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Understanding the failure of Education for Sustainable Development:
An analysis of the content and pedagogy of Education for Sustainable Development

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Abstract

Widespread changes to the social, economic, and natural environments caused by human activities threaten the increase in life quality achieved in the 21st century. This has led to the acknowledgement that a sustainable transition of our societies is required so that the basic human needs of current and future societies are met. The recognition of education as one of the main tools to achieve this transition has led to the creation of education for sustainable development (ESD), which aims at transmitting skills, values, and ethics of sustainability. Although there have been numerous declarations of intention from states and global governing bodies, evidences show a gap between the expressed ambitions and the effectiveness of ESD implementation. One of the main challenges is to switch from an environmental studies-centered approach to ESD, where sustainability competences are merely seen as a collection of learned knowledge and skills, to a holistic educational approach where the entire educational and social structure is devoted to transmitting sustainability skills and values and give opportunities to act sustainably. The aim of this thesis is to 1) understand what is ESD, its relation to sustainable development and to the educational process; 2) identify the obstacles to an efficient implementation of ESD; and 3) define the content and pedagogy of ESD. The intention is to build a content and pedagogical framework that can be used for the implementation of ESD in educational contexts.

Key words: Education for Sustainable Development; Education for Sustainability; Sustainable Development; Transformative Education; Sustainable Development Goals.

Content

I. Introduction: making the case for a sustainable society	4
a. Education at the centre of sustainable development.....	5
b. Aim of the thesis	6
II. Foundation of Education for Sustainable Development.....	7
a. Sustainable development: definition and concepts	7
c. Relation between sustainable development and education.....	10
III. Education for Sustainable Development: definition and approach	11
a. Defining ESD.....	11
b. Current approaches to ESD.....	12
c. Reframing ESD as a pedagogy: a potential solution for ESD implementation?.....	14
IV. Defining the content and pedagogy of ESD	17
a. Defining the essential content of ESD.....	17
b. Pedagogical approach to ESD	21
V. Assessment and examples of ESD implementation	24
a. Assessment of ESD program	24
b. Selected example of ESD programs	26
VI. Discussion	29
a. Conclusion.....	30
References	31
List of abbreviations	37
Appendices.....	38

I. Introduction: making the case for a sustainable society

Education has a main role to play in the sustainable transition of our societies, and for this purpose it is important to understand how education for sustainable development can be implemented efficiently. In the 21st century, the world has enjoyed significant social progresses. The UN's Sustainable Development in the 21st Century Project (SD21) reported in 2012 an increase in global literacy and education, a decrease of poverty and famines, and a global growth of the economy (United Nations, 2012). These social progresses, which improved the life quality of the world population, are mitigated by threats posed by the degradation of the natural and social environments and rising inequalities mostly between the South and the North, and a renewed increase of starvation (United Nations, 2019).

Since the 90', there has been a rise in concern about the state of Earth's environment and its impact on societies. Notably, a scientific consensus emerged that human activities are causing widespread damages to the environment (IPCC, 2013a; Pievani, 2014; United Nations, 2012). Environmental changes, by creating scarcity and instability around key natural resources such as food and water, fuel conflicts and further economic and social instabilities (IPCC, 2014). To highlight the scale of the damages, the UNHCR estimates that in 2017 extreme weather events, made more likely because of environmental changes, have been responsible for 18.8 million disaster-related displacements, most of which because of droughts, cyclones and flooding (UNHCR, 2018). Economically, inequalities have been rising for over 70% of the world population since at least the 90' (United Nations Department of Economic and Social Affairs, 2020). This has large consequences for individual lives as well as whole societies, as countries with higher economic inequalities usually suffer from stronger social stratification (Andersen & Curtis, 2012) and a decreased support for democracy (Andersen, 2012). In Europe alone, damage costs due to environmental change has increased from EUR 9 billion in the 1980' to EUR 13 billion in the 2000' (European Environment Agency, 2012) and has claimed thousands of lives for example because of extreme heat events or widespread air pollution (Rabl, 2003; "Summer Heat 'killed Nearly 1,500' in France," 2019). More recently, the emergence of the SARS-CoV2 causing the Covid-19 disease, which as of today has claimed hundreds of thousands of lives, has been made all the more likely because of the destruction of the environment by human activities (Smith et al., 2014; Vidal, 2020).

As these disruptive changes are expected to worsen, so are the costs going to increase as well as the number of lives it will claim (European Environment Agency, 2012; IPCC, 2013b). The recognition of these facts has led governments to declare a global emergency, notably through the United Nation's "Our common future" declaration in 1987 (World Commission on Environment and Development (WCED), 1987), and recently the establishment of the sustainable development goals (United Nations, 2017) setting an action plan for states towards sustainability. Indeed, urgent actions must be taken to transform our societies to save our civilizations from a global collapse. This societal transformational process is called sustainable development.

a. Education at the centre of sustainable development

Education is a powerful tool to make lasting changes in the values of societies (Apple, 2013). In essence, the core concept of sustainable development is a set of values that once adopted enables current and future societies to meet basic human needs (Kates et al., 2005). Because education is seen as a key factor to transmit values and ethics of sustainability, it is recognized by the United Nations as one of the main tool to implement a sustainable transformation of our societies (United Nations, 2018). From this recognition stems the concept of education for sustainable development (ESD), which aims at developing and transmitting knowledge, skills, values and behaviors needed to live sustainably in today's and tomorrow's world (UNESCO, 2014).

Despite the adoption of ambitious goals for a sustainable transition, the implementation of ESD has been lagging. Implementing ESD would require governments to incorporate education into national strategies and plans for sustainable development (International Union for Conservation of Nature and Natural Resources, 2002). Such implementation needs to go beyond wordings and provide meaningful means and objectives for ESD, mainly by shifting the focus from individual's skills and knowledge into whole societal problematic (Poeck & Vandenabeele, 2012). Although there is currently little to no evidences about what would make an effective implementation of ESD (Pauw et al., 2015), it is clear that there is a lack of guidance into how to implement ESD at school (Wals, 2015). This calls for the establishment of a unified understanding and practical guidelines to implement ESD.

b. Aim of the thesis

It is globally acknowledged that to mitigate the negative impacts of environmental changes on ecosystems, societies and economies, our societies must operate a transition towards sustainability. Education has a central role in this societal change, as education has the potential to act as a vector of transmission of sustainable values and ethics. More specifically, the implementation of education for sustainable development is being actively advocated by the United Nations and adopted by more and more nations as an essential part of their strategies to transform durably and sustainably our societies. However, besides numerous displays of acknowledgements, the implementation of ESD has been lagging and ineffective.

I suggest that the lagging and ineffectiveness of the implementation of ESD may be down to a lack of understanding into *what* is ESD and *how* ESD must be implemented. A solution is to establish a concrete content and pedagogical framework for educational structures to be used as a tool to implement ESD in a meaningful way. This thesis is a literature review that aims at proposing a unified understanding of ESD and to propose criteria for the implementation of ESD through the reviewing of existing academic literature, reports from the UNESCO, and evidences from curricula and school program. Through this thesis, I will 1) investigate the link between sustainable development and education and the foundation of ESD as a topic (Chapter II); 2) review how is ESD currently understood in the academic literature vs evidences of how it is understood and implemented by states and schools (Chapter III); 3) define the content an pedagogical approach of a meaningful ESD program (Chapter IV); and 4) evaluate and review examples of successful ESD implementation (Chapter V).

II. Foundation of Education for Sustainable Development

Education for Sustainable Development (ESD) comprises two different concepts. The first is the concept of *sustainable development*, which is a process by which societies and their current members can meet their fundamental needs without hindering the needs of future generations. The second concept is *education*, a process through which knowledge, skills and values are acquired. *Education for sustainable development* is thus a process through which to acquire knowledge, skills and values needed to take actions towards the sustainable development of our societies. In this chapter, I review the aspects of sustainable development that are relevant to understand ESD. Understanding the importance and main concepts of sustainable development is a needed pre-requisite to understand the goals of ESD and how best to implement it.

a. Sustainable development: definition and concepts

As anthropogenic activities are the main drivers of current environmental changes, the solution lies in the transition of our societies towards sustainability. The creation of World Commission on Development and Environment of the United Nations in 1982 helped to define what sustainable development aims to achieve, notably through the Millennium Declaration (UN General Assembly (55th sess. : 2000-2001), 2000). Since then, repeated political commitment has shown the importance of sustainable development as a common global direction. Notably, in 2017 the 17 goals and 169 targets for the implementation of sustainable development in the world were announced by the United Nations in the 2030 Agenda for Sustainable Development (United Nations, 2017), thus giving clear sustainable goals and targets to states and helping to define sustainable development and elaborate its concepts.

Definition

Sustainable development is defined as Humanity's "ability to make [the] development [of societies] sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development (WCED), 1987). The underlying meaning of sustainable

development is to ensure that basic human needs will be sustained across societies and generations through environmental protection, an equitable economic growth and durable social stability, which represent the three main axes of sustainable development.

The concept of sustainable development arose from post-war collective concerns about maintaining peace, threatened by the cold war and the proliferation of nuclear weapons, as well as seeking freedom from oppression through the implementation of the Human Rights. (Kates et al., 2005). It is only since the 90' that the focus on protecting the environment from damages done by human activities became the almost sole focus of sustainable development. With the development of the notion of ecosystem services, which assigns economic value to ecosystems depending on what economic service it gives, and a more widespread acknowledgement of the role of human activities in environmental destructions, came the idea that the conservation of the environment is thus linked to economic development and social stability (Kates et al., 2005; World Commission on Environment and Development (WCED), 1987). As many resources needed for economic growth and social stability are provided by the natural environment, environmental protection thus became the central theme of sustainable development, at the detriment of the economic and social concepts in sustainable development.

Concepts

According to the National Research Council (1999), sustainable development can be separated from the concepts of *sustainability*, or what is to be sustained, and *development*, or what is to be developed. Sustainable development can thus be understood through what is to be sustained, and what is to be developed to ensure sustaining. Three different dimensions to be sustained are recognized (table 1): nature, which is constituted of the biological and inorganic environmental components of Earth and its ecology (i.e. how these components are linked and interact together); life support, which are the resources needed to sustain life and are found in the environment and through ecosystem services; and finally human communities, which are the cultures, groups, and structures comprised and made up by people and forming societies. From these three dimensions to be sustained, there are three dimensions to be developed: the first is people, which represent the life quality of

individuals through good health, education, economic opportunities; the second is the economy, which is the material wealth created, shared and exchanged by groups of people; and finally the societies, which represent how groups of people are organized, including their institutions, traditions, and cultures. (National Research Council, 1999)

Table 1: Sustainable development specifics. Adapted from National Research Council, Policy Division, Board on Sustainable Development, Our Common Journey: A Transition Toward Sustainability (Washington, DC: National Academy Press, 1999).

WHAT TO SUSTAIN	WHAT TO DEVELOP
NATURE	PEOPLE
Earth, biodiversity, ecosystems	Child survival, life expectancy, education, equity, equal opportunities
LIFE SUPPORT	ECONOMY
Ecosystem services, resources, environment	Wealth, productive sectors, consumption
COMMUNITY	SOCIETY
Cultures, groups, places	Institutions, social capital, states, regions

Sustainable development thus is organized around three central aspects. The first is the natural environment, which provides ecosystem services and resources needed to sustain and develop our societies and the lives of people. The second is the economy, which exploits the environmental services, creates, and defines wealth distribution among people and societies. The third is the society, which is the sum of people, their rules and cultures which is both the origin and the recipient of the exploitation of the environment and the creation and distribution of wealth, through the establishment of structures, rules, customs and cultures. As the values and concepts of sustainability are a shift from the current values of our societies, such as the prioritizing of economic growth over the sustainability of the natural environment or social welfare (Bartelmus, 2013), education plays a major role in the transition to sustainability of societies.

c. Relation between sustainable development and education

The importance of education in relation to sustainable development rose alongside the emergence of the concept of sustainable development, as being the educational counterpart of the implementation of sustainable development in societies. Notably, education was first explicitly mentioned as an essential component of sustainable development in 1993 in the United Nation's Agenda 21 (United Nations Conference on Environment and Development, 1993). Recently, the recognition of the role of education to implement sustainable development has been further strengthened in the sustainable development goals of the United Nation's 2030 Agenda for Sustainable Development. Education is recognized in each of the 17 goals as playing an important role in achieving sustainability and is explicitly recognized in the goal 4, with the aim that by 2030 "learners acquire the knowledge and skills needed to promote sustainable development" [goal 4.7]. The 2030 Agenda put a particular emphasis on education and younger generations to implement sustainable development, as [51]"Children and young women and men are critical agents of change and will find in the new Goals a platform to channel their infinite capacities for activism into the creation of a better world" (United Nations, 2017). The first concrete global attempt to organize and implement educational program aimed at sustainable development was done through the UNESCO's Global Action Program on Education for Sustainable Development, a program that ran from 2015 until 2019 (UNESCO, 2014).

There is thus a clear recognition that younger generations and education are key elements in the transition towards sustainability (United Nations, 2017). This clearly paves the way to develop an education which aims at the sustainable development of societies as a key element in implementing sustainable development. This educational process with sustainable development as a goal is what defines Education for Sustainable Development.

III. Education for Sustainable Development: definition and approach

The concept of ESD stems from the recognition that education plays an important part in creating a sustainable future for our societies. ESD is a multilevel concept aiming at providing an understanding of how the natural environment, economics, and human societies interact and to provide tools to promote a sustainable future in which humanity can live and thrive (Jucker & Mathar, 2015; Stables & Scott, 2002; UNESCO, 2014). Academic literature defines ESD as a holistic process that encompasses environmental, social and political education, with all actors from the learners' community having a role in the educational process (Jucker & Mathar, 2015; Poeck & Vandenabeele, 2012). However, evidences from surveys and curricula shows that current approach to ESD is based on knowledge content rather than values, with a focus on environmental studies at the expense of the economic and social aspects of sustainable development.

a. Defining ESD

Education for Sustainable Development is about empowering the current and future generations to meet their needs, through the development of knowledge, skills, values, and attitudes that enables informed decisions and responsible actions regarding environmental integrity, economic viability, and a just society for all with a respect for cultural diversity (Leicht et al., 2018; UNESCO, 2014).

Ideally, education for sustainable development must be understood as a holistic process that includes environmental, social, and economical education which promote a sustainable future through the involvement of the whole community into the educational process (Leicht et al., 2018). ESD is a learning experience to be implemented in every aspects of the learners' lives, and seen as a process in which the learners are given tools to build and understand relationships with other people, societies and the environment (International Union for Conservation of Nature and Natural Resources, 2002; Jucker & Mathar, 2015; Leicht et al., 2018). ESD should encompass, according to the UN's 2030 Agenda for Sustainable Development, "education for sustainable development and sustainable lifestyle, 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" (United Nations, 2017, goal 4.7).

ESD should focus on integrating values and ethics of sustainable development in every aspects of the learners' education and lives (Leicht et al., 2018; UNESCO, 1977; United Nations, 2017). For this purpose, ESD should be based on concrete examples and provide concrete opportunities for actions that the learners can make, offer real participation and possibility of action, and integrate local and global partners (Jucker & Mathar, 2015). Indeed, it is easy to link ESD to concepts such as food and drink, energy, traffic, well-being, culture, political actions, and many others, into every aspect of the learners' lives. Thus, ESD is not just a collection of skills that some students must acquire, but rather a set of attitudes, mindsets, values, skills, actions and knowledge that enable the concrete implementation of sustainable practices integrated in personal, local and global problematics (Poeck & Vandenabeele, 2012). However, current content and pedagogical approaches seem to both focus almost exclusively on the environmental part, and to treat ESD as a set of abstract knowledge to be learned.

b. Current approaches to ESD

Although the necessity of ESD has reached a global consensus about its importance, it has so far translated poorly in educational implementation (Wals, 2015). Current approaches to ESD suffers two main shortcomings. The first is a skill-centered approach of ESD that lacks the development of a durable culture of sustainability. The second is the over-emphasis on the environmental part. Essentially, ESD is relegated to environmental studies and treated like other academic subjects, where the pupils are supposed to acquire specific knowledge about ESD and expected to become sustainability citizen just because they have related knowledge (Vare & Scott, 2007). This approach seems to reflect how government, teachers and students understand ESD, suggesting that the effective implementation of ESD is mostly due to a lack of understanding into how to implement it rather than a lack of will.

Teachers' and students' understanding of ESD

Insights into how teachers and learners understand ESD sheds light into why the implementation of ESD seem to be so poor. Teachers are an important group to study as they are the ones impacting the most how states' curricula are implemented in classrooms. Thus, understanding how they approach certain topics, like ESD, may give precious insights into how programs are implemented. Among teachers, surveys seem to indicate that 1) teachers (and teacher students) have an environmental-centric understanding of ESD and consider it to be studied as part of environmental studies; 2) teachers are motivated to implement ESD (Cebrián & Junyent, 2015; Spiropoulou et al., 2007). Students are the other half of the equation in implementing educational programs, as it is important to understand their needs and attitudes in order to adapt the programs to them. Similarly to teachers, surveys highlight that students have an environmental-centric view of ESD (Zeegers & Francis Clark, 2014). Generally, this poses problems as it indicates that teachers and students do not realize the importance of the economic and social parts in promoting sustainable development. This may be an explanation into why the implementation of ESD at school seem to be lagging behind its expressed ambitions (Leicht et al., 2018).

Implementation of ESD through curriculums

The implementation of ESD by states, through their educational curriculum, seem to be focused on environmental studies and approached as only a set of knowledge and skills (Gibb, 2016; Leicht et al., 2018; UNESCO, 2014). This approach is for example visible in the French curriculum. The ESD plan in the French curriculum, first implemented in the fall 2019, only concerns high-schools and is strongly oriented towards environmental studies (divided between various subjects in France) and specific content (ÉDUCATION AU DÉVELOPPEMENT DURABLE, 2007). Although it recommends whole-school projects and encourage citizen initiatives, a lack of global school approach, of values teaching, and a heavy bureaucracy is impeding the development of global approach to sustainable development.

Finland provides an interesting case as ESD as an educational concept was already present in the curriculum in use in the 90'. A survey made in 1999 reported that 66% of institutions of general education had the promotion of sustainable development in their school curricula

(Loukola et al., 2001). The current curriculum, implemented in 2016, clearly states sustainable development as one of the main value of the curriculum, and every school subject has objectives related to sustainable development and this from the 1st grade on (Finnish National Board of Education, 2016). Curiously, data regarding the current extent of the application of ESD in schools seem to be lacking. Also, sustainable development objectives are usually vague and only detailed in environmental studies. Although there is a stated effort to approach ESD as a global school approach, in practice the vagueness of the guidelines leaves the implementation of ESD to the will of the teachers and headmasters, and students are ensured to receive a form of ESD only through environmental studies.

c. Reframing ESD as a pedagogy: a potential solution for ESD implementation?

The way ESD is being implemented in schools suffers two shortcomings: the first is the approach of the topic through knowledge content at the expense of values education and the learners' context; and the second is the over-emphasis on environmental issues while ESD also includes economic, political, cultural and social aspects (Gibb, 2016; Leicht et al., 2018; UNESCO, 2014). Interestingly, this approach is in accordance with how ESD seems to be approached and understood by teachers and teacher students (Cebrián & Junyent, 2015; Spiropoulou et al., 2007). However, a content approach through environmental studies is far from sufficient to implement ESD effectively. Instead, there is a need to adopt a holistic approach to ESD, and establishing a clear content and pedagogy may help in this objective.

Shortcomings of the current approach to ESD

As mentioned before, the first shortcoming of the current approach to ESD is its delivery through subject content. Classically, education has been seen as a tool to transmit an arbitrary set of knowledge often with no connection to the realities of the life of the learners, a process called banking education (Freire, 1970). Such education is considered successful when the learners are succeeding at standard tests, often in written form and with a focus on arbitrary knowledge content, best exemplified by the PISA ranking (Breakspear, 2012; Grek, 2009). A drawback to this educational approach is that more often than not the pedagogical content do not respond to the needs of the learners and the societies, present and future,

and do not provide the learners tools to develop critical thinking (Freire, 1970). ESD does not escape this rule, as for example shown in the French and Finnish curriculum, where ESD is defined by an arbitrary set of skills and knowledge. This approach of ESD based on content learning is assured to fall short of the objectives of sustainable development to change whole societies towards sustainability, as ESD needs to be connected to real-world, global, local, and personal problematics and values to be truly emancipatory (Wals, 2015).

The second shortcoming laid bare in curricula analysis and surveys is the over-emphasis on the natural environmental aspect of sustainable development. Although historically sustainable development stems from the need to ensure world peace during the cold war, approach to sustainable development has taken an almost exclusive environmentalist turn with the rising of environmental awareness and green politics. Furthermore, ESD has its roots in the United Nation's Environmental Program (Leicht et al., 2018). As a result, a convergence between environmental studies and sustainable development has been the default approach to ESD in most contexts, including schools. Exclusively linking ESD to environmental studies poses a major problem as the social and economic aspects of sustainable development are completely overlooked, although constituting fundamental aspects of sustainability (Leicht et al., 2018). Furthermore, as environmental studies are usually organized around fact-based learning, it also fails to give relative and reflective experiences that are needed to develop values and attitudes compatible with sustainability.

Finding and defining an effective approach to ESD

Effectively implementing ESD requires to shift away from classic forms of education and adopt a transformative mindset. Banking education, identified by Freire as the standard approach to education, is usually disconnected from the realities of the learners and thus fails to make a meaningful impact on the learners' lives and societies (Freire, 1970). Trying to implement ESD in such a system can thus be argued to be a guaranteed failure. Indeed, it is not realistic to expect ESD to make a meaningful impact on learners and societies if it is approached in similar ways as learning algebra or grammar. Sustainable development requires a shifting of our values and the involvement of every citizen to make personal actions and to be active in local and global projects. Indeed, education for sustainable development following this model

by offering the learners the necessary skills, knowledge, and values compatible with sustainable development, and the opportunities to act sustainably in personal, local, and global level, has been shown to significantly promote the learners' sustainability competencies (Pauw et al., 2015).

I argue that a lack of a unified content to ESD and an associated pedagogical approach are reasons why ESD has failed to materialize globally. Despite numerous declarations since at least the 80' on the need for a sustainable world (World Commission on Environment and Development (WCED), 1987), and the recognition of education as central for the transition towards a sustainable world since at least the 90' (United Nations Conference on Environment and Development, 1993), it is only in this decade that ESD started to appear in educational contexts. Indeed, it is only in 2015 that the United Nations started the Global Action Program (GAP) on ESD, a program aimed at generating ESD into educational programs in different nations (UNESCO, 2014). Before the GAP, ESD was mostly confined to political declarations, academic discussions, and a handful of educational institutions. Building up on the results of the GAP ESD and the academic literature, it is possible to define the essential content of ESD and an associated pedagogy that is expected to have a meaningful impact on the lives of the learners and societies.

IV. Defining the content and pedagogy of ESD

A solution to make ESD meaningful is to define an ESD content and a related pedagogy that allows a concrete implementation of ESD. Although ESD is a recent concept, concerns regarding the preservation of the environment, the development of a just society and a fair economy are not new, and these concerns have already been translated in educational actions. By reviewing existing academic literature, identifying existing pedagogies and educational programs compatible with sustainable development, it is possible to build a pedagogical framework that would allow ESD to be translated into concrete programs leading to tangible results.

ESD is best approached as a whole school/society process (Gibb, 2016; Stables & Scott, 2002). The essence of ESD is about integrating education into sustainable development, by making education an integral part of the sustainability process, and to integrate the transformational process of sustainable development into education (Gibb, 2016). Implementing ESD requires learning methods that give the motivation and the tools for learners to take sustainable actions in their own lives and the wider society (Leicht et al., 2018). Indeed, ESD is not a subject but a set of values, actions, and knowledge to be implemented in every parts of the learning process. It thus requires in most cases fundamental changes in the way education is approached in societies.

This chapter will first review a list of essential criteria needed to have ESD implemented in an educational context such as schools, as well as defining a pedagogical approach best suited to implement ESD. This chapter and the proposed criteria to define ESD are summarized in the Appendix 1, which is also a proposed tool for designing and evaluating ESD programs.

a. Defining the essential content of ESD

A successful ESD is a lot defined by its ability to deliver skills to solve complex problems in a sustainable way. Indeed, the novel nature of the challenges faced by our societies requires the capacities to solve new, complex, and unpredictable problems (Wals, 2015). Learning for sustainability requires the capacity to analyze and understand complex problems, of being critical of proposed solutions, and to offer opportunities to take actions at a personal, local and global level (UNESCO, 2014). ESD is thus centered around giving the learners the capacity

to take informed decisions and actions in favour of a resilient environment, a fair and viable economy, and a just society.

To define the essential content of ESD, it is important first to understand the goals of ESD, and to understand the three essential key competencies of ESD: the knowledge and skills needed to understand sustainable development, the sustainability values needed for self-motivation, and the opportunities for actions (Leicht et al., 2018).

Pedagogical goal of ESD

The main pedagogical goal of ESD is to maximize the sustainability performance of the learners, i.e. the actions of the future citizens (the learners in this case) that ultimately enable current generations to meet their needs without impacting future generations' ability to meet their own needs (Leicht et al., 2018). The sustainability performance of the learners is affected by the knowledge and skills they possess which enable educated decisions and actions, and by the personal values which provide self-motivation and attitudes to act sustainably (figure 1). To act on these values and put skills in practice, learners must get opportunities to act sustainably, whether at a personal, local, and/or global level (Leicht et al., 2018). ESD is thus not depending on a list of "to-know" or "to-do", but rather forms a complex system in which knowledge, values and opportunities all influence each other's (Gibb, 2016) and ultimately determine the sustainability performance of the learners (Leicht et al., 2018). Based on this, it is possible to draw a list of requirements necessary for a sustainability curriculum at school that would efficiently implement ESD.



Figure 1: key competencies and performance from sustainability citizen. Author: Marco Rieckmann in Leicht et al. 2018

Knowledge and skills

Core knowledge for ESD provides a base from which to draw to make informed decisions and process new situations and new knowledge, while core skills are necessary to enable the learners to take actions (Gibb, 2016). The core knowledge of ESD is organized around understanding the natural environmental systems, which aims at giving knowledge about how the environment works and the relation between human societies and nature; sustainable economy, to understand what is a sustainable economic system as opposed to our current system; and cultural diversity, through which to raise awareness and tolerance about the diversity of cultures and societies; and finally how these three components interact with each other's to form complex systems (Leicht et al., 2018). Acquiring sustainability knowledge and skills allows future citizens to interpret, understand and extrapolate in complex systems in an informed and skilled way, as well as to think critically, learn to communicate and to act in complex systems (Wals, 2015). The goal is to enable the future citizens to know how to take action, to cooperate, operate in interdisciplinary context, and resolve conflicts in heterogeneous social environments in order to act sustainably. These

knowledge and skills aren't taught as a specific subjects, but must be approached in all subjects and aspects of learning (Gibb, 2016).

Values and Attitudes

Values and attitudes are what enable future citizens to act with self-motivation, as to answer the question "for what?" about sustainable development (Wals, 2015). In the context of ESD, future citizens are encouraged to adopt values that are compatible with sustainability mindset, so that the actions of the current generation enables access to their needs for livings without impacting future generation's needs (Kates et al., 2005). Essentially, sustainable values are organized around the Human Rights but also extended to include an environmentalist aspect as well. Sustainability values and attitudes, such as respect for Human Rights or responsibly consuming resources, develop the respect for the natural environment, for cultural diversity, for other cultures, develops responsible consumption habits and promote cooperation. This aspect of ESD is essential as it is what gives the future citizens self-motivation to act sustainably (Leicht et al., 2018).

Opportunities for actions

Opportunities for actions is what enables knowledge, skills, values, and attitudes to be knitted together and put in practice. While knowledge builds capabilities to understand complex systems, and values are what drive actions, it is the opportunities for actions that allows the learners to adopt behaviors in accordance with their values and attitudes (Gibb, 2016). Indeed, because values and attitudes are disconnected from adopted behaviors, it is critical that opportunities for actions are given to the learners (Arbuthnott, 2009). Thus, a meaningful ESD program includes a learning environment in which learners have the opportunity to take sustainable actions. These opportunities can be at school, through local operations such as meal choices, energy and water use, possibility for democratic participation into school operation and the building of projects with the school community; but also local and global, with partnership between the school and other communities/organisms (Gibb, 2016). Furthermore, the learning environment itself provides a model of sustainability, by making

sustainability principles (at an environmental, economic and cultural/social level) the guiding principles of the school.

Towards a holistic approach of ESD

Education for Sustainable Development, as a global societal problematic, must be approached holistically (Stables & Scott, 2002). It is the dynamic interaction of the knowledge, skills, values, attitudes and opportunities for actions that defines the sustainability performance of the learner (Leicht et al., 2018). It is thus important that these aspects are not learned separately, but rather are integrated into a holistic approach where every subject, actor and actions are participating towards the building of the sustainability performance (Gibb, 2016). There is thus a need to adopt a pedagogical approach that enables the holistic realization of ESD.

b. Pedagogical approach to ESD

ESD can be deemed successful when the learners are empowered and motivated to become active sustainability citizens (Leicht et al., 2018). It is clear that a separated collection of unrelated learning content or an emphasis on only environmental studies, which are solutions favored by a traditional approach to education, will not be enough to deliver a meaningful ESD (see chapter III). This means that alongside implementing a whole-school ESD content, there is also the need to fundamentally change our pedagogical approach to education in schools (Barth & Michelsen, 2012). A pedagogy that focuses on the desired outcome of ESD - that is, maximizing the sustainability performance of future citizens- while promoting concrete actions would thus best ensure an effective implementation of ESD. Transformative pedagogy offers an ideal framework for this, while project- and inquiry-based learning provide concrete tools for action-oriented learning.

Transformative pedagogy at the core of ESD

Transformative pedagogy focuses on the aims and principles that a curriculum seeks to transmit, as well as how the learning is achieved (Mezirow, 2009). Transformative pedagogy offers a learning environment where the learners are at the center of the educational process and are offered possibilities for reflection and the evaluation of values, behaviors and lifestyles (Mezirow, 2009). It is in contrast with a banking approach to education which focuses on learning specific content and knowledge, often with no context and no aim to create a lasting impact on society (Freire, 1970). Learner-centered pedagogy puts the learner at the center of learning. Concretely, instead of passively listening at an expert (in a classroom, the teacher) and then trying to remember, the learner is guided to investigate problems, acquire applicable knowledge, and find solutions. This approach usually leads to superior learning outcomes than traditional approaches (Schalk et al., 2018).

Transformative pedagogy is especially adapted in the context of ESD (Rodríguez Aboytes & Barth, 2020). Indeed, students learning ESD through transformative pedagogy have been shown to possess knowledge, skills, values and attitudes related to sustainability, as well as the ability to take sustainable actions. Through ESD, learners become active sustainability citizens when they question the societal status-quo and become co-creator of new solutions that are entrenched in sustainable principles. Such aim can be reached only if the learners have integrated into and by themselves sustainability values and are given opportunities to act on their values and beliefs. Transformative learning offers efficient pedagogical tool to implement lasting social transformations towards sustainability. (Rodríguez Aboytes & Barth, 2020)

In a similar spirit to transformative pedagogy, humane education provides a set of values and attitudes that are sustainable at their core. Humane education is an educative approach that seeks to develop compassion and respect for all living beings, raising non-human life especially as important as human beings (Weil, 2004). Ultimately, humane education is about giving the learners tools and values which promote sustainability mindset, such as kindness and compassion (Taylor et al., 2009; Weil, 2004).

Project-based learning and inquiry-based learning as practical tools

Learning is best achieved when learners are active creators of their knowledge (Blumenfeld et al., 1991; Boss et al., 2018). Action-oriented learning enables the learners to reflect on their own experience and knowledge, and to draw from them to engage into the learning process. It allows the learners to link knowledge, competencies, skills, and values.

Project-based and inquiry-based learning offers a step-by-step learning framework which contains a concrete experience, such as a workshop, a project or an internship, and allows the learners to make observations and reflections, to draw hypothesis and new knowledge, and finally to draw from this experience and knowledge to act appropriately in other situations (Boss et al., 2018). Project-based learning is a student-centred pedagogy in which students are directed to investigate a real-world problem and to find applicable solutions (Blumenfeld et al., 1991). Through project-based learning, students are directed to learn content through inquiry, and to apply it by finding solutions to problems posed by the project. Inquiry-based learning is a pedagogical method by which students build their own knowledge in relation to a problem (Pedaste et al., 2015). In inquiry-based learning pedagogical method, teachers act as guides by making the student reflect on a problem related to the lesson content. Because it is focused on very specific problematics, it integrates very well in project-based learning as sub-parts through which students investigate problems posed in the elaboration of the wider project. Using such pedagogies enable the students to put into action their knowledge and skills while acting on their values.

V. Assessment and examples of ESD implementation

Assessing whether an ESD program has a meaningful impact to the learners and their communities is crucial to understand how the objectives of sustainable development can be reached. Finding and drawing inspiration from successful examples of ESD implementation in school would provide valuable knowledge, but it is difficult to come by such examples. Although examples of ESD practices can be found, there is currently very little research and reviews about what constitutes an efficient ESD program (Pauw et al., 2015). Furthermore, schools usually do not publish their curricula, nor do they follow up their students. This leaves us with only anecdotal examples of ESD programs and implementations.

This chapter establishes a proposed framework for the assessment of an ESD program based on conclusions from the UNESCO's Global Action Program on ESD (GAP ESD) (UNESCO, 2016) and includes selected examples of ESD programs meeting these criteria.

a. Assessment of ESD program

The assessment and evaluation of ESD program ensures that the adopted content and pedagogy are effective in reaching their objectives, rather than based on faith and opinion. A major drawback is that so far little research has been done about what makes an ESD program effective and meaningful (Leicht et al., 2018; Pauw et al., 2015). We can however use the results of the UNESCO's GAP ESD and theoretical design of ESD as proxies to evaluate what constitutes an effective ESD program. Indeed, UNESCO's GAP ESD, so far the most ambitious implementation of ESD on a global level, provides very useful insights into what sort of meaningful ESD projects can be put up (Leicht et al., 2018; UNESCO, 2016).

During the GAP ESD was launched the UNESCO-Japan Prize on Education for Sustainable Development, which "honours exceptional efforts by individuals, institutions, organizations and other entities engaged in activities promoting ESD" (UNESCO, 2017). Using the set of criteria for the selection of program (UNESCO Global Action Program on Education for Sustainable Development, 2015) and on the definition of the content and pedagogy of an ideal ESD program (see chapter IV), we can come up with a set of criteria that would be expected in an ESD program to be deemed impactful. The criteria could be split in three

categories: *program content*, *integration*, and *learning environment*. The content of this chapter and the criteria for assessment are summarized in the Appendix 2.

Program content

The content of the ESD program includes knowledge, skills and values about sustainability. The content has components related to the natural, social and economic environments to understand the principles of sustainability and sustainable development. It provides skills related to critical thinking, communication, operating in diverse social environment and complex problem solving. Finally, the program provides opportunities for the learners to make concrete actions, for example through the realization of projects or cooperation with other groups or institutions.

Integration

All aspects of the program content are integrated into all subjects and operations. For example, in a school context, the ESD program is integrated into every aspects of the school's operations, such as the subjects taught, the pedagogies used, how the school life is organized, the process involved in school's decisions etc. The content of the program is integrated within one another: the environmental, social and economic part, but also the knowledge, skills and values are all integrated with each other's and in multiple subjects (as opposed to treated in isolation). The program is also integrated in the lives of the learners so that it is adapted to their experiences and to their own lives. The program is also integrated in the local community so that it has an expected and sustainable positive impact for the development of the community.

Learning environment

The aim of the ESD program is to transform the lives of the learners, their community, and the society towards sustainability. For this purpose, a transformative pedagogy and mindset is favoured in the implementation of the program. The ESD program has thus the clear goal

to form sustainability citizens and ultimately transform societies, as opposed to learning an arbitrary content with no further goals than a learning. In order to make the learning experience meaningful, the learning environment is related to the lives of the learners and there is the use of project-based pedagogy. Through the implementation of the program and the learning environment, the learners are empowered to bring sustainability changes in their lives and their communities.

b. Selected example of ESD programs

In this section selected examples of ESD programs are discussed. All the selected ESD programs met all the criteria established in Chapter V) a). Notably, the program content includes environmental, social and economic aspects, the program is integrated into the lives of the learners, and it has a positive impact on the lives of the learners and their community, all while aiming at a sustainable transformation of the learners and their communities.

Although these programs are deemed successful examples, unfortunately a more detailed curriculum was not available for any of these programs. Nevertheless, here are a short description of three programs: *Sihlengeni primary school, Malaika school and community centre, and the Namib Desert Environmental Education Trust.*

Sihlengeni primary school, Matabeleland South Province, Zimbabwe

Winner of the UNESCO-Japan prize in 2017, this school of about 500 pupils is located in a rural area of Zimbabwe. This made that most pupils come from families who are subsistence farmers. Along with a “traditional” curriculum including for example maths, arts and languages, the school has put an emphasis on learning from its local social, economic, and natural environment. Indeed, the school has put in place a “permaculture” program through which students learn to manage and use land in a sustainable way, so to overcome local environmental. Among practical examples, the school grows its own food, recycle its water, has courses into how to manage land, produce food and sell food products, all while enabling a sustainable culture through the use of local species and avoiding for example wastes or pollutant. This ultimately empowers the whole local community by transmitting useful and

sustainable skills through the learning of the pupils, and many of the students end up developing their own business. (UNESCO, 2017)

This example is a good illustration on how to use the experiences and lives of the students to make the learning meaningful for their lives and impactful for the community. By providing learning into how to exploit the local environment in a sustainable way, while learning how to set up businesses, the local kids end up protecting their local environment while raising the living standard of the whole community.

Malaika school and community centre, Haut-Katanga province, Democratic Republic of Congo

Founded in 2007 by Noella Coursaris Musunka local women who has lived and got an education in Europe, the aim of the school and community centre has been to provide education for the local girls. This has been a significant endeavour for the local community, as the region has been home to military conflicts due to post-independence political instability between the 60' and 80', and that the level of education remains overall low, with high child mortality and poor prospects of empowerment for the local girls.

The school has been shown to have a positive impact on the community, by providing education to local girls, but also through the development of a sustainability program. Indeed, the school provide opportunities to students to learn sustainable farming, use of water, learn about the natural environment, develop female role model other than traditional ones, and how to create businesses. (UNESCO, 2019)

This school provides thus a good example into how adapting a program to the needs of the local community, through the use and learning of sustainability practices, leads to a learning which is fully integrated into the local society, the environment, and the economy.

Namib Desert Environmental Education Trust, NamibRand, Namibia

The Namib Desert Environmental Educational Trust (NaDEET) was founded in 2004 with the goal to share knowledge about the Namibian desert. The NaDEET ended up being an educational centre providing educational opportunities about the local environment,

sustainable ways of life, and how communities can live in balance with their natural environment. Nowadays, the NaDEET strives to bring lasting sustainable transformation to the Namibian society. In their programs, the NaDEET provide integrated learning where the learners get to build a sustainable community while putting the skills learned from their national curriculum into use – such as maths or English. (NaDEET, n.d.; UNESCO Global Action Program on Education for Sustainable Development, 2018)

Although this program centres around the environmental part, it still provides opportunities for the learners to learn about how to sustainably use the environment for the benefit of their community. This program is also notable as its program is accessible on their webpage, providing thus useful information about their curriculum.

VI. Discussion

Although there is a clear will to use education as a tool to achieve the sustainable transition of our societies, through a process called education for sustainable development, the implementation of such education so far has not been an effective realization.

Establishing and exploring the link between sustainable development and education allows us to derive the core principles of ESD but also to highlight what is missing from the current approach to ESD. Sustainable development is about developing societies sustainably so to ensure that they meet the basic human needs of present generations without compromising the ability of future generations to meet their own needs. Sustainable development is thus about preserving the natural environment, developing stable, fair and peaceful societies, and having an economic system that is fair to everyone. Education for Sustainable Development thus has the aim to form sustainability citizens, through the maximizing of their sustainability performance, in order to ultimately transform societies towards sustainability. Besides numerous displays of good-will, the implementation of ESD is still however lagging. Indeed, ESD is currently approached by states, teachers, and students as a subject-content to be learned as part of environmental studies, which may explain why the current implementation of ESD is not effective.

Following these findings, academic articles, and reports about the implementation of ESD, it is possible to form a content and pedagogical framework of ESD based on the concept of sustainability performance. The main idea is to use sustainability performance, which is the sum and interaction of knowledge, skills, attitudes and actions taken towards sustainability by a learner / future citizen, as the central aspect of the implementation of ESD. An ideal ESD program consists thus of the inclusion of environmental, social and economic aspects, has values of sustainability and provides opportunities for actions; it aims at impacting the lives of the learners and their community in a positive and sustainable way; and for this purpose, it uses transformative pedagogy, is project-based, and involves the whole community.

a. Conclusion

A working implementation of ESD is needed in order to provide future citizens with lasting knowledge, values, ethics and attitudes compatible with sustainable development. In this thesis, I identified two obstacles to efficient ESD implementation: 1) a subject-focused approach that fails to make a meaningful educational impact; 2) an over-emphasis on environmental literacy resulting in overlooking the social and economic aspects of sustainable development. As potential solution, I suggest the development of an ESD implementation model by first defining essential components of an ESD program, and second by defining a pedagogical framework for ESD by using the concept of sustainability performance.

Besides an evident enthusiasm for ESD, current literature highlights the fact that we do not know what makes an ESD program effective. Nevertheless, it is possible to derive a set of criteria for ESD programs as well as to find examples of apparently successful ESD practices. Future research should investigate the factors that make an ESD program impactful to the learners and their communities, in order to build a unified content and pedagogical framework that could be used by states and teachers in the future.

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List of abbreviations

ESD: Education for Sustainable Development

GAP: UNESCO's Global Action Program

GAP ESD : UNESCO's Global Action Program on Education for Sustainable Development

UNESCO: United Nations Educational, Scientific and Cultural Organization

UNHCR: United Nations' High Commissioner for Refugees

Appendices

Appendix 1: list of suggested criteria for ESD plan evaluation

Competencies / specificities	Goals
<i>Knowledge and skills</i>	
<ul style="list-style-type: none"> - Environmental knowledge - Economic system functioning - Social and cultural knowledge - Dynamic of sustainability - Complex system thinking - Critical and anticipatory thinking - Interpersonal skills - Acting autonomously 	<p>Obtaining knowledge about the environment, the economic system and societies, as well as they relation to each other's in order to have sufficient knowledge to understand sustainability and act sustainably.</p> <p>The development of ESD skills allow the learner to interpret, understand and extrapolate in complex systems; to think critically and reflect on knowledge and opinions; to retrieve and communicate knowledge; to cooperate, act in interdisciplinary context, and resolve conflicts in heterogenous social environment; to elaborate personal or group projects and act on them with self-motivation.</p>
<i>Values and Attitudes</i>	
<ul style="list-style-type: none"> - Sustainability values - Human Rights - Promotion of equality (gender, racial, cultural...) - Cultural and environmental awareness - Responsible consumption 	<p>Values and attitudes give self-motivation. Adopting values and attitudes that are compatible with sustainability mindset, so that current and future generations can meet their needs for living. The learners are at the center of the process, and are made to develop values giving the motivation to adopt sustainable attitudes and take actions. Such values and attitudes</p>

<ul style="list-style-type: none"> - Action oriented - Learner-centered 	<p>develop the respect for the natural environment, for cultural diversity, for human rights; responsible consumption habits that entails a parsimonious use of resources.</p>
<p><i>Opportunities for actions</i></p>	
<ul style="list-style-type: none"> - Opportunities for action - Sustainable facilities - Learners' participation - Whole-school approach - Partnership community outside school (local, global) - School operations (food, heating, energy, water use) 	<p>The learning environment, at school and beyond, must provide the learner with opportunities to take actions towards sustainability. Sustainability is the guiding principle of the school principle (and not just a subject). The school institution is tuned towards giving the learners opportunities to learn and act sustainably, and this at multiple level (personal, local, global). For this, the whole school is operating in a sustainable manner and all of its elements are connected together. All members of the school (learners, teachers, administrators, operators...) get to participate in school operations and have a voice in its governance through democratic process. Facilities and operations (meals, heating, electricity, water use) are sustainable. The whole school showcases a model of sustainability through sustainability culture, interconnection, learner participation, opportunities for action, sustainable facilities. The school has partnership with communities outside schools, such as local councils, NGOs, other schools... at local and global levels.</p>

Appendix 2: list of suggested criteria for the assessment of ESD program

Program content	<ul style="list-style-type: none">- It includes knowledge, skills, and values about sustainability- It has environmental, social, and economic components- The learning provides concrete opportunities for actions
Integration	<ul style="list-style-type: none">- The environmental, social, and economic aspects are all integrated within one another- The program is relevant to the lives of the learners- It has an expected positive and sustainable impact for the development of the community
Learning environment	<ul style="list-style-type: none">- The program aims at transforming society towards sustainability- Transformative pedagogy and mindset are favoured- Use of project-based pedagogy- Learners are empowered to bring changes in their lives and communities