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Enhancing Teacher Competences in Education for Sustainable Development (ESD): A Value-Oriented Framework

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Abstract

The article proposes a framework for developing competences in teachers related to values of education for sustainable development (ESD). Utilizing a systematic literature review (SLR), existing models and frameworks have been identified, including the CSCT (Curriculum, Sustainable Development, Competences, Teacher Training) model, and incorporated into the proposal. A value-based framework has been developed through content analysis. A set of value-related competence indicators has been identified, thereby presenting a value-based framework. The proposed competences have been categorized according to the professional dimensions of the CSCT model, adding a new dimension that names the teacher as an "educator". The main results include the identification of valued competences for ESD and the need to recognize cultural and contextual diversity

in sustainability approaches. It is concluded that the proposed framework contributes to a more holistic understanding of sustainability in education, empowering educators to promote positive changes in their communities, aligning with the challenges of the Anthropocene era.

Keywords: Competence, education for sustainable development (ESD), systematic literature review, teacher, value-oriented framework.

Introduction

Education for sustainable development (ESD) aims to empower individuals, communities, and societies of different generations to create a sustainable future by integrating economic, social, and environmental dimensions into all aspects of education, from policy formulation to curriculum design and teaching methods (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2002; UNESCO, 2018; UNESCO, 2020).

The opportunities and challenges presented by ESD have been described in numerous international statements such as the Rio Earth Summit in 1992 and, ten years later, at the last World Summit on Sustainable Development in Johannesburg in 2002 (UNESCO, 2002). In 2015, ESD was specifically included as one of the Sustainable Development Goals (SDGs) by the United Nations (UN), SDG 4 – Quality Education, with the specific target to "ensure inclusive and equitable education and promote lifelong learning for all" (UNESCO, 2017, p. 3).

In recent decades, ESD has increasingly emerged as a pivotal strategy worldwide to achieve a more sustainable and equitable future. There has been significant effort and engagement from global institutions to shape a new global agenda for sustainable development in 21st-century education through ESD, as indicated by Bell (2016). However, these principles assume a consensus on appropriate education for the 21st century, considering that students should be educated with a forward-looking vision, critical thinking, and knowledge of environmental, social, and economic concerns. As demonstrated a lot of times, by everyday events which draw us toward unsustainability, we are still far from achieving the objectives of ESD. Some authors argue that we live in the Anthropocene era, a term derived from scientific theory that proposes humans are the foundation of a new geological era, but also highlights the unsustainable nature of human social, cultural, and ecological interactions (Figueroa, 2017).

Teachers are considered key drivers of the ESD agenda, due to their teaching and education responsibilities, which require them to develop students' competences for sustainable activities. This suggests a change in the traditional education to "transformative education", in which the teacher facilitates students' learning of critical information, skills, competences, and principles of ESD (Bell, 2016). However, do all teachers have the same knowledge and abilities to help students embrace sustainable attitudes and values? What are their values, beliefs,

and worldview related to ESD, independent of their knowledge? Do they truly care about ESD sufficiently to make a significant difference? If teachers do not change, how can we expect student changes? What ESD competences should educators develop to overcome this challenge?

In the literature, several studies have proposed ESD competences for teachers (Corres et al., 2020; Imara & Altinay, 2021; Leal et al., 2021; Rieckmann, 2018; Sleurs, 2008; United Nations Economic Commission for Europe [UNECE], 2012; Vare et al., 2019), considering the professional teachers in different dimensions, such as self-transformation as individuals, contributing to society, and meeting the demands of educational institutions (EIs) (Brandisauskiene et al., 2020; Sleurs, 2008). However, few studies have emphasized values as the primary area of competence, even though some have highlighted values as the central area of competence.

Value is a crucial component of ESD competence, as it can be seen as a set of ethical, moral, and cultural principles underpinning sustainable development and providing guidance for action and decision-making (Sleurs, 2008; UNESCO, 2014; UNESCO, 2018). Therefore, it is important to understand, stimulate, and develop teachers' principles and perceptions of ESD, considering value as the core of ESD competences, as studies suggest (Fox et al., 2019; Lambrechts et al., 2013; Meihami & Salīte, 2019; Okeke & Mtyuda, 2017).

Despite the increasing recognition of the importance of teacher competences in ESD, there remains a significant gap in the literature concerning the integration of values as a core component of these competences. Most existing frameworks tend to prioritize knowledge, skills, and attitudes without sufficiently addressing the normative and ethical dimensions that underpin sustainable thinking and behavior. Thus, the aim of this study is to present a framework for the development of teachers' value-related competences in ESD. In the present study, values are viewed as key competences outlined in the CSCT (Curriculum, Sustainable Development, Competences, Teacher Training) model and other models or frameworks that have been derived from publications analyzed through a systematic literature review (SLR). Additionally, this framework incorporates a new dimension to the CSCT model (Sleurs, 2008), the "teacher as educator", also considering their pedagogical role.

This framework can help teachers develop greater awareness and acceptance of diverse cultures among their students by highlighting the value area. According to Meihami and Salīte (2019), it can also motivate them to employ a range of methods of interaction that enhance teamwork, communication, and critical thinking abilities about ESD. These actions will contribute to understanding culture and sustainability. In order to achieve sustainability, this new framework aims to consider teacher roles as professionals, individuals, citizens, and educators.

To guide this investigation, the following research questions have been formulated: (1) What value-based competences for ESD are present in the

literature on teacher education? and (2) How can these competences inform the design of a new framework that emphasizes the educator's role in fostering sustainable values?

An Overview of ESD Competences for Teachers

Building on Rieckmann's (2012) conceptualization, competence is approached in this article as a holistic disposition involving knowledge, motivation, and action, not restricted to task performance or subject-specific knowledge. This concept is often associated with skills, abilities, capabilities, capacities, qualifications, and other concepts in the educational literature on competences in general and competences in sustainability in particular (Baartman et al., 2007). However, competence-based approaches should be considered "self-regulated action, involving know, know to do and be, with social relevance, building situations of constructive, complex and collaborative learning towards real problem solution" (Díaz Barriga Arceo, 2019, p. 52), focused on problem-solving strategies, concepts, and abilities for social action, which are not restricted by subject boundaries or specific content knowledge (De Haan, 2006).

There are two distinct approaches to theoretical perspectives on competences: one is rationalist and objectivist, and defines competence as an asset, expecting results (Le Deist & Winterton, 2005), while the other is subjectivist and interpretivist, viewed more like a dynamic and ongoing process, focused on learning (Spanos & Prastacos, 2004). These approaches should not be considered complementary and interdependent (Håland & Tjora, 2006). In the current article, competences are understood as "individual dispositions to self-organization which include cognitive, affective, volitional (with deliberate intention) and motivational elements; they are an interplay of knowledge, capacities and skills, motives and affective dispositions" (Rieckmann, 2012, p. 129).

Considering ESD competences for teachers, we conceive that development and growth are possible in terms of sustainability, and the development of these competences is an opportunity for enhancing ethical reflection on growth, development, and other socio-economic, political, cultural, and ecological dimensions shaping sustainability (Grange, 2017). Furthermore, it is interesting to explore the extent to which they provoke transformative changes towards the current unsustainable reality through developing emancipatory qualities among teachers, wishing professionals who are able to bring about change in the different educational sectors (Bürgener & Barth, 2018). These emancipatory qualities are linked to competences that provide teachers with a way of both understanding complexity and transforming their realities while enabling them to make responsible decisions towards more sustainable futures (Wals & Jickling, 2002).

Developed in 2008, the CSCT model (Sleurs, 2008) was one of the first models to structure competences for teachers. This model is significant because

it identifies ESD competences across three dimensions (teaching, reflecting/visioning, and networking) and five domains (knowledge, systems thinking, emotions, values, ethics, and action). It focuses on teacher competences and, as such, encompasses different dimensions of their professional role, enabling the development of a more comprehensive education, such as their role in the educational institution (EI), their own values regarding ESD, and their reflection on the historical, cultural, and social perspectives on sustainable development (SD), despite its globalizing aspects.

Researchers worldwide are concerned about unsustainable educational practices at both global and local levels, where the importance of the teacher in all these professional dimensions is recognized. For example, research by Elorinne et al. (2020) regarding school and household food waste in Finland demonstrates that personal attitudes influence teachers' pedagogical practices. They recommend that future studies examine teachers' personal values and their consistency with basic curriculum values. Research conducted by Ferreira et al. (2020) discusses how to promote social and emotional learning (SEL) in schools by implementing specific programs. In their study, the scholars discuss the difficulties of incorporating SEL into the regular curriculum, highlighting the importance of teachers in the EI. At the same time, to address sustainability challenges, it is necessary to undertake projects beyond the confines of the educational institution. For example, Omeje et al. (2020) utilized collaborative action research to advocate for a change in behavior regarding construction waste in the Nsukka community and at the University of Nigeria. All these studies demonstrate the importance of considering other teacher roles in improving SD.

It is worthwhile mentioning an important study about ESD competences for teachers that is manifested as a meta-analysis performed by Wiek et al. (2011) and Wiek et al. (2015). Based on the numerous documents analyzed, the scholars identified a set of five key competences that were almost always present. Following this work, the authors became a reference for subsequent studies. A few years later, in 2012, UNECE published a range of core competences in ESD for educators, with 39 competences presented in a 4 x 3 matrix with the rows aligned to UNESCO's four pillars of learning: learning to know, learning to do, learning to live and work together, and learning to be. The UNECE framework aimed to identify competences in a comprehensive manner and became a widely shared reference. However, its impact continues to be analyzed because, like a theoretical tool, practical assessment or testing in real educational contexts is still being applied (UNECE, 2012).

Since then, the concept of competences concerning teacher ESD has continued to develop (Corres et al., 2020; Leal et al., 2021; Rieckmnn, 2018; Sleurs, 2008; UNECE, 2012; Vare et al., 2019). Despite progress, the literature lacks practical implementation of theoretical frameworks or models. These are just examples of the various frameworks or models used for developing ESD competences for teachers.

The Crucial Role of Competence Values for ESD

Building on our earlier definition, values in ESD are not only guiding principles but also contextual expressions of worldviews that influence educational aims, practices, and decision-making across diverse cultural settings (UNESCO, 2020). Values for ESD can be considered a set of ethical, moral, and cultural principles that underpin sustainable development and provide guidance for what is right or wrong, supported by norms and rules (Sleurs, 2008; UNESCO, 2014, UNESCO, 2020). The relation with education is the integration of "principles, values, and practices of sustainable development into all aspects of education and learning" (UNESCO, 2020, p. 1).

The premise of this work is that, even though ESD addresses universal principles and global issues like justice, equality, and dignity (UNESCO, 2020), it still faces challenges due to the uncertainty of sustainability issues in a social context in the Anthropocene era. ESD deals with complex and contentious questions with social, ethical, and political implications, just like other topics, economic and environmental concerns.

However, it also has the potential to challenge the fundamental convictions and societal constructs of individuals and communities, thus influencing their social customs (Barthes & Alpe, 2016; Block et al., 2019). In line with this assumption, we consider that knowledge about ESD is shaped by historical, political, and cultural circumstances, making it a product of society (Connell et al., 2017). Therefore, values play a central role in the ESD debate.

"Educators remain key players in facilitating learners' adoption of sustainable lifestyles in an era where information is available everywhere and the role of educators is changing." (UNESCO, 2020, p. 30). In order to contribute both individually and as a member of a community to the creation of a more just and sustainable world, combining equity and social solidarity with dialogue, it is essential that teachers assume the commitment to education and sustainable ways of life (Fedosejeva et al., 2018) in the different spheres of social intervention and their professional dimensions (Sleurs, 2008). They should also act as role models, lending credibility to speeches and actions. However, given the variety of definitions in reference sources, it is especially important to consider how differently teachers comprehend ESD and its principles depending on their national, local, and educational contexts (Barthes & Jeziorski, 2012). Therefore, it is crucial to develop a framework that considers values as the center of ESD competences.

Fedosejeva et al. (2018) developed a holistic framework for ESD, stressing the necessity to begin with defining the educational objective. This objective serves as a guide for the approach to education and the potential pursuit of sustainability or unsustainability. In the context of this article, the central focus lies in questioning and, consequently, encouraging the development of values that guide each teacher's quest for sustainability.

Despite starting from different points, we recognize the importance of using more holistic research frameworks for ESD research. Such frameworks allow us to explore sustainable education and ESD in a comprehensive manner, considering ecological, cultural, and social aspects. By adopting a holistic perspective, we can better address the complex challenges of sustainable development and prepare future generations for a more harmonious and resilient world.

Values are explicitly and implicitly present in ESD frameworks or models, representing the worldview of specific groups regarding sustainability, as well as the importance placed on it, adherence to norms and rules, and approaches to problem-solving and action. An article applying the Delphi Analysis methodology recognized the need to consider values-thinking competences as providing the normative orientation for all the other competences. According to specialists in this study, "the competences alone, without being placed within a sustainability context, can […] be utilized for distinctly unsustainable nefarious purposes […] and lead to very unsustainable outcomes" (Brundiers et al., 2021, p.20).

Ethics and values are one of the five domains of competences in the CSCT model (Sleurs, 2008). The author considers that norms, values, attitudes, beliefs, and assumptions guide our perception, thinking, decisions, and actions. The Joint Research Centre (JRC) of the European Union developed a set of competences for ESD, called Green Comp, defining specific domains about values and considering the incorporation of sustainability (Bianchi et al., 2022).

Values are deeply ingrained beliefs reflected in our behavior, influenced by factors like ideology, religion, gender, class, culture, and life experiences. They encompass all aspects of human life, from religion to politics to social and economic spheres, defining who we are as individuals. Values serve as a moral compass, guiding our judgments of right and wrong. Ethical behavior aligns with what is considered right or moral, but determining what is universally "right" can be a complex task (Sleurs, 2008; UNESCO, 2014; UNESCO, 2020). According to the CSCT model (Sleurs, 2008), there are some values and ethical competences that can be developed for teachers in three professional dimensions (Table 1).

Table 1

Value-Based Competences for ESD According to the CSCT Model
Source: Sleurs et al. (2008), pp. 56–57

Professional Dimension	Teacher Competences Related to Values and Ethics
Teacher as an individual	The teacher should be able to clarify (making implicit beliefs explicit) their own beliefs, assumptions and values related to sustainable development, education, and learning.
	The teacher should be able to encourage students to question their beliefs and assumptions to clarify their thinking.
	The teacher has to be aware of societal tensions, including conflicting interests, and also of the positive trends in society related to SD and education, so that they can anticipate changes and the consequences of action.
	The teacher has to be able to analyze the underlying structure and reasoning, thus allowing both themselves and the students to participate in the decision-making processes of the society they inhabit.
Teacher in the EI	The teacher is able not to impose their own values and opinions allowing students to hold their own positions.
	The teacher is able to model the values of respect and dignity that underpin sus-tainable development in the personal and institutional life.
	The teacher is able to help learners gain plural perspectives on issues.
	The teacher is able to make the assumed norms explicit so that they can be exam-ined, debated, tested, and applied.
	The teacher is able to help learners develop critical understanding of sustainable development.
	The teacher is able to focus on students' clarification and discussion of their own values.
	The teacher is able to offer students opportunities to appreciate and confront diversities and to see them as opportunities.
	The teacher is able to work with contradictory beliefs, assumptions, values, and moral dilemmas.
	The teacher is able to offer opportunities to students to distinguish between factual knowledge and value-based opinions, and to investigate the beliefs and interests behind them.
	The teacher has knowledge about a range of teaching/instructional meth-ods/materials related to values (what, how, and when).

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Continuation of Table 1

Professional Dimension	Teacher Competences Related to Values and Ethics
Teachers in society	By focusing on students' clarification and discussion of their own values, the teacher is able to ameliorate mutual respect and understanding. Teachers need to be aware that values cannot simply be applied but are developed through an ongoing and context sensitive process. Teachers should be able to focus on understanding the concept of European citizenship, including the rights and responsibilities it confers. The teacher is able to cooperate to bring about structural or institutional change within society so that efforts can be embedded within the mainstream. ESD must go beyond individual self-development to promote structural social change. The teacher is able to use existing regional, national, and international policy framework, non-governmental organizations, and networks for ESD to build common understandings, identify common challenges and strengthen common commitment in order to plan joint actions.

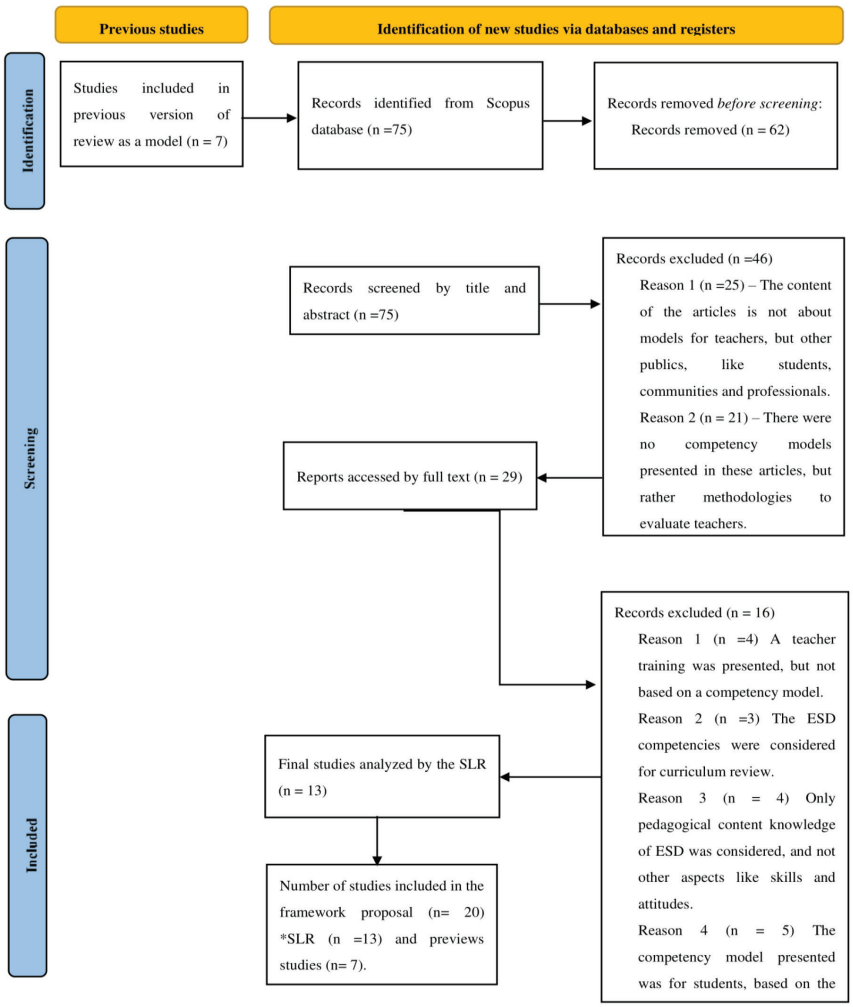
Materials and Methods

A SLR was conducted based on a search of academic literature about models or frameworks that addressed teachers' competences for ESD in the SCOPUS database. The method was applied based on Okoli et al. (2019) and Tranfield et al. (2003). The search was conducted in April 2023 using the following keywords: *education for sustainable development, framework or model, competence and teacher*. The results were filtered by the period of 2017–2023. The searches were conducted in English because it is the primary language used in academia worldwide and represents most articles in the Scopus database.

We got an initial sample from a total of 75 academic publications. To refine the selection, the abstract of each paper was analyzed considering if the article focused on ESD and/or sustainability education, presented a framework or model for ESD competences, and addressed teachers. The papers were excluded when no framework or model of ESD was conceived, presented, applied, or discussed in the articles, or the papers focused on curriculum changes towards ESD without addressing the topic with regard to teachers, as depicted in the PRISMA flow diagram (Figure 1). Through this first screening, we discarded 62 papers, and the remaining 13 articles were considered in the final sample that was thoroughly and carefully reviewed.

Figure 1

The PRISMA Flow Diagram
Source: Developed by the authors (2023)



All competences regarding ESD for teachers and their respective descriptions and indicators were listed. Then, the value domains present in the identified competences were filtered, and from this list, the analysis for framework development was initiated. The aim was to understand what had been investigated about teacher's competences for ESD and related to values. Based on this overview, we intended to propose a new framework to develop in teachers the competences about ESD with values as the foundation (Table 2).

Table 2

Value Dimensions Found in the Published Articles About Competences for ESD in the SLR
Source: Developed by the authors (2023)

Title and author	**Value-based competences for ESD**	**Value-based competence descriptors or indicators related to ESD**
Connecting Competences and Pedagogical Approaches for Sustainable Development in Higher Education: A Literature Review and Framework Proposal (Lozano et al., 2017)	Justice, responsibility, and ethics	Application of concepts of ethics, justice, social and ecological integrity, and equity. Description, negotiation, and reconciliation of principles, values, aims, and goals for sustainability. Responsibility for one's actions. Ethics and sustainability of personal and professional behavior.
	Empathy and change of perspective	Ability to identify own and external perspectives. Understanding and sympathy for the needs, perspectives, and actions of others. Ability to deal with internal and external value orientation. Compassion, empathy, and solidarity with others across differences. Accepting and embracing of a diversity of opinions, experiences, or perspectives. Transcultural understanding.
Devising a Competence-Based Training Program for Educators of Sustainable Development: Lessons Learned (Vare et al., 2019)	Responsibility	The educator of ESD may be in the fortunate position of recognizing that they are carrying out meaningful work and thus contributing to a meaningful life. Acting transparently and responsibly themselves, the educator of ESD will have a range of tools, e.g., role play, simulations, real-world engagements, through which to develop their learners' abilities to act responsibly. In this way, they will encourage long-term thinking about what kind of human beings we want to be and what kind of world we want to live in.

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Continuation of Table 2

Title and author	**Value-based competences for ESD**	**Value-based competence descriptors or indicators related to ESD**
Developing ESD Competences in Higher Education Institutions: Staff Training at the University of Vechta (Scherak & Rieckmann, 2020)	Values	The educator develops an awareness among learners of how beliefs and values underpin actions and how values need to be negotiated and reconciled.
	Responsibility	The educator helps learners reflect on their own actions, act transparently and accept personal responsibility for their work.
A Novel Improvement Strategy of Competence for Education for Sustainable Development of University Teachers Based on Data Mining (Weng et al., 2020)	Competence for ESD	The ability of ISEC teachers to fulfil the responsibility of education for sustainable development. ISEC teachers should guide students to establish the idea of sustainable development, acquire relevant knowledge and abilities, improve the lifestyle, prepare to be responsible citizens in the future, and contribute to the sustainable development of society, economics, environment, and culture.
Integrating Education for Sustainable Development Competencies in Teacher Education (Imara & Altinay, 2021)	Values and Behaviors	Promote sustainable use of natural resources. Promote social tolerance and equity. Optimism towards contributing to ESD. Responsibility for environmental problems. Acknowledgment of the importance of the idea of SD as a task for society as a whole. Acknowledgment of the role of education as a resource for tackling of this societal task. Normative and cultural competence. Application of ethical principles related to the values of sustainability.

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Continuation of Table 2

Title and author	**Value-based competences for ESD**	**Value-based competence descriptors or indicators related to ESD**
University Teaching Staff and Sustainable Development: An Assessment of Competences (Leal et al., 2021)	Ability to value varying perspectives	The educator shapes personal and collective identities, and the formation of responsible citizenship.
	Commitment to SD	The educator demonstrates "doing by example" in respect to environmental conservation, social responsibility, ethics and cultural diversity.
Pre-Service Geography Teachers' Professional Competencies in Education for Sustainable Development (Ammoneit et al., 2022)	Value-based ESD competences	Diversity of values, cultures, and living conditions. Globalization of religious and ethical models.
Differences in Teachers' Professional Action Competence in Education for Sustainable Development: The Importance of Teacher Co-Learning (Isac et al., 2022) and Teacher Action Competence in Education for Sustainable Development (Vukelić, 2022)	Self-efficacy regarding education for sustainable development	Develop students' ability to reflect on their own actions. Develop students' ability to express their own views on sustainability issues, make students realize that there are conflicting interests on the road to sustainable development. Develop students' ability to act for sustainable development at a local level (e.g., in the school). Develop students' ability to act for sustainable development at a regional level (e.g., in the municipality). Develop students' ability to act globally for sustainable development (e.g., boycott certain goods).

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Continuation of Table 2

Title and author	**Value-based competences for ESD**	**Value-based competence descriptors or indicators related to ESD**
	Willingness to implement education for sustainable development	Each day, I make sure that I have enough opportunities to dedicate myself to education for sustainable development. ESD is typically me. ESD is close to my heart. Without ESD I wouldn't be myself. Implementing ESD gives me energy. I try to plan my daily work so that I have as much time as possible to spend on ESD. When I'm working on ESD, I experience that as an intense experience. ESD will play an important role in my life. I often feel a strong urge to work with ESD. I am often really looking forward to working with ESD. Many of my personal goals are related to ESD.
Measuring Professional Action Competence in Education for Sustainable Development (PACesd) (Sass et al., 2022)	Knowledge of ESD-specific teaching principles	Create participative learning environments. Create an appreciative atmosphere respecting diversity. Use the knowledge base from multiple disciplines and take into account multiple perspectives. Use real world problems to create learning tasks. Foster critical thinking. Expose learners to uncertainty, dilemmas and conflicts of interests. Integrate values into teaching and make assumed norms explicit. Inspire creativity and innovation.
Education Stakeholders' Viewpoints About an ESD Competency Framework: Q Methodology Research (Chaaban et al., 2023)	Value in ESD	Possess knowledge of local culture. Possess knowledge of local education policies. Foster emotional connectedness and community. Participate in school decision-making. Apply ethical principles.

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Continuation of Table 2

Title and author	**Value-based competences for ESD**	**Value-based competence descriptors or indicators related to ESD**
Teaching and Learning Approaches: Curriculum Framework for Sustainability Literacy for Technical and Vocational Teacher Training Programmes in Malaysia (Chinedu et al., 2023)	Specific ESD competences	To identify the principles of sustainable development. To explain the key principles of SD, such as equity, ecological balance and protection, education, responsible citizenship, responsible production and consumption, peace, conflict resolution, human security, social justice, etc. To explain ethics in sustainability. Demonstrate sustainable behavior for responsible citizenship. Demonstrate the capacity to reflect on actions that contribute to economic, social, and environmental issues. Explain the role of students in sustainability through participation in civic learning. Explain the place of ethics in educating students for a sustainable future. Explain the concepts of ethical behavior and attitude. Explain the role of fairness and justice in building an equitable society. Analyze existing models to explain the social, environmental, economic, and cultural aspects of SD.
The Development and Validation of an Instrument for Assessing Science Teacher Competency to Teach ESD (Eliyawati et al., 2023)	Attitudes	Responding to social, economic, and environmental changes by being involved in communities and society. Having tolerance for students. Demonstrating a consistent and positive attitude and lifestyle. Cooperating with students and communities across different cultures. Having work discipline in achieving personal and family well-being.

The studies reviewed were conducted in a variety of countries, including Japan, China, the United States, Qatar, Malaysia, and several European countries.

Results

The studies analyzed were represented by different countries, including Japan (one article), China (one article), Malaysia (one article), United States (one article), Qatar (one article), and European countries (eight articles). They were developed within formal education contexts, including teacher training institutes, and the participants consisted of teachers in primary and/or secondary education (six articles) and higher education (seven articles).

In some cases, models such as UNECE (2012) and CSCT (Sleurs, 2008) were used as guides to develop other frameworks or models (e.g., Ammoneit et al., 2022; Chaaban et al., 2023; Chinedu et al., 2023; Imara & Altinay, 2021; Leal et al., 2021; Vare et al., 2019; Vukelić, 2022;). In other cases, new frameworks or models (e.g., Corres et al., 2020; Eliyawati et al., 2023; Lozano et al., 2017; Weng et al., 2020;) were improved. Another guiding framework was the key competences in sustainability model developed by Wiek et al. (2011) and Wiek et al. (2015), which was originally designed as a global model of key competences to guide the design, teaching, and assessment of programs and courses in sustainability science.

Vare et al. (2019) aimed at developing a competency-based teacher ESD program sought to create a practical accreditation model for teachers working on ESD within an EU-funded project. This model was based on the UNECE (2012) competence framework, with certain statements reduced and complemented through the Delphi method and compared with other sustainable development and ESD competence frameworks, such as Wiek et al. (2011) and Wiek et al. (2015). The competence that closely aligns with the value of ESD was empathy. It involves understanding and effectively responding to our own and others' emotions to help teachers create positive learning environments, build connections, and develop sources of resilience in the face of inevitable social change.

Lozano et al. (2017) already developed a framework based on twelve competences identified in the literature using hermeneutics and grounded theory methods. In their synthesis, they highlighted competences related to justice, responsibility, and ethics, which could be delivered through various methods: universal methods (such as case studies, lectures, and problem-based learning), community and social justice methods (including community service learning, jig-saw/interlinked teams, and participatory action research), and environmental education methods (such as eco-justice and community, place-based environment education, life cycle analysis, and traditional ecological knowledge). This demonstrates that the values and competences of ESD can be specifically integrated into relevant pedagogical approaches.

In the SLR following PRISMA guidelines created by Vukelić (2022), a discussion on the central concepts of ESD-specific teacher competences was conducted, leading to the proposal of a refined model of ESD-specific professional action competence. In this model, certain value-based competences for ESD were introduced, including knowledge about values and emotions in the context of ESD, as well as knowledge of ESD-specific teaching principles. According to this model, teachers are expected to make independently justified decisions based on differentiated knowledge and reflected values.

Another SLR on teacher competences for ESD resulted in a unified framework proposing eight competences related to values and behaviors (Imara & Altinay, 2021). The authors suggest that values and behavior enable the transformation of ESD knowledge into desired behaviors and practices.

In other studies, frameworks explicitly created for different research purposes were employed. For instance, the Okayama University ESD Promotion Center proposed an instrument for measuring science teacher competences to teach ESD (Eliyawati et al., 2023). This model includes six domains to assess competences: content knowledge, inquiry, professional practice, professional development, assessment and evaluation, and attitude. The attitude domain, in particular, describes how a science teacher responds to social, economic, and environmental changes to promote ESD learning in a community.

In Malaysia, TVET (teacher training programs) aimed to develop vocationally competent teachers and workers in the field of ESD. This included learning outcomes for sustainability literacy, teaching competences for sustainability literacy, pedagogical approaches to foster effective teaching and learning for sustainability, ESD integration strategies, and specific indicators (Chinedu et al., 2023). The specific learning outcomes for sustainability literacy encompass competences related to values, which were integrated into the proposal of this study (Table 3).

Table 3

The Proposed Framework: Value-Based Competence Indicators for ESD Teachers
Source: Developed by the authors (2023)

Dimension	Competence indicator	Key references
Teacher as an Individual	Demonstrates ethical self-awareness and reflects on personal sustainability values.	Rieckmann (2012); Bürgener & Barth (2018)
	Engages in lifelong learning and critical self-reflection on values and behavior.	Wals & Jickling (2002); Sass et al. (2022)

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Continuation of Table 3

Dimension	Competence indicator	Key references
	Recognizes the influence of personal beliefs and culture on teaching practices.	Barthes & Jeziorski (2012); Fedosejeva et al. (2018)
	Acts with integrity and transparency in sustainability-related decisions.	Leal et al. (2021); Brundiers et al. (2021)
	Exhibits empathy and compassion toward students and community.	Vare et al. (2019); Meihami & Salīte (2019)
Teacher in Society	Promotes social justice, inclusion, and community participation in sustainability.	Sleurs (2008); Sass et al. (2022)
	Advocates for equity and responsible citizenship through ESD.	UNESCO (2020); Chaaban et al. (2023)
	Demonstrates cultural sensitivity and respect for diverse values.	UNESCO (2018); Connell et al. (2017)
	Participates in societal dialogues on sustainability and ethics.	Wiek et al. (2011); Vukelić (2022)
	Encourages students' civic engagement on sustainability issues.	Fox et al. (2019); Isac et al. (2022)
Teacher in the Educational Institution	Integrates ESD values into curriculum and pedagogical strategies.	Vare et al. (2019); Imara & Altinay (2021)
	Leads or supports institutional sustainability initiatives.	Leal et al. (2021); Lozano et al. (2017)
	Fosters a school culture of ethical and sustainable behavior.	Omeje et al. (2020); Elorinne et al. (2020)
	Uses inclusive practices that model respect for all learners.	UNESCO (2014); Ferreira et al. (2020)
	Reflects critically on institutional barriers to sustainability.	Fedosejeva et al. (2018); Connell et al. (2017)

See next page for continuation of table

Continuation of Table 3

Dimension	Competence indicator	Key references
Teacher as an Educator	Uses participatory methods to foster critical thinking and values exploration.	Lozano et al. (2017); Meihami & Salīte (2019)
	Designs learning experiences that integrate ethics and action.	Wiek et al. (2015); Chinedu et al. (2023)
	Encourages collaborative learning around real-world sustainability challenges.	Ammoneit et al. (2022); Scherak & Rieckmann (2020)
	Assesses student learning with attention to values and behavior change.	UNECE (2012); Sass et al. (2022)
	Guides students in exploring identity, responsibility, and sustainability.	Barthes & Alpe (2016); UNESCO (2020)
	Models reflective practice and sustainability-oriented leadership.	Leal et al. (2021); Bianchi et al. (2022)
	Addresses controversial and ethical issues with sensitivity and openness.	Brundiers et al. (2021); Fox et al. (2019)
	Facilitates inter- and transdisciplinary approaches to sustainability.	Lozano et al. (2017); Weng et al. (2020)
	Encourages systems thinking and long-term ethical reasoning.	Rieckmann (2012); Wiek et al. (2011)

A study that incorporated DRSA (Data Reduction and Sensemaking Approach) analyzed evaluation data on ESD competences in 156 ISEC university teachers in China using data mining techniques (Weng et al., 2020). The study identified six critical competences relative to ESD from the nine existing competence indicators. The competences for ESD included the ability of teachers to fulfill the responsibility of ESD, act as responsible citizens in the future, and contribute to the sustainable development of society, economy, environment, and culture.

In Belgium, two studies (Isac et al., 2022; Sass et al., 2022) approached a teacher's competence model considering action oriented to ESD. One of them validated the instrument (Sass et al., 2022), and the other applied it with 557 teachers from 49 primary and secondary schools to assess its effectiveness, providing additional insights for this study.

An assessment of ESD competences for university teaching staff emphasizes the importance of equipping learners across all disciplines with the knowledge, skills, attributes, and values necessary to pursue sustainable visions of the future. As part of this assessment, certain competences related to values were introduced, such as a commitment to ESD and demonstrating "doing by example" in relation to the conservation of the environment, social responsibility, ethics, and cultural diversity (Leal et al., 2021).

Ammoneit et al. (2022) focused on the professional competences acquired by pre-service geography teachers during their university education and how these competences influenced their contribution to ESD in their future careers. The results showed a high assessment of competence and an even higher importance assigned to ESD-related professional competences. However, the study also revealed that teachers were generally less confident in their pedagogical knowledge compared to their social and personal competences, highlighting the significance of value aspects.

In an Erasmus+ Project called "A Rounder Sense of Purpose" (RSP) (Scherak & Rieckmann, 2020), the authors aim to provide a comprehensive and useful framework of competences that can be applied in any European environment to help pre-service and in-service educators demonstrate their proficiency in ESD. To determine which competences university professors require in order to engage with the notion of ESD in higher education and how these may be developed in a series of staff training workshops, they collected data through a focus group and a self-assessment survey, generating 12 competences.

Some results demonstrate the inherent complexity of preparing teachers for ESD due to the existence of a variety of beliefs and practices. Moreover, ESD competences are complex due to the interactions and influences of multiple and diverse stakeholders, communities, and contexts (Chaaban et al., 2023).

The primary finding of this research is that promoting ESD requires teachers to improve their competences. It highlights how crucial it is for teachers to incorporate sustainability-related values like empathy, fairness, transparency, and ethics into their teaching strategies. Additionally, it demonstrates that different models and frameworks can be utilized to develop these competences, adapting to the specific needs in various educational and cultural contexts. It has been suggested that one of the most effective ways to develop a more sustainable attitude and encourage good changes both within and outside educational communities is to promote sustainable principles among educators and students.

Based on the results and findings of the previous studies, a framework has been developed. This framework analyzes value-based competences for ESD and proposes 24 competence indicators divided into four professional dimensions. These indicators serve as a guide for teachers to develop their principles and values for ESD (Table 3).

Conclusions

The study has proposed a framework to develop teachers' competences related to values for ESD, divided into four dimensions based on the CSCT model (Sleurs, 2008): teacher as an individual, teacher in society, teacher in the educational institution (EI), and, additionally, teacher as an educator. The list of competence indicators has been produced using a SLR.

Most of the analyzed articles originated in European countries, the United States, and other developed countries, which can be seen as a limitation in terms of possible approaches to competence for ESD teachers worldwide. While we agree with the existence of an open environment for universal values, when we propose a framework where values are at the core of ESD competences, we must not forget that values express the culture and worldview of a community. Therefore, it is important to acknowledge that different regions and cultural contexts may have unique perspectives and priorities when it comes to ESD.

In response to the first research question, the systematic literature review has identified a set of competences explicitly related to values, such as empathy, ethical responsibility, cultural awareness, and commitment to sustainability principles. These have been drawn from a diverse range of studies across multiple countries and educational levels, highlighting the presence of values in existing ESD frameworks, albeit often implicitly.

Regarding the second research question, the findings have been synthesized into a value-oriented framework composed of 24 competence indicators. These indicators have been organized into four dimensions – teacher as an individual, teacher in society, teacher in the educational institution, and teacher as an educator – based on the CSCT model. By placing values at the core of ESD teacher development, this framework supports the integration of ethical, cultural, and contextual awareness into teaching practices across diverse educational settings.

The proposed framework is also aligned with the current research on unsustainable education and the Anthropocene era because it recognizes the importance of values and cultural perspectives in addressing sustainability challenges. In the Anthropocene era, characterized by unprecedented human impact on the planet, traditional educational approaches may perpetuate unsustainable practices and attitudes. It is essential to recognize that sustainability challenges are shaped by social, cultural, and environmental factors. Therefore, educational approaches to sustainability must be sensitive to these diverse contexts and responsive to the specific needs and values of different communities.

By developing teachers with competences that emphasize values such as environmental stewardship, social justice, and cultural sensitivity, the framework aims to cultivate a more sustainable mindset among educators and learners alike. Also, by addressing the need for broader contexts of sustainability in education research, the proposed framework contributes to a more holistic understanding of

sustainability and its implications for education. It recognizes that sustainability is not just about environmental conservation but also encompasses social justice, cultural diversity, and economic equity. By incorporating these principles into teachers' competences, the framework seeks to empower educators to foster a deeper understanding of sustainability among their students and to promote positive change within their communities.

Further studies should explore this framework in other contexts, including different ways of knowing and perspectives, and involve experts from other regions, like Latin America, to address the cultural limitations of this study. Additionally, by using this framework, it is possible to approach ESD principles to develop better teaching practices that have the potential to change the unsustainable reality.

The framework can also guide the revision of teacher education curricula by embedding value-based competences into learning outcomes and assessment criteria, following approaches used in programs such as "A Rounder Sense of Purpose" (Scherak & Rieckmann, 2020). In-service and pre-service teacher training programs may integrate the framework into workshops, reflective portfolios, and self-assessment tools to promote value awareness and sustainability-related professional growth (Leal et al., 2021).

Institutions and policy-makers can adopt the framework as a benchmark for designing competence-based certification or accreditation processes related to ESD teaching. The value-oriented competences support the use of participatory pedagogies such as project-based learning, case studies, and community engagement (Lozano et al., 2017), allowing teachers to model sustainable behaviors in diverse educational contexts.

References

Ammoneit, R., Turek, A., & Peter, C. (2022). Pre-service geography teachers' professional competencies in education for sustainable development. *Education Sciences*, *12*(1), 42. https://doi.org/10.3390/educsci12010042

Baartman, L., Bastiaens, T., Kirschner, P., & Van der Vleuten, C. (2007). Evaluating assessment quality in competence-based education: A qualitative comparison of two frameworks. *Educational Research Review*, *2*(2), 114–129. https://doi.org/10.1016/j.edurev.2007.06.001

Barthes, A., & Jeziorski, A. (2012). What kind of critical university education for sustainable development? *Journal of Social Science Education*, *11*(4), 62–77. https://doi.org/10.2390/JSSE-V11-I4-79

Block, T., Van Poeck, K., & Östman, L. O. (2019). Tackling wicked problems in teaching and learning: Sustainability issues as knowledge, ethical and political challenges. In K. Van Poeck, L. O. Östman, & J. Öhman (Eds.), *Sustainable development teaching: Ethical and political challenges* (pp. 28–39). Routledge.

Bell, D. (2016). Twenty-first century education: Transformative education for sustainability and responsible citizenship. *Journal of Teacher Education for Sustainability*, *18*(1), 48–56. https://doi.org/10.1515/jtes-2016-0004

Bianchi, G., Pisiotis, U., & Cabrera Giraldez, M. (2022). *GreenComp, the European sustainability competence framework*. Publications Office of the European Union. https://doi.org/10.2760/13286

Brandisauskiene, A., Cesnaviciene, J., Miciuliene, R., & Kaminskiene, L. (2020). What factors matter for the sustainable professional development of teachers? Analysis from four countries. *Journal of Teacher Education for Sustainability*, *22*(2), 153–170. https://doi.org/10.2478/jtes-2020-0022

Brundiers, K., Barth, M., Cebrián, G., Cohen, M., Diaz, L., Doucette-Remington, S., Dripps, W., Habron, G., Harré, N., Jarchow, M., Losch, K., Michel, J., Mochizuki, Y., Rieckmann, M., Parnell, R., Walker, P., & Zint, M. (2021). Key competencies in sustainability in higher education-toward an agreed-upon reference framework. *Sustainability Science*, *16*(1), 13–29. https://doi.org/10.1007/s11625-020-00838-2

Bürgener, L., & Barth, M. (2018). Sustainability competencies in teacher education: Making teacher education count in everyday school practice. *Journal of Cleaner Production*, *174*, 821–826. https://doi.org/10.1016/j.jclepro.2017.10.263

Chaaban, Y., Du, X., Lundberg, A., & Abu-Tineh, A. (2023). Education stakeholders' viewpoints about an ESD competency framework: Q methodology research. *Sustainability*, *15*(3), 1787. https://doi.org/10.3390/su15031787

Chinedu, C., Saleem, A., & Wan Muda, W. (2023). Teaching and learning approaches: Curriculum framework for sustainability literacy for technical and vocational teacher training programmes in Malaysia. *Sustainability*, *15*(3), 2543. https://doi.org/10.3390/su15032543

Connell, R., Collyer, F., Maia, J., & Morrell, R. (2017). Toward a global sociology of knowledge: Post-colonial realities and intellectual practices. *International Sociology: Journal of the International Sociological Association*, *32*(1), 21–37. https://doi.org/10.1177/0268580916676913

Corres, A., Rieckmann, M., Espasa, A., & Ruiz-Mallén, I. (2020). Educator competences in Sustainability Education: A systematic review of frameworks. *Sustainability*, *12*(23), 9858. https://doi.org/10.3390/su12239858

de Haan, G. (2006). The BLK '21' programme in Germany: A 'Gestaltungskompetenz'-based model for education for sustainable development. *Environmental Education Research*, *12*(1), 19–32. https://doi.org/10.1080/13504620500526362

Díaz Barriga Arceo, F. (2019). Evaluación de Competencias en Educación Superior: Experiencias en el Contexto Mexicano [Assessment of competencies in higher education: Experiences in the Mexican context]. *Revista Iberoamericana de Evaluación Educativa*, *12*(2), 49. https://doi.org/10.15366/riee2019.12.2.003

Eliyawati, Widodo, A., Kaniawati, I., & Fujii, H. (2023). The development and

validation of an instrument for assessing science teacher competency to teach ESD. *Sustainability*, *15*(4), 3276. https://doi.org/10.3390/su15043276

Elorinne, A., Eronen, L., Pollari, M., Hokkanen, J., Reijonen, H., & Murphy, J. (2020). Investigating home economics teachers food waste practices and attitudes. *Journal of Teacher Education for Sustainability*, *22*(1), 6–20. https://doi.org/10.2478/jtes-2020-0002

Fedosejeva, J., Boče, A., Romanova, M., Iliško, D., & Ivanova, O. (2018). Education for sustainable development: The choice of pedagogical approaches and methods for the implementation of pedagogical tasks in the Anthropocene Age. *Journal of Teacher Education for Sustainability*, *20*(1), 157–179. https://doi.org/10.2478/jtes-2018-0010

Ferreira, M., Martinsone, B., & Talić, S. (2020). Promoting sustainable social emotional learning at school through relationship-centered learning environment, teaching methods and formative assessment. *Journal of Teacher Education for Sustainability*, *22*(1), 21–36. https://doi.org/10.2478/jtes-2020-0003

Figueroa, A. (2017). *Economics of the Anthropocene age*. Springer. https://books.google.lv/books?isbn=3319625845

Fox, A., Iriste, S., & Bezeljak, P. (2019). Detecting a sustainable mindset through using content analysis of teacher-produced learning journals. *Journal of Teacher Education for Sustainability*, *21*(1), 35–47. https://doi.org/10.2478/jtes-2019-0003

Grange, L. L. (2017). Environmental education after sustainability. In B. Jickling & S. Sterling (Eds.), *Post-sustainability and environmental education* (pp. 93–107). Palgrave Macmillan. https://doi.org/10.1007/978-3-319-51322-5_7

Håland, E., & Tjora, A. (2006). Between asset and process: Developing competence by implementing a learning management system. *Human Relations; Studies towards the Integration of the Social Sciences*, *59*(7), 993–1016. https://doi.org/10.1177/0018726706067599

Imara, K. & Altinay, F. (2021). Integrating education for sustainable development competencies in teacher education. *Sustainability*, *13*(22), 12555. https://doi.org/10.3390/su132212555

Isac, M., Sass, W., Pauw, J. B., De Maeyer, S., Schelfhout, W., Van Petegem, P., & Claes, E. (2022). Differences in teachers' professional action competence in education for sustainable development: The importance of teacher co-learning. *Sustainability*, *14*(2), 767. https://doi.org/10.3390/su14020767

Lambrechts, W., Mulà, I., Ceulemans, K., Molderez, I., & Gaeremynck, V. (2013). The integration of competences for sustainable development in higher education: an analysis of bachelor programs in management. *Journal of Cleaner Production*, *48*, 65–73. https://doi.org/10.1016/j.jclepro.2011.12.034

Le Deist, F. D., & Winterton, J. (2005). What is competence? *Human Resource Development International*, *8*(1), 27–46. https://doi.org/10.1080/1367886042000338227

Leal, W., Levesque, V., Salvia, A., Paço, A., Fritzen, B., Frankenberger, F., Damke, L., Brandli, L., Ávila, L., Mifsud, M., Will, M., Pace, P., Azeiteiro, U., & Lovren, V. (2021). University teaching staff and sustainable development: An assessment of competences. *Sustainability Science*, *16*(1), 101–116. https://doi.org/10.1007/s11625-020-00868-w

Lozano, R., Merrill, M., Sammalisto, K., Ceulemans, K., & Lozano, F. (2017). Connecting competences and pedagogical approaches for sustainable development in higher education: A literature review and framework proposal. *Sustainability*, *9*(10), 1889. https://doi.org/10.3390/su9101889

Meihami, H., & Salīte, I. (2019). EFL teachers' cultural identity development through participating in cultural negotiation: Probing EFL students' perspectives. *Journal of Teacher Education for Sustainability*, *21*(1), 115–127. https://doi.org/10.2478/jtes-2019-0009

Omeje, H., Okereke, G., & Chukwu, D. (2020). Construction waste reduction awareness: Action research. *Journal of Teacher Education for Sustainability*, *22*(1), 66–83. https://doi.org/10.2478/jtes-2020-0006

Okeke, C., & Mtyuda, P. (2017). Teacher job dissatisfaction: Implications for teacher sustainability and social transformation. *Journal of Teacher Education for Sustainability*, *19*(1), 54–68. https://doi.org/10.1515/jtes-2017-0004

Okoli, C., Duarte, T., & Mattar, R. (2019). Guia Para Realizar uma Revisão Sistemática de Literatura [Guide to conduct a systematic literature review]. *EAD em FOCO*, *9*(1). https://doi.org/10.18264/eadf.v9i1.748

Rieckmann, M. (2012). Future-oriented higher education: Which key competencies should be fostered through university teaching and learning? *Futures, 44*(2), 127–135. https://doi.org/10.1016/j.futures.2011.09.005

Rieckmann, M. (2018). Learning to transform the world: Key competencies in education for sustainable development. In A. Leicht, J. Heiss, & W. J. Byun (Eds.), *Issues and trends in education for sustainable development* (pp. 39–59). UNESCO.

Sass, W., Claes, E., Pauw, J., De Maeyer, S., Schelfhout, W., Van Petegem, P., & Isac, M. (2022). Measuring professional action competence in education for sustainable development (PACesd). *Environmental Education Research*, *28*(2), 260–275. https://doi.org/10.1080/13504622.2021.1976731

Scherak, L., & Rieckmann, M. (2020). Developing ESD competences in higher education institutions-staff training at the university of Vechta. *Sustainability*, *12*(24), 10336. https://doi.org/10.3390/su122410336

Sleurs, W. (2008). Competencies for ESD (Education for Sustainable Development) teachers: A framework to integrate ESD in the curriculum of teacher training institutes – Comenius 2.1 project 118277-CP-1-2004-BE-Comenius-C2.1. http://www.unece.org/fileadmin/DAM/env/esd/inf.meeting.docs/EGonInd/8mtg/CSCT%20Handbook_Extract.pdf

Spanos, Y., & Prastacos, G. (2004). Understanding organizational capabilities: Towards a conceptual framework. *Journal of Knowledge Management*, *8*(3),

31–43. https://doi.org/10.1108/13673270410541024

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, *14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375

United Nations Economic Commission for Europe. (2012). *Learning for the future: Competences in education for sustainable development*. https://unece.org/fileadmin/DAM/env/esd/ESD_Publications/Competences_Publication.pdf

United Nations Educational, Scientific and Cultural Organization. (2002). *Education for sustainability: From Rio to Johannesburg, lessons learnt from a decade of commitment*. https://unesdoc.unesco.org/ark:/48223/pf0000127100.locale=en

United Nations Educational, Scientific and Cultural Organization. (2014). *Global citizenship education: Preparing learners for the challenges of the 21st century*. https://unesdoc.unesco.org/ark:/48223/pf0000227729

United Nations Educational, Scientific and Cultural Organization. (2017). *Education for sustainable development goals: Learning objectives*. https://unesdoc.unesco.org/ark:/48223/pf0000247444

United Nations Educational, Scientific and Cultural Organization. (2018). *Issues and trends in education for sustainable development*. (A. Leicht, J. Heiss, & W. J. Byun, Eds.) https://unesdoc.unesco.org/ark:/48223/pf0000261445

United Nations Educational, Scientific and Cultural Organization. (2020). *Education for sustainable development: A roadmap*. https://doi.org/10.54675/YFRE1448

Vare, P., Arro, G., de Hamer, A., Del Gobbo, G., de Vries, G., Farioli, F., Kadji-Beltran, C., Kangur, M., Mayer, M., Millican, R., Nijdam, C., Réti, M., & Zachariou, A. (2019). Devising a competence-based training program for educators of sustainable development: Lessons learned. *Sustainability*, *11*(7), 1890. https://doi.org/10.3390/su11071890

Vukelić, N. (2022). Teacher action competence in education for sustainable development. *Journal of Contemporary Educational Studies*, *73*(139), 180–194.

Wals, A., & Jickling, B. (2002). Sustainability in higher education: From doublethink and newspeak to critical thinking and meaningful learning. *Higher Education Policy*, *15*(2), 121–131. https://doi.org/10.1016/s0952-8733(02)00003-x

Weng, S.-S., Liu, Y., Dai, J., & Chuang, Y.-C. (2020). A novel improvement strategy of competency for education for sustainable development (ESD) of university teachers based on data mining. *Sustainability*, *12*(7), 2679. https://doi.org/10.3390/su12072679

Wiek, A., Bernstein, M., Foley, R., Cohen, M., Forrest, N., Kuzdas, C., Kay, B., & Keeler, L. (2015*).* Operationalising competencies in higher education for sustainable development. In M. Barth, G. Michelsen, M. Rieckmann, & I. Thomas (Eds.), *Routledge handbook of higher education for sustainable development* (pp.

241–260). Taylor & Francis. https://doi.org/10.4324/9781315852249.CH16

Wiek, A., Withycombe, L. & Redman, C. (2011). Key competencies in sustainability: A reference framework for academic program development. *Sustainability Science*, *6*(2), 203–218. https://doi.org/10.1007/s11625-011-0132-6

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