course instructors responded to or managed this diversity among participants. Meanwhile, the WHO was a more homogenous group regarding educational and health sector background, in the National-HEI and National-VET courses. However, despite all participants being from the health domain and WHY ESD in the health sector was addressed during the courses, participants translation of sustainability and ESD into their own specific health education and profession still appeared difficult. At the National-HEI course, the participants themselves asked for group work during the course to take place within the specific health educational programmes, such as only occupational therapists in one group, to better support reflections on WHY, WHAT, and HOW in their own teaching, education, and professional context.

Learning resources addressing WHAT, such as the GreenComp framework (Bianchi, Pisiotis and Cabrera Giraldez, 2022) and literature on HOW and the pedagogical approaches for ESD, were provided as homework for the national courses. WHAT at the international course focused on a generic presentation of the key sustainability competencies. Due to the overarching nature of the GreenComp framework competencies, one WHAT focus on the national courses was on translating them into the health sector context. It can be argued that it is not possible to achieve in-depth experience with all key sustainability competencies during a three- or five-day course and due to the limited time and capacity available, three to four key competencies were selected to work with in-depth, while building a broad foundation in the others. At the same time recognizing, that not all competencies will be equally relevant for every educator. It was observed that system thinking, critical thinking, futures literacy and promoting nature were chosen throughout both the international and national courses, while others were only mentioned and some key competencies not addressed at all. It was not conveyed why these were chosen. However, it could be speculated that as these were the key sustainability competencies that were introduced in the international course, it might have been the reason for educators to choose them in the national courses, having attained them as competencies themselves. Observations on WHAT, from the national courses also revealed the inclusion of the concept 'being-competence', alongside with efforts to establish links between the key sustainability competencies and broader educational frameworks, including 21st century skills, together with the integration of technology, in both pedagogical and professional practice. The participants responded to this in varied ways; while some found the approach somewhat unclear, others appreciated it, as they were already engaged in implementing technology and 21st-century skills and perceived this as an opportunity to concurrently introduce sustainability and ESD. The variable interpretations of ESD and contextual interpretation of the key sustainability competencies in the courses could be claimed to be problematic to measurability and accountability, but could at the same time be argued to be necessary as competencies are culturally and context bound (Rieckmann and Barth, 2022). Either way, it should be considered when designing for HOW and choice of pedagogical approaches.

5.2 Pedagogical Approaches

ESD frameworks, including the GreenComp framework (Bianchi, Pisiotis and Cabrera Giraldez, 2022), provide a structured approach to understanding how transformative learning can be fostered, through engaging the cognitive, socio-emotional and behavioural domain and promoting a holistic educational experience. This ambition calls for learning theory to inform the design of ESD and should address knowledge, skills, attitudes

and actions toward future sustainable development. In the meantime, it is argued that breaking down (key sustainability) competencies into knowledge, skills, values, and so forth can lead to the idea that learning can be atomized and detailed inventories be made, which is antithetical to the holistic ethos of sustainability (Vare, 2022). However, to provide structure to reflect on WHAT and HOW and choice of pedagogical approaches, findings from the current study are discussed in relation to the categories knowledge, skills and actions inspired by the B-ESD framework (Figure 1)(Jensen and Pilgaard, 2022).

A body of research have identified several pedagogical approaches applied for teaching for key sustainability competencies, with some reported to be more effective for learning such competencies, such as problem-based learning and interdisciplinary team teaching (Lozano et al., 2017; Lozano and Barreiro-Gen, 2022). Acquiring new knowledge is interdependent with context and acting in the world and therefore enables knowledge to be acquired in various ways. It was identified in both the international and national courses that the most prominent teaching activity was knowledge dissemination through lectures, which is described to be one of the least effective ways to develop sustainability competencies (Lozano and Barreiro-Gen, 2022). It is not possible to conclude if this dissemination of knowledge affected the participants' attitudes towards sustainability. At the National-HEI course, futures literacy and system thinking were taught by lecturing, but also by hands-on teaching activities. However, this was done with simplistic exercises that the participants carried out. It was not related to the health domain or their own teaching or professional practice, which left it up to the participants to make this translation themselves. Nature was generally being highlighted as a WHAT by the course educators and as being very important, both vocally as well as through applying teaching activities situated in nature. As addressed earlier, nature has an importance in ESD, and this was vocalized at both national courses and some of the course days were at a location, which is embedded in nature and works with sustainability in different ways. The topic nature-connectedness and relations to health was addressed in lectures, with activities in nature including a guided walk, group discussions and reflection activities relating to other topics than nature. Nature served as a scenery for the teaching activities, and some course participants expressed that it was not easy to transfer HOW and the nature experiences to their own teaching and professional practice. However, during the walks, course participants were heard trying to make these professional and educational translations, discussing it with colleagues. During the national courses, it was observed that the participants were actively engaged, both during lectures delivered by sustainability experts and during visits to on-site real-world locations such as a hospital working strategically with sustainability. However, these sustainability experts were not educators but worked with sustainability in the public or private sector and no link was made to the key sustainability competencies, ESD or pedagogical approaches.

Findings across all courses revealed that learning theory and reflections and considerations on choice of pedagogical approaches for the teaching activities were rarely explicated for the participants, even though an intention to do so was vocalized in one of the national courses.

The course participants development of their own ESD during the course was an attempt at an action-oriented approach for ESD in educator training. During the national courses, time was allocated for participants, to design and develop an ESD initiative to implement in their own teaching. On the last course day, they pitched it to and received feedback from invited stakeholders, such as sustainability and ESD experts, educational leaders, and course educators. Key sustainable competencies should be framed as observable behaviors, but as the study did not follow the participants' journey in implementing ESD in their teaching, it was not possible to pursue this in the current study.

6. Conclusion

The ethnographic study presented in this paper was conducted as part of an international cross-disciplinary project focusing on developing, integrating, and scaling ESD in HEI and VET educational programmes, supported by the development and integration of an OLP. The study focuses on three courses carried out in the fall and winter of 2024. The aim of the training was for educators to learn about the European GreenComp competency framework (Bianchi, Pisiotis and Cabrera Giraldez, 2022), and empower them with knowledge and experience on how to approach the framework as a key for transitions toward teaching and designing for ESD. During the courses, various pedagogical practices and teaching activities were introduced as a means for course participants to develop key sustainability competencies and knowledge on how to teach for such competencies. The study identified a tendency to choose lectures for introducing the key sustainability competencies and challenges in bridging generic competencies such as system thinking and futures literacy explicitly to sustainability. Furthermore, the study showed challenges in explicating pedagogical choices for the design and teaching of the key sustainability competencies. These findings illustrate the complexity inherent in designing and teaching for

key sustainability competencies and designing for ESD. This calls for reflections on both knowledge on pedagogy, technology and the key sustainability competencies when designing for ESD, including an ESD OLP to support educator training. Serving as an argument for involving a learning designer in the design and development process to support the development of ESD and fostering pedagogically informed sustainable educational teaching and learning. In a post-digital perspective, where pedagogy and technology are deeply entangled, WHY, WHO, WHAT, and HOW can serve as the framework and structuring to support the critical reflections throughout the design process and guide the development of both online and on-site learning activities, with an awareness towards the interconnected nature of knowledge, skills, attitudes, values, and actions in teaching key sustainability competencies.

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Ethics Declaration

No ethical clearance needed

AI Declaration

AI has been used for checking grammar and spelling.

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