
Education for Sustainable Development: a Conceptual and Methodological Approach

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Introduction

In December 2002, the United Nations General Assembly adopted resolution 57/254 proclaiming the United Nations Decade of Education for Sustainable Development. This initiative completed a series of texts (Chapter 36 of Agenda 21, provision 124) adopted at the United Nations Conference on Environment and Development (Rio de Janeiro, June 1992) and the World Summit on Sustainable Development (Johannesburg, September, 2002). UNESCO was entrusted with the responsibility of leading this Decade and developing a draft international implementation programme. Education for Sustainable Development thus became a political project, which was formalized by the major international and national institutions. As such, the International Implementation Scheme for the United Nations Decade of Education for Sustainable Development considers that ESD "is based on the principles and values that underpin sustainable development; concerns the good health of the three spheres of sustainability (environment, society and economy); promotes lifelong learning; is locally relevant and culturally appropriate; is based on local needs, attitudes and conditions, but recognizes that meeting local needs often has international implications; mobilizes formal, non-formal and informal education; adapts to the evolving concept of sustainability; addresses content taking into account context, international issues and local priorities; builds citizens' capacities in the areas of community decision-making processes, social tolerance, environmental management, labour flexibility and quality of life; and is interdisciplinary. ESD is not the exclusive domain of any discipline, but all disciplines can contribute to ESD; it uses a variety of pedagogical techniques that promote participatory learning and the acquisition of high intellectual skills" (UNESCO, 2005, p. 35-36).

In 2018, UNESCO placed ESD at the heart of the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (United Nations, 2015). The SDGs recognize that all countries should stimulate action in the

following key areas - People, Planet, Prosperity, Peace, and Partnership (the Five Ps) - in order to tackle the global challenges that are crucial for the survival of humanity. ESD is explicitly mentioned in target 4.7: "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development" (UN, 2015, p. 19). For UNESCO, the five priority action areas (policies to support ESD, transforming learning and training environments, building the capacity of educators and trainers, empowering and mobilizing young people, accelerate the search for solutions at the local level) are intended to increase the number of countries that have integrated ESD into education and sustainable development policies, and so to catalyse ESD's capacity to help achieve global commitments (as part of the Paris Agreement on Climate change ESD introduced the Education for Climate Change (ECC). ESD requires changes in education systems, including strengthening curricula, innovative pedagogies and teacher training, but above all a model for transforming education systems.

It is difficult to imagine a universal model of education for sustainable development, as each country must define its objectives, priorities, programme of action, and how they are to be assessed. Economic, environmental, social, religious, and cultural conditions are such that ESD can take different forms. Nevertheless, it is possible to specify the essential characteristics of education for sustainable development and to define the contours of its theoretical framework. Firstly, it is part of the field of Education for (e.g. Education for biodiversity, Education for Health, Education for Environment).

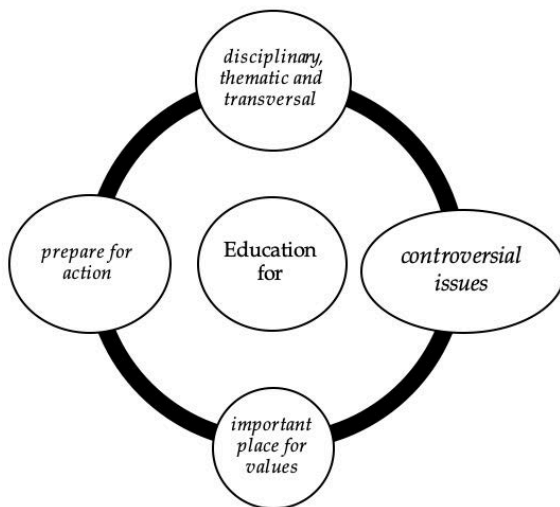
Secondly, it refers to a conceptual framework of sustainable

development. Thirdly, it uses a methodological approach, the REDOC model.

ESD and education for

In recent years, education for has entered our educational system. This phenomenon has become widespread, in France and in Europe, and the list continues to grow with incursions into inter- or trans-disciplinarity taking place (Giordan, Souchon, 1991). How can such a phenomenon be explained? Is this a fashion or is it a real desire to transform our education systems? Lebeaume (2004), Lange and Victor (2006), Simonneaux (2006), Legardez and Alpe (2013), Lange (2015) oppose these educational forms to traditional teaching. Unlike traditional teaching, which refers to compartmentalized disciplinary content (scientific knowledge is stabilized) and places the teacher at the heart of knowledge transmission, education for is based on the knowledge of the various actors in formal/informal education, proposes to build a model of social and ethical competencies, uses a trans-disciplinary approach (Diemer, 2014) and aims at a critical and committed form of pedagogy (Diemer, Marquat, 2014; Diemer, 2015). Legardez and Alpe (2013) have specified the four important features of this difference from classical education: their thematic, non-disciplinary and "transversal" nature (according to the terminology of the French Ministry of National Education); their close relationship to present social issues; the important place they give to values; and their objective of changing behaviour, to prepare for action.

Fig 1. The four components of Education for



Source: Diemer (2015, 2016)

This change in education has challenged the relationship of teaching to education, and is a challenge for institutions in charge of teacher training. In what follows, we look at the four characteristics of Education in order to identify the challenges for education systems (Diemer, Marquat, 2016)

and for education for sustainable development. At the international level, UNESCO states that ESD "consists in integrating into teaching and learning the key themes of sustainable development, such as climate change, natural risk prevention, biodiversity, poverty reduction or sustainable consumption. It involves the adoption of participatory pedagogical methods to motivate and empower learners to change their behaviour and become actors in sustainable development. This is why education for sustainable development promotes the acquisition of skills that enable learners to develop their critical thinking skills, imagine future scenarios and make common decisions" (2005, p. 35). Education for sustainable development implies a fundamental change in teaching as it is generally practiced today.

Education for ... is a-disciplinary, thematic and transversal

Education for requires decompartmentalization and transdisciplinarity. It involves the mobilization of various types of knowledge and their linking to understand the complexity of problem. It is a question of reconnecting disciplines long divided into classes and subclasses (Bodin, Diemer, Figuière, 2014). While education for calls for a transdisciplinary approach, it does not mean that it abandons the need to mobilize disciplinary knowledge. Thus, even if the question of knowledge is peripheral to the objective, disciplinary skills are fundamental to developing critical thinking skills about social practices. A disciplinary scientific culture is an essential basis for the analysis of facts. Contrary to what Alain Beitone (2014) suggests, the positioning of "education for " does not consist in "challenging the scientific approach", but rather in supplementing the theory of the general fact with an approach to particular facts (Diemer, 2013), to associate value judgments with the observation of facts. 'Education for' and especially Education for Sustainable Development requires the creation of a conceptual framework to observe and understand the phenomena that cross the world. In its report, United Nations Decade of Education for Sustainable Development (2005-2014), UNESCO outlined the framework: "Education for sustainable development is interdisciplinary. ESD is not the exclusive domain of any discipline, but all disciplines can contribute to ESD" (2005, p. 36).

In France, the Bregeon report (2008) confirmed this position: "Education for sustainable development is not a discipline. It calls for integration into existing pedagogical processes, invites partnership actions and calls for a variety of approaches, as well as pedagogical innovation".

Education for...refers to controversial issues

The production of scientific knowledge is subject to power and meaning relationships, according to Bourdieu's field theory (1979). The more rigorous the science is, the more accurate its objectification and effects will be. The close interaction of the world of science with those of politics and

the media, which do not, however, obey the same rules, creates strong pressures that generate positions that are not subject to any scientific rigour. However, by influencing people's knowledge of the world, we can, according to Bourdieu, influence the social world (Bourdieu, 1980). The teacher therefore faces a double challenge. On the one hand, the teacher must escape the quarrels and political compromises to which scientists are subjected and which distort the theory of the general fact. On the other hand, the teacher must adapt his/her practice in order to develop in the students the skills necessary for their civic construction, in particular an autonomy of analysis that encourages them to act in a critical and responsible manner. This is the case for scientific fields which are exposed to the media that are part of national education programmes such as the issue of energy and climate (Diemer, 2015) or the production of GMOs (Diemer, 1999, 2001, 2002). These fields are subject to emotional tensions and strong positions that require appropriate teaching. These areas, sometimes termed controversies (Latour, 1989; Albe, 2011; Diemer, Marquat, Rafaitin, 2014) and other socially relevant issues (Legardez, Simonneaux, 2006, 2011), are the subject of research and are at the origin of the development of innovative educational practices. According to Raynaud (2003, p. 8), "a scientific controversy is characterized by the persistent and public division of several members of a scientific community, whether coalitionized or not, who support contradictory arguments in the interpretation of a given phenomenon". According to Legardez and Simonneaux (2011, p. 16), a socially lively issue has the following characteristics: (1) It is alive in society: it raises questions about the social practices of the actors, and their social representations. It is considered as an issue for society and gives rise to debate (disputes, conflicts), it is the subject of media coverage. (2) It is highly relevant to reference knowledge: it gives rise to debates (controversies) between specialists in disciplinary fields or between experts in professional fields. Controversies can be subject to paradigm shifts (e.g. the treatment of inequalities according to redistributive or commutative justice). (3) It is alive in school (or even university) knowledge. Controversies can arise within institutional knowledge (programmes) and intermediate knowledge (manuals). Teachers are directly confronted by it.

Teaching about scientific controversies means addressing the question of scientific rationality in a changing and tense societal context that challenges knowledge and creates uncertainty. The teaching of Life and Earth Sciences and Economic and Social Sciences are particularly exposed to the question of controversy since these disciplines must address such issues as gender, global warming, genetically modified organisms, social protection, inequality, participatory democracy, etc. Education for sustainable development is an excellent place for addressing societal issues and controversies.

Education for... gives an important place to values

Education for brings us into the field of values. Introducing values into the educational field does not necessarily refer to subjectivity. Such an approach makes it possible to associate principles (e.g. solidarity, participation, etc.) with the analysis of facts while opening up new perspectives in terms of skills. Life skills (attitudes), know-how (skills and approaches), knowledge in terms of knowledge and finally knowledge about knowledge (which is equivalent to metacognition) are in turn mobilized at school (Giordan, Pellaud, 2001). Combining the autonomy of reasoning with a constructive critical spirit (Freire, 1996), these four types of knowledge in a broad sense make it possible to make well-considered decisions, based as much on a "scientific" understanding of the problems as on ethical reflection. In the case of ESD, the questions may concern the relationship between man and his environment, and more generally, our relationship with the world. People have a diversity of cultures and ethical relationships with the environment and sustainable development, which makes us oscillate between two extreme philosophies (Clément 2004), materialism (nature results from evolution) and spiritualism (nature is a gift from God). Between these two extremes, there are many positions. Implementing ESD requires positioning oneself at the intersection of these extreme positions, decentralizing from these representations to better understand those of others, and building shared representations. This posture leads to questions about the relationship between principles, values, and ethics.

The principles are based on fundamental propositions, they serve as a basis for reasoning and position papers, they define a way of action. In the case of Education for Sustainable Development, the principles of responsibility, precaution, and solidarity allow individuals to conform their conduct to a set of predefined rules regardless of the particular circumstances of the action (Diemer, 2013). Principles are values in the sense that if they were worthless, if they had no meaning, an individual would not make them his/her own. However, values are on a different level, they affect the intimacy of the individual and enter into the construction of his/her psycho-social identity (Malewska-Peyre, 1991). Any direct questioning of these values is therefore likely to create cognitive blockages. Both the field of education and the field of the environment are 'undermined' by values (Sauvé, 2009), which requires teachers to be clear-sighted, rigorous and of the highest integrity. Generally, values are socially constructed and culturally determined (Diemer, Marquat, 2016), which gives them a universal character (Sauvé, Villemagne, 2005). Understanding our own values, the values of the society in which we live, and the values of other societies around the world (Dewey, 2011), is an essential aspect of Education for Sustainable Development. While the history of the United Nations has been accompanied by the promotion of a large number of values related to dignity and human rights, equity and respect for the environment, sustainable development, and more specifically education for sustainable development, goes further by extending them to the inter-

generational level (Caravita et al, 2008). Of course, the values to be taught and learned in each ESD programme can be debated, however, the objective of ESD is to "create locally relevant and culturally appropriate values" based on the principles and values inherent in sustainable development (UNESCO, 2005, p. 8). Ethics, on the other hand, can be seen as an attempt to answer the Socratic question: how should we live? (Williams, 1985). It is a reasoned reflection with a view to "doing the right thing". Ethics refers to action (Fortin, 1995), specifically it proposes to question the values and principles that tend to guide our actions, in order to act in accordance with them (Legault, 1999, Pellaud, 2011).

Education for...prepare for action

Traditional education is not the preferred place for action. It is intended to prepare minds by providing them with the knowledge they need to understand the world and to train responsible citizens. Nevertheless, schools are evolving. Initiatives and citizen actions are being developed in partnership with local actors. Hence the importance of developing forms of education that prepare successive generations to build the society to come. Schools are beginning to open up to this perspective by drawing inspiration from the principles of popular education. Education tends to answer the question of the individual and collective construction of a common future by working in three directions (Christian Maurel, 2011): emancipation of individuals so that they are able to leave the place - social, gender, cultural - that has been assigned to them; action to regain control of their destiny; and involvement in the transformation of social and political relations.

Education for... allows the development of processes of empowerment and choice of education through a critical analysis of the issues at stake. It is part of the emancipation process by allowing a critical and analytical mind to flourish. Emancipation, which in the strict sense of the term means freedom from specific constraints, can only be achieved in a democratic context. Emancipation means access to free will, to a judgment of situations by oneself. It is a capacity to think, to elaborate and to consider oneself at the origin of one's judgments (Pasquier, 2013). The emancipation necessary for the preparation of action is one of the roles of school. Learning to live together (Pellaud, Giordan, Eastes, 2007), which begins with the ability to live with oneself, requires first of all the clarification of one's own values in order to be able to confront them with ideas. This dialogue (internal and external) between values, principles of life, and the rules of collaborative action requires the development of the skills of understanding and listening to oneself and others. To foster the development of these skills necessary for collective action, it is also useful to diversify pedagogical practices by taking into account the representational universes and organizational concepts (knowledge anchorage point) of each person. Beyond traditional formal education, non-formal and informal education should not be neglected. Their advantage is that

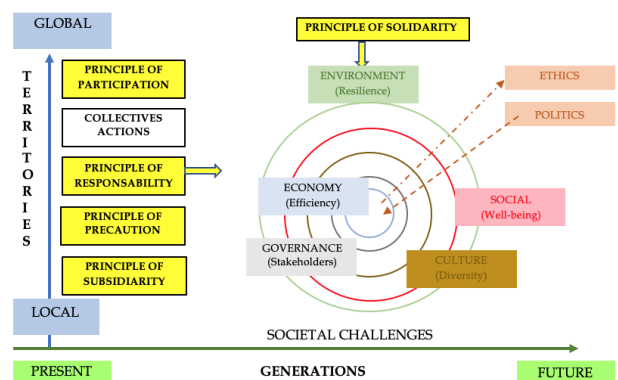
they are most often anchored in reality, that they are in synergy and network with other actors, that they encourage imagination because they are unconstrained, and that they are part of the action (Diemer, Marquat, 2016).

ESD

A conceptual framework of sustainable development

Education for Sustainable Development (ESD) refers to a conceptual framework of the sustainable development concept (Diemer, 2013, 2017) characterized by (i) societal challenges (also referred to as controversial issues); (ii) an introduction to complexity and system thinking; (iii) a transdisciplinary approach; (iv) five pillars of sustainable development (environmental, social, cultural, economic, governance); (v) spatial and temporal scales; (vi) a system of values and broad principles (responsibility, precaution, participation, solidarity).

Fig 2. Thinking ESD in the Sustainable Development Framework



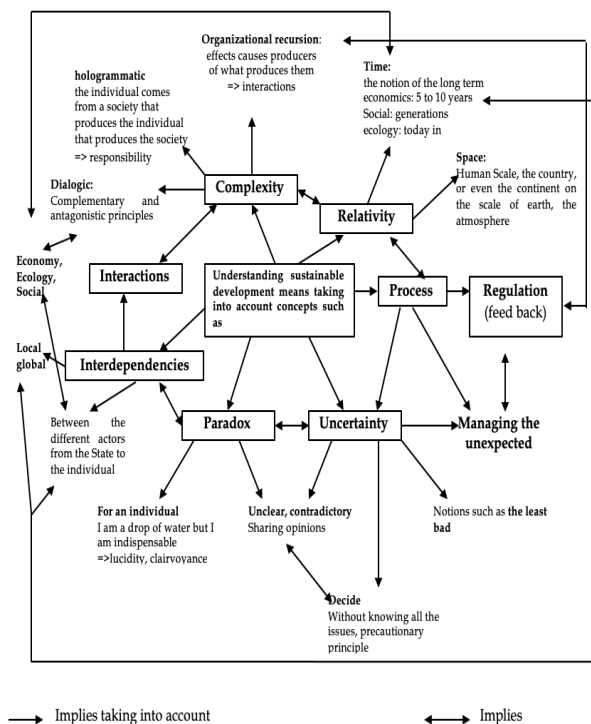
Source: Diemer (2015)

(i) Sustainable development asks us to consider a growing list of societal issues (biodiversity, climate change, energy, water, production patterns, consumption patterns, food, human rights, human health, governance, urbanization, sustainable mobility, etc.). ESD is integrated into many global frameworks and conventions: Article 6 "Education, training and public awareness" of the United Nations Framework Convention on Climate Change (1992); Article 13 "Public education and awareness" of the Convention on Biological Diversity; point 18 "Education and training" of the Hyogo Framework for Action 2005 - 2015 for Disaster-Resilient Nations and Communities; and the 10-year framework of programmes on sustainable consumption and production 2012 - 2021 "Lifestyles and sustainable education

(ii) Sustainable Development invites us to consider complex thinking and systemic analysis. A complex situation requires a global vision of the context, which means considering all the factors involved in the problem being addressed, while placing the problem within a broader framework (Morin, 2005). Complexity introduces the concepts of interactions, interference, and uncertainty. It involves the use of system dynamics (Meadows Report, 1972) which focus on

interacting elements (feedback loops) and irreversible processes.

Fig 3. Complexity of Sustainable Development



Source: Pellaud (2011)

(iii) Sustainable development requires a transdisciplinary approach. Education for sustainable development is fuelled by the explosion of disciplinary research (the importance of fundamental knowledge related to sustainable development), advocates openness between disciplines (interdisciplinarity), and research to bring knowledge together across disciplines (transdisciplinarity). Transdisciplinarity is situated between disciplines, across disciplines, and outside disciplines (Nicolescu, 1996). Transdisciplinarity constructs its own content and methods in order to capture a multidimensional reality, structured at multiple levels. It is a cognitive paradigm whose main mission is to build bridges between disciplines (Piaget, 1972).

(iv) Sustainable Development is based on a set of 5 pillars of sustainable development. In addition to the three well-known pillars of the Brundtland Report (environmental, social, and economic), the cultural and governance pillars have to be added. Culture, and more specifically cultural diversity (UNESCO, 2001, 2005), plays an important role in the understanding, acceptance, and diffusion of sustainable development. This signifies the need to apply a culturally sensitive educational model so that local populations can both take ownership of it and contribute to its enrichment. Governance, on the other hand, introduces the notion of stakeholders (Freeman, 1984). It reminds us that education for sustainable development actions are the result of an awareness of the central position given to meaningful action. Governance rehabilitates the intentionality (competence to act) and justifications of actors in a reciprocal process of doing and saying (Boidin, Diemer, Figuière, 2014). In this

representation of sustainable development, it is important not to go beyond the boundaries of the planet (the environment is characterized by biodiversity, climate, water – which are challenges for society), so that the ecosystem can be resilient. Above all, society must respect the environment and focus on the notion of well-being (Buen vivir). Culture is part of the social sphere, it uses diversity to enrich human relationships. Governance involves all stakeholders in the decision-making process. The economy is reduced to its purest representation, a place of exchange, and it concerns only a small part of our lives (the relational goods that are shared by all citizens replace the material goods, obtained under the sign of private property).

(v) Sustainable Development has spatial and temporal scales. Time introduces the generational effect (as defined in the Brundtland report), but also looks at the past (refusal to forget), and the future (a prospective approach that must be based on medium- and long-term planning [Sachs, 1997]). Space must articulate global and local levels (Zuindeau, 2000) based on the principle of subsidiarity (this point is particularly important when talking about territories and the enhancement of indigenous knowledge).

(vi) Sustainable development introduces a system of values and four principles of sustainability. These values, respect for the environment, empathy, respect for others, and self-esteem, should (?) make it possible to empower individuals, to train responsible citizens (education for eco-citizenship) capable of projecting themselves into the future, to become involved in a genuine social project, to understand the full complexity of the socio-economic, ecological, cultural, and ethical factors that determine the entire sustainability of development (UNESCO, 2009). ESD also integrates the basic values of environmental education, whether it is Goffin's STAR (Solidarity, Tolerance, Altruism and Responsibility) model (1992, 1997) or Alaya's CARTAS (Citizenship, Autonomy, Responsibility, Tolerance, Altruism and Solidarity) model (2010). Principles such as responsibility, solidarity, precaution, and participation now define the philosophy of sustainable development. Education for sustainable development thus refers to the art of living together. On the basis of this conceptual framework, it is possible to propose a methodological framework for integrating ESD into the learning process.

ESD as a methodological framework, the REDOC approach

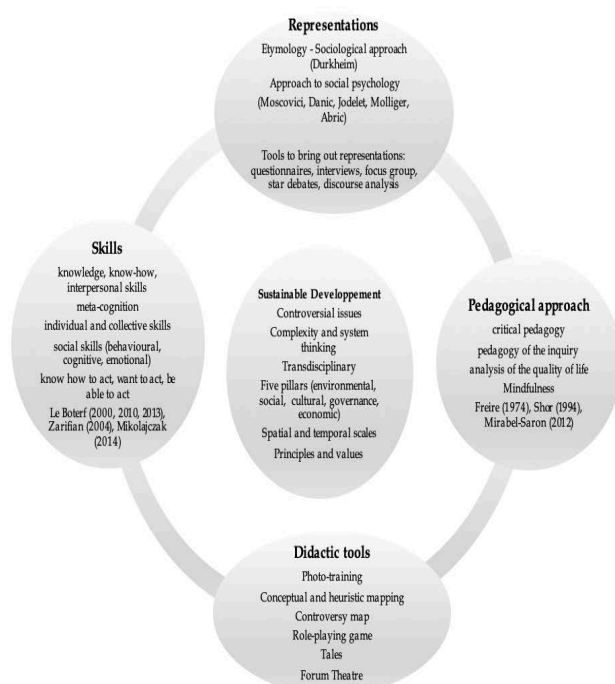
Below we present a methodological framework for education for sustainable development. This framework is associated with a model called REDOC, Representations, Pedagogical Approach, Tools and Skills (Diemer, Kerneis, Marquat, 2014). We used this framework for our study on Education for sustainable development for African Countries (Diemer, 2015).

Step 1 - Representations - the aim is to bring out the representations of sustainable development of teachers, pupils, and citizens by using different techniques such as

questionnaires, interviews, focus groups, or the analysis of speech proposed by software (TROPES). The notion of representation refers to the mental elements that are formed by our actions and that inform our actions. It is characterized by a process of construction and functioning that is distinct from other ways of thinking (Danic, 2006). The notion of social representation includes a certain number of features such as symbolism, imagination, cognition, action, conception, interaction, etc: "Social representation is a process of perceptual and mental elaboration of reality that transforms social objects (persons, contexts, situations) into symbolic categories (values, beliefs, ideologies) and confers on them a cognitive status allowing them to grasp aspects of ordinary life by reframing our own behaviours within social interactions" (Fischer, 1987, p. 118).

Step 2 - Pedagogical approach - there is a broad consensus that the pedagogical practices of education for sustainable development are based on the teacher's active construction of his/her own skills (Vygotsky, 1934; Piaget, 1937; Meirieu, 1987, Astolfi, 1997), and his/her ability to help students build their own skills (Eastes, 2013). Socio-constructivism is a relevant theoretical framework for studying ESD (Doise and Mugny, 1981; Cole, 1991). Each teacher builds his/her own knowledge, skills, attitudes and values in a socialized context (family, village, friends, colleagues, working conditions, social pressures, etc).

Fig 4. REDOC Framework



Source: Diemer, Marquat, Bigohe (2014), Diemer (2015, 2017)

ESD invites us to pay particular attention to cultural and educational contexts in cognitive processes (this is why concepts and representations are so connected). However, as we have already pointed out, the theory of didactic situations (Brousseau, 1998) can also be used here, particularly for problem situations, debates, socially lively questions, surveys, and collective actions.

In a previous study (Diemer, 2015), we sought to show how, through specific pedagogies, it is possible to develop in teachers (but also in students) skills specific to understanding sustainable development. We identified four pedagogical modalities: critical pedagogy (Freire, 1974), project-based pedagogy (Hubert, 1999), exploration of the living environment (Sauve, 1997), and mindfulness (Hant Thich Nhat, 2011).

Step 3 - Use and design of didactic tools - ESD uses innovative tools which enable teachers to interact with their students. Use of photographs, storytelling, comic strips, theatre, discussion topics, concept mapping, heuristics, and debates were proposed in a framework aimed at (i) collecting teachers' representations (both to free-up speech and to facilitate exchanges during focus group sessions), (ii) identifying whether certain tools resonated with local practices, (iii) analysing the possibilities of integrating the tools into a phase of accompanying teachers in education for sustainable development. In the case of Benin and Togo, three didactic tools were tested: storytelling (use of the book Justine and fire stone Ogress which speaks of Western overconsumption), photographs (writing a story from three images referring to a certain idea of Nature), and debate (use of a puppet to provoke a discussion on the nuisance of plastic bags which is a big pollution problem in African countries).

Step 4 - Skills - a fundamental issue in education for sustainable development. Several of the competences targeted by ESD are derived from the key competences for education framework, namely: acting autonomously, interacting with one's environment, interacting effectively with others. UNESCO's work on competences is based on the report Learning: the Treasure Within (1996), which contains the following pillars: (i) learning to know, (ii) learning to do, (iii) learning to be, (iv) learning to live together, (v) learning to transform oneself and society. Of course, each country will seek to give priority in its education system to skills that are consistent within its specific cultural, social, environmental, and economic framework. However, there are skills that are related to the pedagogical objectives and modalities of ESD: critical analysis (ability to ask questions, seek answers, debate, choose, argue), systemic reflection (ability to analyse and understand complex situations, to accept several points of view and partial solutions), transdisciplinary approach (ability to mobilise several fields of knowledge, know how to connect and discuss them), collaborative decision-making (know how to collectively build an optimal solution for all, motivate stakeholders to converge, develop a common

vision of a project), a sense of responsibility (act responsibly, ability to assume responsibilities and take charge of missions). It should be noted that in all these skills, there are interactions between mobilized knowledge, attitudes, and values.

Conclusion

Education for sustainable development has been implemented by the resolution 57/254, proclaiming the United Nations Decade of Education for Sustainable Development (2004-2015). In 2018, UNESCO placed ESD at the heart of the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (United Nations, 2015). ESD is explicitly mentioned in target 4.7: "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development" (UN, 2015, p. 19). Beyond the good practices and guidelines, the success of ESD requires a strong conceptual and methodological foundations. From the conceptual point of view, ESD involves controversial issues, complexity, transdisciplinary approach, system thinking method, principles and values. From the methodological point of view, ESD introduces a new framework. The REDOC model is an educational model which analyses people's representations, uses pedagogical methodology, proposes didactic tools and suggests new skills. As education seems to be the new vehicle for better sustainability, it is necessary to engage world's citizens in order to change their behaviour and accept more responsibility.

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