Teacher's perception on the implementation of education for sustainable development-based learning in senior high school

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Abstract. This study aims to describe teacher's perception of the implementation of sustainable development-based learning in chemistry, physics and biology subjects. This research is a qualitative descriptive research. The subjects of the research are the chemistry, physics and biology teachers in nine provinces. The data was collected by using interview sheets, questionnaire and observation sheets. According to the analysis data, the result shows that the term sustainable development is still considered foreign by 77.7% of the teachers, the implementation of sustainable development-based learning can be carried out in very good category by 44.44% of the teachers and in good category by 33.33% of the teachers, and 22.22% of teachers have difficulties in implementing sustainable development-based learning. Other results also show that the concept of sustainable development allows it to be applied in all three subjects with the characteristics of the material relating to the environment. This research can be a recommendation for sustainable science learning.

1. Introduction
The concept of sustainable development is firstly defining by World Commission on Economic Development at 1987 in Brundtland report [1-3]. United Nations Educational, Scientific, and Cultural Organization (UNESCO) and the Organisation for Economic Co-operation and Development (OECD) recommend education for sustainable development (ESD) as the role concept to promote sustainable development goals. It focuses on improving the quality of the environment, quality of life, and a more equitable economic growth for sustainability. A sustainable society requires healthy, well-educated, skilled, and active citizens that are informed and motivated to live more sustainably and ensure future generations’ quality of life [4, 5]. UNESCO promotes some learning strategies and models to implement education for sustainable development namely: [6, 7], project-based learning [8], inquiry learning [9], story-based learning, value-based education, authentic assessment, problem-based learning, outside-class learning, and problem-solving communities [3].

The presence of sustainability and ESD in the curriculum varies around the world and the implementation of ESD in schools and universities has been studied in several countries from different continents. Australian primary school teacher’s accounts of their practice illustrate the ways they interacted with the materiality of local places as an essential part of sustainable education. They identified ESD practices within the four sets of relations: the materiality of school grounds; connections with local places; partnerships with community; and creative processes [10]. The teacher must have the
ability to analyze the characteristics of the material, students and learning objectives so that the values of sustainable development can be embedded and embedded properly in the student's personality [11].

Participatory active teaching methods stimulate students to reflect on their own learning about sustainability. Participatory methods such as problem solving, discussions, debates, presentations, fieldwork, experiments, demonstrations, projects and co-operative learning promote competencies such as critical thinking, imagining future scenarios and making decisions in a collaborative way. In this research, the implementation of education for sustainable development is reviewed as the feedback to develop the innovation and reformation of education in Indonesian educational system. The aim of this research is to describe teacher's perception on the implementation of sustainable development-based learning in chemistry, physics and biology subjects.

2. Methods

2.1 Research Design

This research is a qualitative descriptive research. The objective of this research is to describe teacher's perception on the implementation of sustainable development-based learning in chemistry, physics and biology subjects. The data was collected by using interview sheets, questionnaire and observation sheets. The data collecting process consist of pre-teaching and teaching process. In pre-teaching, the subject teacher was asked with several questions that relevant to the topic. This activity aims to describe their knowledge and paradigms about education for sustainable development in Indonesia. In teaching process, the teacher was reviewed about their teaching process on implementation of education for sustainable development concept through developed learning model, that is ESD character model.

2.2 Research Subject and Location

The subjects of the research are the chemistry, physics and biology teachers in nine provinces namely Lampung, Banten, West Kalimantan, Bali, South Sulawesi, West Nusa Tenggara (NTB), East Nusa Tenggara (NTT), Maluku, and West Papua.

3. Result and Discussion

The subjects of this research are the chemistry, physics and biology teachers in nine provinces namely Lampung, Banten, West Kalimantan, Bali, South Sulawesi, West Nusa Tenggara (NTB), East Nusa Tenggara (NTT), Maluku, and West Papua. There is one teacher for specific subject in each province. It was chosen from West Kalimantan, West Nusa Tenggara, and Maluku as the representative chemistry teacher for this research. The physics teachers in Banten, Bali and East Nusa Tenggara was chosen randomly as the representative physics teachers for this research. For representative biology teachers, it was chosen randomly from Lampung, South Sulawesi and West Papua.

3.1 The Result of Pre-Teaching

In pre-teaching stage, the subject teacher was interviewed with several questions that relevant to the topic. This activity aims to describe their knowledge and paradigms about education for sustainable development in Indonesia. The questions are: (1) Have you ever heard about education for sustainable development? (2) What do you know about the term sustainable development? (3) In your opinion, how to integrate sustainable development into classroom? The answer from some teachers about those questions is shown in Table 1.
### Table 1. Teacher responses on sustainable development

| Questions                                                                 | 1         | 2         | 3         | 4         | 5         | 6         | 7         | 8         | 9         |
|---------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Have you ever heard about education for sustainable development?           | Not yet   | Yes       | Not yet   | Not yet   | Yes       | Not yet   | Not yet   | Not yet   | Not yet   |
| What do you know about the term sustainable development?                   | Perhaps it is a concept about sustainability | It talks about economy, environment, and social. | No idea | No idea | No idea | It has goals. It is concerning about our environment, economy that refers people, social. | No idea | No idea | Perhaps it is about development of something |
| In your opinion, how to integrate sustainable development into classroom?  | Through some models or methods | Models or Methods | No idea | No idea | By using lesson plans maybe | The teacher must be trained firstly then through models or methods | No idea | No idea | No idea |

Based on the table above, it indicates that mostly teachers did not know about the concept of education for sustainable development. There are 7 from 9 teachers who did not know about the term of education for sustainable development. It is referring that the term sustainable development is still considered foreign by 77.7% of the teachers. Teacher’s misconceptions about the concept of sustainable development also occurs in teacher’s responses. Teacher’s misconception about the concept of sustainable development is shown from the response of the second questions, education for sustainable development not only encompasses knowledge about the environment, economy and society. It means to promote sustainable living by addressing the learning skills, perspectives and values that people hold [12]. There are 5 from 9 teachers also have no idea about how to integrate this concept into classroom or through education system. It is considered that mostly teacher do not know about their role to promote sustainable development values and goals through education, whereas education is the main aspect to integrate this concept in depth. Teacher’s perceptions of education for sustainable development play a major role in the way they teach and prepare learners for the future [13].

### 3.2 The Result of Teaching Process

In teaching process, the teacher was reviewed about their teaching process on implementation of education for sustainable development concept through developed learning model, that is ESD character model. ESD character model is a learning model that has steps are collecting, consultation, analyzing, communicating and applying [14, 15]. The learning tools consist of lesson plans, students’ worksheet and assessment instrument had been developed by using the steps of ESD character models. The teacher implemented these learning tools in classroom with specific matter relating to environment. The result of teaching process is shown in Table 2.

### Table 2. Implementation of Education for Sustainable Development in Classroom

| Difficulties Category | Frequencies | Percentages (%) |
|-----------------------|-------------|-----------------|
| Very Good             | 4           | 44.44           |
| Good                  | 3           | 33.33           |
| Low                   | 2           | 22.22           |
Based on Table 2 above, it indicates that the teacher can implement education for sustainable development concept through ESD character model in various difficulties category. There are 4 from 9 teachers in very good category. There are 3 from 9 teacher is in good category. This result shows that the teacher is very good learners. They can implement education for sustainable development through ESD character model very good even though they did not understand about that concept previously. Other results also show that the concept of sustainable development allows it to be applied in all three subjects with the characteristics of the material relating to the environment.

4. Conclusion
Based on the analysis data and result It can be concluded that the term education for sustainable development is still considered strange by the teacher but most teacher can implement that concept with specific model. Education for sustainable development can be implemented in classroom with specific matter that relating to environment.

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