

Achievement of ESD (Educational for Sustainable Development) through mathematics learning

S Y Ningsih^{1,*} and D Juandi²

¹Departemen Pendidikan Matematika, Sekolah Pascasarjana Universitas Pendidikan Indonesia, Jl. Dr. SetiaBudhi No. 229, Bandung 40154, Indonesia

²Departemen Pendidikan Matematika, Sekolah Pascasarjana Universitas Pendidikan Indonesia, Jl. Dr. SetiaBudhi No. 229, Bandung 40154, Indonesia

*sriyunitaningsih@upi.edu

Abstract. The purpose of writing this article is to know the concept of ESD, to know the perspective in ESD, to know the role of math teacher in ESD. Indonesia is a developing country which is actively doing national development from various sectors. This development has nothing but positive impacts or negative impacts. The positive impact is the development in Indonesia is good enough can be seen from improvements in the economic sector, education, infrastructure, and so forth. But the negative impacts come to the environment sector. Even environmental conditions in the last decade are getting worse. This is where the concept of sustainable development (sustainable development) is very important to be applied in order that development goes well without putting environmental interests aside. ESD (education for sustainable development) is a dynamic concept through education that has a noble value for the sake of the realization of a sustainable future. There are three main perspectives in ESD: socio-cultural, environmental, and economic perspectives. Education as an approach used in ESD therefore the role of teachers and the learning process that is in it is very important. ESD can be instilled to learners one of them through learning mathematics.

1. Introduction

Indonesia is a developing country which is actively undertaking national development from various sectors in terms of education, economy, infrastructure, and other sectors. This development has nothing but positive impacts or negative impacts. The positive impact is the development in Indonesia is good enough can be seen from improvement in economic sectors, education, infrastructure, and so forth. But not only the positive impact, the negative impact comes to the environmental sector. Even environmental conditions in the last decade are getting worse. Environment is increasingly concerned about the destruction of the environment, especially forests due to illegal logging, peat land fires, expansion of oil palm plantation areas, developments, and so on will further worsen the environment condition in Indonesia. This is where the concept of sustainable development (sustainable development) is very important to be applied in order that development goes well without putting environmental interests aside.



The history of the development of sustainable development (sustainable development) has lasted long. Starting from the document *Our Common Future* (future together) and published in 1987 by The World Commission on Environmental and Development (WCED), an institution established by the United Nations (UN). Meanwhile, the beginning of the ESD (Education for Sustainable Development) eruption in 1992 "The World Summit on Sustainable Development" conducted in Johannesburg. ESD is an environmental education that is a global issue at a United Nations (UN) conference, which aims to eradicate poverty, alter unsustainable patterns of production, consume existing natural resources.

2. Methods

This type of research is qualitative research. Creswell States that qualitative research is means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem [1]. The process of research involves emerging questions and procedures: collecting data in the participants' setting; analyzing the data inductively, building from particulars to general themes; and making interpretations of the meaning of data. The final written report has a flexible writing structure. Ibnu and friends explained that descriptive research aims to describe events that occur in the present [2]. The results of the study were obtained from the results of several literature studies. The literature used is related to the Educational of sustainable development. The literature is obtained from several international journals. The journal used to discuss this study amounted to 11 pieces, the journal was obtained from different sources. Journal related to ESD: Kemdiknas 2010, Soares M L A and Petarnella L 2011, Mitchell B 2010, Brundtland G 1987, McKoewn R 2002, UNESCO 2009, UNESCO 2007, UNESCO 2006, UNESCO 2012, Gadotti M 2008, Anderberg E, B Norden and B Hansson 2008. The discussion in this study was carried out conceptually, that is based on the reference theory used.

3. Discussion

3.1. History of Education for Sustainable Development (ESD)

The beginning of the ESD (Education for Sustainable Development) eruption is from environmental education that became a global issue during the United Nations (UN) conference. The conference discussed the Human Environment "(The Human Environment) in Stockholm, Sweden, 1972, become the booster for human in focusing attention on environmental issues. At a subsequent conference the global community affirmed the need for interrelationships between the environments and socioeconomic issues both concerning on poverty and lacking in development. Since the 1980s there has been a growing concept of sustainable development in response to the need for balancing economic and social progress with attention to the environment and conservation of natural resources, and continues at the next Decade (1992) United Nations conference "The World Summit on Sustainable Development "conducted in Johannesburg, 193 countries and 58 international organizations participated. It was finally decided to reaffirm the outcome of the meeting in Rio De Janeiro (Eco-92) in the form of commitments relating to interdependency in economic growth, social justice, and environmental protection. The main objective is to eradicate poverty, changing patterns that are not sustainable in producing, consuming existing natural resources [3,4].

The development of sustainable development (sustainable development) has lasted long. Starting from the document *Our Common Future* (future together) and published in 1987 by The World Commission on Environmental and Development (WCED), an institution established by the United Nations (UN). In particular, the task framework of the UN assembly is to (1) propose a long-term environmental strategy for achieving sustainable development beginning in 2000, and (2) to identify how human, resource, environment and development relationships can be integrated into national and international policies. The Commission consists of many representatives of developed and developing countries, as well as holding open meetings in various countries [5].

3.2. *The concept of Education for Sustainable Development (ESD)*

The concept of sustainable development was first introduced in 1987 by the World Commission on Environment and Development (Brundtland Commission) through its book *Our Common Future*. It is in this book that the term sustainable development is introduced. According to the Brundtland Report in the World Commission on Environment and Development, sustainable development is a principled development process on "meeting the needs of the present generation without compromising the fulfillment of the needs of future generations (... to meet theirs)" [6]. In other words, development is essential for the fulfillment of human needs and improving the quality of human life.

Sustainable development is not only focused on one aspect of its economy but also social and environmental. According to Law no. 32 of 2009 on Environmental Protection and Management affirms that sustainable development is a conscious and planned effort that combines environmental, social and economic aspects into a development strategy to ensure the integrity of the environment and safety, capacity, well-being and quality living the present generation and future generations.

Education is a means to introduce this concept of course as an effort to change the perspective, attitude, and human habit of the environment. This is in harmony with McKoewn [7] as confirmed by UNESCO that education as a tool to achieve sustainable development goals [8]. Kemdiknas argues that the concept of ESD as a meaningful, functioning, and aims education for 1) development that can meet the needs of the present generation without having to override the ability of future generations to meet their living needs, 2) improve the quality of human life by staying alive within the carrying capacity of the ecosystem, and 3) beneficial to all beings on earth (human and ecosystems) today and in the future [3].

UNESCO explains that ESD (education for sustainable development) or Education for Sustainable Development is a learning process based on the objectives and principles that underlie sustainability and relate to all levels and types of education. ESD supports five basic learning to provide quality education and nurture sustainable human learning, knowing, learning to be, learning to live together, learning to do, and learning to transform oneself and society [8].

Adapted from the Asia-Pacific regional report UNESCO also mentions that ESD is seen as an approach in education to develop values that support sustainable development with the aim of helping humans learn about knowledge relevant to values, developing healthy habits and lifestyle that will lead to sustainable development for the whole society [9]. ESD also contributes to the acquisition and practice of knowledge, values, and skills that ensure a balance between economic, social and environmental aspects of sustainable development as an effort to advance both individual and community life [10].

It should be emphasized that ESD contains the characteristics of Creation of Awareness, containing local and global vision, learning to be Responsible, Learning to Change, Participation, Lifelong learning, Critical thinking, emphasizing systemic approach and understanding complexity, Decision-making, Interdisciplinary, problem-solving, and satisfying present needs without sacrificing future generations [11].

Education for sustainable development must continue working with environmental education which brought a new view human relationship with the word environment-which is no longer conceived as an object, but as a living creature that shares the same destiny with human beings. Environmental knowledge is ethical and political. It isn't only a matter of understanding ecological principles, but also involves a new concept of reality [12].

3.2.1. *Perspectives in ESD.* There are three perspectives in ESD that become the main pillars are as follows: first, socio-cultural concerning issues of human rights, peace and human security, gender equality, understanding of cultural and intercultural diversity, health, HIV & AIDS, governance. Second, the environment is related to issues of natural resources (water, energy, agriculture, and biodiversity), climate change, rural development, sustainable urbanization, disaster prevention and mitigation. Third, the economy is related to issues of poverty reduction, corporate responsibility, accountability and reorientation of the economy market.

Based on these three perspectives can be seen that the existence of interrelationships between aspects that cannot be mutually exclusive in supporting ESD. It is intended that ESD implementation cannot prioritize only one aspect but must pay attention to these three aspects, namely social culture, economy, and environment. Figure 1 illustrates the interrelationships of the three aspects.

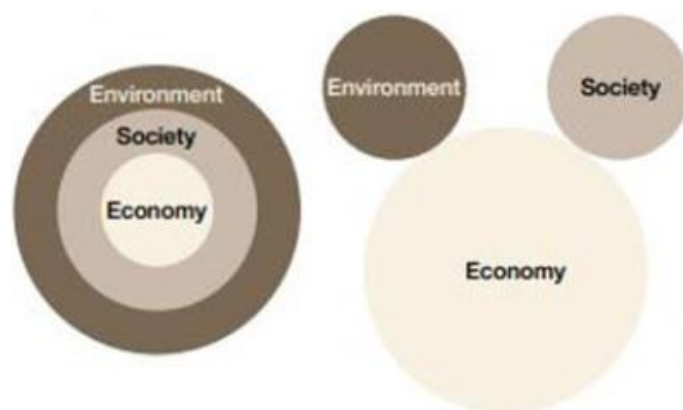


Figure 1. ESD perspective [11].

3.3. ESD through mathematics learning

ESD or education for sustainable development is indirectly contained in the curriculum or subject matter in school one of them in the field of mathematics studies, especially mathematics subjects. It is certainly necessary for the role of mathematics teachers in mathematics learning to integrate ESD in their learning. Related to this matter, not only teachers are required to take an active role in ESD actualization in learning but also need good cooperation with schools including teachers and school citizens presented in the lesson will be more complex by emphasizing the interdisciplinary principle. The importance of ESD in mathematics learning is closely related of schools, students, society, and school environment condition.

To introduce ESD to students then teachers need to do curriculum analysis. Curriculum analysis is done by identifying SK-KD on KTSP curriculum and KI-KD in 2013Curriculum. Thus, the teacher can determine what materials can be inserted ESD concept. Here is the scope of material on mathematics subjects in high school that is: 1). Statistics, 2). Build Space, 3). Systems of Linear Equations.

From these materials can be linked to real issues that exist in everyday life, so as to attract students to learn about the concept of ESD. The topics outlined above can be assessed through an ESD approach whereby teachers can integrate strategies, models, and learning methods to support education for sustainable development. By looking at the ESD prism, the study of science to how mathematics teachers integrate the three aspects of socio-cultural, economic, and environmental issues to discuss issues learned by students so as to provide understanding of knowledge, perspectives, skills and values relevant to his life.

Education promotes sustainable development, using specific methods to change the word. Finally, global learning for sustainable development is currently emerging from the increasing international concern with issue of sustainable development and the demand for both global learning as well as education for sustainable development [13].

4. Conclusions

ESD (education for sustainable development) or Education for Sustainable Development is a learning process based on the objectives and principles that underlie sustainability and relate to all levels and types of education. ESD has 3 perspectives that become the main pillar of social culture, environment and economy. The role of teachers in ESD through mathematics subjects is expected to invite students to know more about what is sustainable development and how sustainable development that exists in Indonesia, in one of them through mathematical material. To introduce ESD to students, teachers need

to conduct curriculum analysis, by identifying SK-KD in KTSP and KI-KD curriculum in Curriculum 2013. Thus, the teacher can determine what materials can be inserted ESD concept. Here is the scope of material on the scope of mathematics, statistics, Space rise, Linear Equation system. From these materials can be linked to real issues that exist in everyday life, so as to attract students to learn about the concept of ESD.

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