

Sustainable education

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Synonyms

SE

Definition/description

The concept of sustainable education is based on the terms sustainability and education. The term ‘sustainability’ is derived from the Latin *sustinere* and the term ‘education’ from the Latin word *educatio*. The former is a model of thinking in which the quality of life is improved through balancing the environment, society and the economy (Jeronen 2013). The latter refers to an activity or process for acquiring or sharing knowledge or skills, developing the powers of reasoning and judgment, and intellectually preparing oneself or others for life (Thesaurus 2021). Many of today’s challenges require a veritable shift in thought and behavior to support sustainable living. According to Stephen Sterling (2008), the necessary cultural change can be achieved through sustainable education (SE). He defines the concept as:

“a change of educational culture, one which develops and embodies the theory and practice of sustainability in a way which is critically aware. It is therefore a transformative paradigm which values, sustains and realises human potential *in relation to* the need to attain and sustain social, economic and ecological well being, recognising that they must be part of the same dynamic.” (Sterling 2001, p. 22.)

The concept of SE thus refers to finding sustainable solutions to environmental, social and economic problems through education (Prabakaran 2020). It is a concept that challenges both formal and non-formal educational sectors to actively participate in the creation of economic, social and environmental programs that improve quality of life, increase empowerment and respect interdependence (Abduganiev and Abdurakhmanov 2020).

Introduction

“Our machines, our value systems, our educational systems will all have to be informed by (the) switch, from the machine age when we tried to design schools to be like factories, to an ecological age, when we want to design schools, families and social institutions in terms of maintaining the quality of life, not just for our species, but for the whole planet.” (Cited in Sterling 2008, para. 5)

Since the 1980, there has been increased international attention on sustainability and **sustainable development** (SD) issues. According to UNESCO (United Nations Educational, Scientific and Cultural Organization), the difference between the two concepts is that sustainability is a long-term goal towards a more sustainable world, whereas SD implies the processes to reach this goal (UNESCO 2018a). Sustainability can be considered as a paradigm for thinking about the future in which environmental, societal, and economic considerations are balanced in the pursuit of an improved quality of life (Jeronen 2013). It is heavily context-dependent in social, cultural, and environmental situations (Kopnina 2012). **Brundtland's report** (1987) defines sustainability as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (UN 2021a, p. 1). Today, it is described as the organizing principle of human development that fulfils long term needs of humanity and at the same time sustains the “ability of natural systems to provide natural resources and ecosystem services upon which society and economy depend” (Glavić 2020, p. 2). It is thought to comprise three main dimensions: the ecological, social and economic dimensions (Fien et al. 2009; Quinn et al. 2016). These dimensions are complexly interrelated. Also research and education of sustainability are based on these dimensions (Maurer and Bogner 2019).

To promote sustainability locally, regionally and globally, United Nations (UN), including the UN Department of Economic and Social Affairs, with several countries began to develop **sustainable development goals** or global goals (SDGs). In June 1992, in Rio de Janeiro, Brazil, more than 178 countries ratified Agenda 21, which aimed to work together globally to improve people's lives and protect the environment from a SD perspective. At the September 2000 Millenium Summit in New York, the Member States adopted the Millennium Declaration, which led to eight Millennium Development Goals (MDGs) of reducing extreme poverty by 2015. The Johannesburg Declaration on SD and the Plan of Implementation, adopted in 2002, reaffirmed the global commitments to poverty eradication and environment through multilateral partnerships, based on Agenda 21 and the Millennium Declaration. In June 2012, the UN Conference on Sustainable Development (Rio + 20) in Rio de Janeiro, Brazil, adopted "The Future We Want". Among other things, it decided to develop a set of SDGs to build upon the MDGs. Negotiations on a Post-2015 Development Agenda began in January 2015 and ended in August 2015. The negotiations resulted in the adoption of the Addis Ababa Action Plan in July 2015. The final document, Transforming our world: the 2030 Agenda for Sustainable Development (called **Agenda 2030**), with 17 SDGs at its core, was adopted at the UN Sustainable Development Summit in September 2015 in New York. (UN 2021b) Today, the Division for Sustainable Development Goals (DSDG) supports capacity building on the SDGs and related thematic issues.

The 2030 Agenda for Sustainable Development and its 17 SDGs are focused both on environment and a multidimensional approach to SD to achieve the well-being of people around the world (Di Fabio 2017). The 17 SDGs are: 1) No Poverty, 2) Zero Hunger, 3) Good Health and Well-being, 4) Quality Education, 5) Gender Equality, 6) Clean Water and Sanitation, 7) Affordable and Clean Energy, 8) Decent Work and Economic Growth, 9) Industry, Innovation and Infrastructure, 10) Reducing Inequality, 11) Sustainable Cities and Communities, 12) Responsible Consumption and Production, 13) Climate Action, 14) Life Below Water, 15) Life On Land, 16) Peace, Justice, and Strong Institutions, and 17) Partnerships for the Goals (UN 2016).

Each SDG typically has 8 to 12 targets, and each target has 1 to 4 indicators to measure the achievement of the objectives. The targets are either "outcome targets" (conditions to be achieved) or "means of implementation". SDG17 concerns how the SDGs can be achieved. (Bartram et al. 2018) The Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs) developed a Global Indicator Framework for SDGs. It was adopted by the General Assembly in July 2017. The

indicator framework will be refined annually. It was reviewed comprehensively by the Statistical Commission in March 2020 and will be reviewed again in 2025. The global indicator framework will be complemented by indicators at the regional and national levels, which will be developed by Member States (see UN 2016).

Targets and indicators of SDG4

Education as an SDG is, perhaps more than ever, a priority to ensure that students are able to develop appropriate and rapid responses based on inputs to the SDGs. The SDG4 called ‘Quality Education’ particularly focuses on ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. It aims to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.” (UNESCO 2017)

The SDG4 includes seven targets that stress inclusion, quality and equality in all phases of education. The first three targets aim to ensure that all children and adults have access to quality education from early childhood to primary and secondary education and to vocational and university education. The fourth target is to improve the working capacity of young people and adults. The fifth target addresses access to education for people with disabilities, indigenous peoples and vulnerable people. The sixth target aims to guarantee literacy and numeracy for all young people and to reduce adult illiteracy. The seventh target concerns the content of education aiming to develop the knowledge and skills needed to promote SD, gender equality and peace and non-violence culture. (Unterhalter 2019)

The 32 indicators related to these targets are classified into Tiers 1, 2 and 3 (UN Statistical Commission 2018). Only two indicators are classified as Tier 1: participation in organized learning one year before primary school and the amount of official development assistance spent on higher education scholarships. The tier 2 indicators relate to the methods used to try to achieve the targets. Many of the Tier 3 indicators are linked with facets of quality and equality. (Unterhalter 2019) One indicator (the indicator 4.7.1) addresses the extent to which global citizenship education and education for sustainable development (ESD) should be taken into account in national education policies, curricula, teacher education and student assessment (UN 2016, p. 5).

Several different concepts have been and continue to be used in education of sustainability and SD. The concepts do not necessarily mean the same thing, even if they contain similar ideas. In the following sections, these concepts are considered separately from the perspectives of education, teaching and learning.

Concepts related to sustainability used in education

The concepts ‘sustainability education’, ‘education for sustainable development’, ‘education for sustainability’, and ‘sustainable education’ are often used as synonyms. However, they do not necessarily mean the same thing although they do contain similar ideas (Table 1).

Table 1. Definitions of the concepts ‘sustainability education’, ‘education for sustainable development’, ‘education for sustainability’ and ‘sustainable education’.

	Definition	Source
Sustainability education	is an interdisciplinary, collaborative, experiential, and potentially transformative process of creating a space for inquiry, dialogue, reflection, and action about the values and goals of sustainability.	Moore, J. (2005, p. 78)
Education for sustainable development (ESD)	is holistic and transformational, lifelong learning process which aims to enhance the cognitive, social and emotional and behavioral dimensions of learning.	UNESCO (2021)
Education for sustainability (EfS)	is "regarded as possessing both the <i>process towards</i> and the <i>vision of sustainability</i> ."	Wade, R. (2008, p. 32)
Sustainable education (SE)	is "a change of educational culture, one which develops and embodies the theory and practice of sustainability in a way which is critically aware. It is therefore a transformative paradigm which values, sustains and realises human potential <i>in relation to</i> the need to attain and sustain social, economic and ecological well being, recognising that they must be part of the same dynamic."	Sterling (2001, p. 22)
	is "a change of educational culture which both develops and embodies the theory and practice of sustainability in a way which is critically aware. This would be a transformative paradigm which values, sustains and realizes human potential in relation to the need to attain and sustain social, economic and ecological well-being, recognizing that they are interdependent."	Sterling (2003, p. 233)

Sustainability education has evolved in waves in the 20th century in response to sustainability challenges (Wals and Blewitt 2010). The first wave, called environmental education, paved the way for a new type of educational culture. The first descriptions of it were published at the Intergovernmental Conference on Environmental Education in Tbilisi (UNESCO 1977). In Agenda 21, it has been stated that environmental education is a continual, life-long learning process to raise

public awareness and action globally, nationally and locally in every area in which humans impact the environment (UN 2003). The main theme was thus concern about the state of the environment. The 1992 UN Conference in Rio Janiero emphasized the need to integrate environmental education and development (UN 1993). This integration gave birth to four new waves of sustainability education. The first of these waves was about implementing environmental education and the related environmental education for sustainability (EefS) in response to environmental and developmental concerns (Papenfuss et al. 2019). The key components of the EefS are relevance, integrity, values, action, and political literacy (Tilbury 1995). Thus, the EefS evolves by acknowledging that sustainability challenges are socially connected, transdisciplinary, normative, and urgent.

The second of the new waves, called the campus greening movement, addressed the complicity in sustainability dilemmas (Wals and Blewitt 2010). It focuses less on pedagogy, and more on efforts to reduce ecological impacts. However, despite the development of the first and second new waves of sustainability education, many indicators of global sustainability continued to decline during the 2000s (Rockström et al. 2009).

The aim of sustainability education was to meet these new challenges with the help of the third new wave, which included transformative and emancipatory pedagogies and their interaction (Papenfuss et al. 2019). It aims at “learning that helps people transcend the ‘given,’ the ‘ordinary,’ and often the ‘routine ways of doing,’ to create a new dynamic and alternative ways of seeing and doing” (Wals and Blewitt 2010, p. 66).

The fourth new wave of sustainability education can be considered contemplative education (Papenfuss et al. 2019). It has been defined as a “way of knowing that compliments the rational and the sensory” (Hart 2004 p. 29), and “a set of pedagogical practices designed to cultivate the potentials of mindful awareness and volition in an ethical-relational context in which the values of personal growth, learning, moral living, and caring for others are nurtured” (Roeser and Peck 2009, p. 11). Other goals are the development of empathetic connection, compassion, creativity, and altruistic behavior (Zajonc 2013).

In summary it can be stated that, over the years, sustainability education expanded from an original ecological perspective to include social, ethical and transformative aspects as well.

The use of the concept ESD became more widespread during the United Nations Decade of Sustainable Development (2005-2014, DESD) (UNESCO 2009). The Decade was the culmination of many initiatives that have developed on the international stage since 1980, when the concept ‘sustainable development’ was first introduced by Robert Prescott-Allen (IUCN 1980). Very recently (UNESCO 2018b) ESD is placed at the centre of the 2030 Agenda for Sustainable Development and has been widely acknowledged as a key enabler of all 17 SDGs (besides SDG4 Quality Education for all). ESD is one of the teaching approaches with the complexity of a globalized world. The key principles of ESD are (UNESCO 2009, 2017):

- A transformative and reflective process that seeks to integrate values and perceptions of sustainability into, not only education systems, but one’s everyday personal and professional life;
- A means of empowering people with new knowledge and skills to help resolve common issues that challenge global society’s collective life now and in the future;
- A holistic approach to achieve economic and social justice and respect for all life;
- A means to improve the quality of basic education, to reorient existing educational programmes and to raise awareness.

According to Wade (2008), the EfS examines sustainability at different levels from the personal and psychological to the organizational, local, national and global levels from a value perspective with the goal of sustainable change. It focuses on sustainable planning, alternative energy, land education, human rights education, conflict resolution, futures education, anti-racism and intercultural education. The core concept of EfS is the agency of human being, this concept can be very useful in building an ethical framework for action (Dower 2003). The EfS process is based on a systemic approach that emphasizes contexts to create overall images of phenomena. Thus, it provides “a holistic approach by recognizing the complex, interrelated nature of all aspects of the world around us from the individual to the global level” (Sterling 2005, p. 23). The EfS is a lifelong process in which much of our learning takes place outside the formal sector. Wade (2008) believes that the EfS can provide a framework based on the idea of multidisciplinary to bring together related fields.

Some progressive steps have been taken through sustainability education, ESD and EfS. However, attitudes, values, and behaviors have not sufficiently adjusted to the much-needed sustainable lifestyles. Therefore Sterling (2008, p. 64) argues that we need for anticipative education to help identify new conditions and discontinuities faced by current generations, e.g. the massive challenges of global warming, species extinction, economic vulnerability, social fragmentation and migration, endemic poverty, the end of cheap energy, and more positively, the rise of localism, participative democracy, green purchasing, ethical business, and efforts to achieve a low carbon economy. Consequently, Sterling provides the concept of SE as a basis for education, emphasizing the nature, policy, and practice of educational thinking as a whole.

Sustainable education for sustainable transformation

According to Sterling (2008), the concept of ‘sustainable education’ refers to a change in culture in the way education and learning are understood. SE has been considered as renewable resources to be geared towards the acquisition of key competences of 21st century including sustainable lifestyles, work and habitat (Branden 2015). The heart of it lays on an ecological orientation. Other terms describing the nature of the SE are ‘holistic’, ‘systemic and ‘inclusive’ showing that SE is relative, committed, ethically oriented, and globally and locally relevant. SE signifies a systemic change in educational thinking and practice that arises around the poles of holism, systemic thinking, sustainability and complexity. SE enables education that is appropriate, takes into account and responds immediately to changes in circumstances, and supports the development of students' adaptability, creativity, self-reliance, hope and resilience. SE combines education and learning theories integrating the best aspects of liberal education with new ideas of transformative education, capacity building, creativity and adaptive management which are considered as a part of the new SD program at all educational level. (Sterling 2008.)

SE requires education policies and practices that are sustaining, tenable, healthy, and durable (Sterling 2008, p. 65):

- Sustaining: it helps sustain people, communities and ecosystems;
- Tenable: it is ethically defensible, working with integrity, justice, respect and inclusiveness;
- Healthy: it is itself a viable system, embodying and nurturing healthy relationships and emergence at different system levels;
- Durable: it works well enough in practice to be able to keep doing it.

Traditional teaching cannot bring about a change in the whole system, but everything continues in a more or less the same way (so-called 'first order change'). Achieving change requires at least 'a second order change' that involves re-examining assumptions through systemic and in-depth learning toward broader awareness at the personal, organizational, and community levels.

Thus, an ecological orientation means seeking synergies between all aspects of education: ethos, curriculum, pedagogy, leadership, use of resources, architecture, and community connections. (Sterling 2008.)

The purpose of SE is to promote equity, improve the quality of life and well-being, conserve natural resources and protect health (Jämsä 2006, p. 28). Jämsä emphasizes that the principles of SE are similar to the general principles of education and that SE is an essential as part of ethical education. He also believes that SE can awaken people to a deep personal awareness of the various consequences of moral choices. According to Alcalá and Gutiérrez (2019), SE should include innovative pedagogy that supports students' understanding of social reality. In teaching and learning, crucial issues are values (e.g. respect, trust, participation, community, justice, participatory democracy, openness and critical reflection). The educational process should be planned and implemented from a holistic perspective (Burns 2011), and SE practice extended to be systemic and cross-disciplinary (Stevenson et al. 2017). At SE, the core of education is a critically important 'learning about learning' process that directly affects the opportunities for a more sustainable future for all.

Despite the distinctions that can sometimes be drawn between sustainability education, ESD, EfS and SE, they all share a vision of quality education and a society that lives in balance with Earth's carrying capacity (cf. Sterling 2010). According to Sterling (2004a), a key question concerns 'response-ability' that is, how different sectors are able to respond to the wider context of the unsustainability crisis and the opportunities of sustainability. This is a difficult challenge that requires learning from all those involved in educational planning, policy, and practice. Sustainability requires the development of systematic and integrative activities as well as systemic thinking in education (Sterling 2004b). Ultimately, the sustainability transition requires a shift of culture from a mechanistic and reductionist towards a more ecological and holistic one. Achieving these changes requires designing education systems from a sustainability perspective.

Teachers' competencies of sustainability and SE

The key skills for SD are systems thinking competency, anticipatory competency, normative competency, strategic competency, collaboration competency, critical thinking competency, self-awareness competency and integrated problem-solving competency (Unesco 2017). Systems thinking competency means the abilities to recognize and understand relationships, to analyse complex systems, to think of how systems are embedded within different domains and different scales and to deal with uncertainty. Anticipatory competency comprises the abilities to understand and evaluate possible, probable and desirable futures, to create one's own visions for the future, to apply the precautionary principle, to assess the consequences of actions and to deal with risks and changes. Normative competency includes the abilities to understand and reflect on the norms and values that underlie one's actions and to negotiate sustainability values, principles, goals and targets in a context of conflicts of interest and trade-offs, uncertain knowledge and contradictions. (UNESCO 2017)

Strategic competency is the ability to collectively develop and implement innovative actions that further sustainability at the local level and further afield. Collaboration competency includes the abilities to learn from others, to understand and respect the needs, perspectives and actions of others, to understand, relate to and be sensitive to others, to deal with conflicts in a group and to facilitate collaborative and participatory problem-solving. Critical thinking competency comprises the ability to question norms, practices and opinions; to reflect on one's values, perceptions and actions, and to take a position in the sustainability discourse. Self-awareness competency is the ability to reflect on one's own role in the local / global community and society, to continually evaluate and further motivate one's actions and to deal with one's feelings and desires. Integrated problem-solving competency is the overarching ability to apply different problem-solving frameworks to complex sustainability problems and develop viable, inclusive and equitable solution options that promote SD, integrating the abovementioned competences. (UNESCO 2017)

The key competencies for sustainability can be understood as transversal, multifunctional and context independent (Rychen and Salganik 2003). They represent what citizens who work to achieve sustainability will particularly need to deal with today and the future's complex challenges. They are relevant to all SDGs and enable individuals to relate the different SDGs to each other – to see 'the big picture' of the 2030 Agenda for Sustainable Development (United Nations 2015). The key competencies represent cross-cutting competencies that are necessary for all learners of all ages worldwide. Thus, teachers should be able to master the issues concerning the key competences for sustainability and be able to apply their knowledge in teaching situations.

According to Brundiers and Wiek (2017), the knowledge dimensions required for integrative SD include content knowledge, methodological skills, communication skills, collaborative teamwork, participant engagement, project leadership ability, continuous learning ability and self-care. By fostering competencies of SD (Lozano et al. 2017; Rieckman 2019) it is important to steer education in a global direction to achieve social justice for present and future generations while respecting cultural diversity. At the local level, teaching should be favored a variety of formal, non-formal and informal learning to accelerate the implementation of sustainable solutions (Lockhart 2016).

SE is lifelong learning and an integral part of a quality, comprehensive, and transformative education concerning content, environment, and learning outcomes, as well as pedagogy (Ghemawat 2017). Beside environmental issues, interaction between society and the environment is in the core of teaching, studying and learning processes. Cooperation between fields of education should be encouraged, especially in matters of environmental protection, human rights, social and economic development. The values, knowledge and skills needed for sustainable environmental management, the promotion of social justice and the eradication of poverty are key to education (Coriddi 2008). SE can be seen as an instrument of empowerment that inspires individuals and society to adopt sustainable lifestyles for the benefit of present and future generations.

Summary

The issues of sustainability and SD have received more national and international attention in recent decades. Numerous concepts are used interchangeably in education of sustainability. The following terms are most commonly used: 'sustainability education', 'education for sustainable development (ESD)', 'education for sustainability (Efs)' and 'sustainable education (SE)'. Although they contain similar ideas, their starting points, goals, and approaches differ somewhat.

Over the years, sustainability education has expanded from an original ecological perspective to include social, ethical and transformative aspects as well. Also ESD and Efs aim to find sustainable solutions to local and global problems through a transformative perspective. The core ideas of ESD

are social justice and cultural diversity while in EfS emphasizes the agency of human being in order to achieve sustainable change from a value perspective. Like early sustainability education, also SE is based on ecological orientation. Ecological orientation means that the sustainable use of natural resources must also be taken into account when promoting justice and improving the quality of life and well-being. SE should support students' understanding of social reality. Teaching and learning of SE should be based on values and in the holistic, systemic and cross-disciplinary planning and implementation processes.

Today, the crucial goal is to learn to live sustainably. This requires education systems, educational institutions and educators with a willingness to tackle sustainability problems and the ability to respond to them.

Cross-references

(see chapter [sustainable development](#))

(see chapter [Brundtland's report](#))

(see chapter [2030 Agenda](#))

(see chapter [Sustainable Development Goals](#))

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