

Science Learning Quality to Promote Sustainable Development in Early Childhood Education: A Case Study of Teachers in Tasikmalaya

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ABSTRACT

One of the Sustainable Development Goals (SDG) in the education sector is to ensure children have an access to quality early childhood development, care, and pre-primary education. The government must provide free and compulsory pre-primary education for at least one year with professional educators who can provide learning practices that can stimulate children development and accommodate the needs of sustainable developments. One of the learning practices that meets those criteria is science learning. This paper aims to portray factual conditions associated with achieving the SDG. Four teachers from four different kindergartens in Tasikmalaya were selected to participate in this study. Data were collected by using semi-structured interviews and observations. The finding showed that the quantity of children participating in early childhood education has increased, but availability of human resource has not fulfilled. The teachers that involved in ECE do not have criteria of professionalism. Even the professional teachers face problems in implementing good quality learning, especially in science learning. Additionally, teachers are a critical element for guaranteeing quality education who should be empowered, given equitable training and payment to be professional.

Keywords: Sustainable development, early science, science education, teachers quality

1. INTRODUCTION

Currently, the world is facing environmental problems which happen in the local, regional, and global levels. These problems also affect the emergence of other problems in the social, development, and economic fields (Blatchford, Smith & Samuelsson, 2010; Öztürk & Olgan, 2016). Consequently, sustainable development is crucial for every country in order to answer the global challenges for the sake of human survival. There are 17 sustainable development goals (SDGs) that must be achieved in order to ensure a sustainable, peaceful, and affluent in living on earth for present and the future (Rieckmann, 2017).

The education sector has a strategic role in achieving SDG. For instance, contemporary education that can help to stop the destruction of our planet, caring and responsible parenting so that they will become good citizens who are genuinely concerned with and able to contribute to a fair and peaceful world (United Nations Educational, Scientific, and Cultural Organization, 2008). It is necessary for all educational stakeholders at all levels of education to exert serious efforts in preparing the next

generation to be good citizens who are willing to promote SDG with their knowledge and skills (Annan-Diab & Molinari, 2017; Owens, 2017). The most basic level is early childhood education because the beginning of the year is vulnerable time but also a period of great opportunities for children's development. The early period is a great time to instill a foundation of values and knowledge to prepare children to live their lives in the future. Children often experience the greatest environmental challenges, and this is the right time to implement basic attitudes and values. Then, if the Education for Sustainable Development (ESD) idea is introduced from now on, it is capable of giving a big impact in the education (Blatchford, Smith and Samuelsson, 2010; Öztürk & Olgan, 2016).

A way to facilitate the children for to be a good citizen and to promote SDG is through science learning. Science is in line with children characteristics because, naturally, children were born to learn about science with their high curiosity. They will do an active process to know and to understand the world around them and they are able to acquire new knowledge of the activity (Cleminson, 1990; Qonita et al., 2019; Syaodih & Mulyana, 2017). Science also teaches children to be active in the social world by

integrating the domains of science into real-life activities (Torquati, Cutler, Gilkerson, & Sarver, 2013). Science can be set as a bridge to understand these issues and take action to deal with them (Tytler, 2007). Thus, it can prepare children to become a responsible citizen in order to create a sustainable world (Frisk & Larson, 2011; Hart, 2013).

2. LITERATURE REVIEW

2.1. Sustainable Development Goals

Development means optimizing or realizing a potential; bring more than one, bigger, or better'. The terms 'sustainable development' and 'sustainable growth' are well known but their meanings are still vague. Growth is a quantitative increase in physical aspects, while development is a qualitative increase or opening up and increasing potential. Thus, a sector can grow without developing, or developing without growing, or both, or vice versa (Daly, 1990).

Sustainable development was first reported in 1987 by the Bruntland World Commission on Environment and Development (WCED) (Blatchford, Smith and Samuelsson, 2010), which explain for a development strategy that:

"...Meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p.43).

There are four main elements of sustainable developments (Duran, Gorgan, Artene, & Duran, 2015; Blatchford, Smith & Samuelsson, 2010; Öztürk & Olgan, 2016). According to the generation type of assumptions, we divided the existed work into two categories.

- 1) Ecological/ Biological sustainability: Interactions with the physical, natural environment to protect biological diversity, species and ecosystem.
- 2) Economic sustainability: Ensuring economic activity is stable and balanced since the Earth's resources are finite.
- 3) Social sustainability: Enabling all people of the world to have a quality life in which their human dignity is respected and ensuring their right to nutrition, health, wellbeing, education freedom
- 4) Cultural sustainability: Recognising that our communities and world are enriched by the diversity of people, languages, traditions, knowledge, and beliefs.
- 5) Sustainable development is supported by the four elements that work together. The practices and policies developed by taking into account the most efficient or effective environmental, economic, social and cultural strategies.

2.2. Quality Science Education to Promote Sustainable Development

Education in Sustainable Development aims to balance human and economic well-being with cultural traditions and respect for the environment (Öztürk & Olgan, 2016; Rieckmann, 2017).

Education has a role in promoting country cultures. Through quality science education, children are able to know and realize their environmental conditions. Science will enhance children's pride of their country and its culture, for instance to make them realize that they live in a rich country and should be grateful for it. In addition, children will be aware of existing environmental issues by knowing the cause and looking for a solution to the problems (Karaarslan & Teksöz, 2016).

Science education can be a driving force in efforts to reduce poverty, violence and injustice (Holbrook, 2009). Creative and innovative science learning can utilize natural resources to develop physical products or ideas that are marketable, such as strategies for teaching children to plant crops, caring for animals, which results can be used to fulfil children's nutrition. Learning science for early childhood can also be done collaboratively; invite children to learn and to work together in solving environmental problems with peers without differentiating gender, ethnicity, or social status. Science learning is also very concerned about security principles that avoid violent behaviour.

Through early childhood education, school communities can form local communities to care for and preserve the earth (Hart, 2013). Organizing fun activities for nature-based, making environmentally-friendly habituation programs, giving seminars or outreaching to parents about sustainable development to create personal and communal awareness of global responsibility, active participation in changes that support a sustainable future for all (Karaarslan & Teksöz, 2016).

2.3. Effective Teacher Preparation to Ensure the Quality of Learning

The teacher is the key of successful education as well as the achievement of SDG. No matter how excellent the school curriculum and facilities are, without competent teachers, it would be difficult to achieve worthy education. Several things are needed to produce professional teachers in terms of conducting science learning (United Nations Educational, Scientific, and Cultural Organization, 2010).

- 1) Teacher education needs to equip teachers with teaching strategies so that they can carry out creative, innovative learning and are able to design teaching materials that not only focus on knowledge, but also develop affective domains, decision-making skills, and problem-solving skills (Manchishi & Mwanza, 2018; Harding, et al., 2019).
- 2) Teachers should be provided with more adequate guidance and information so that they can be aware of

sensitive issues in sustainable development and find ways to solve them.

- 3) Teachers need to be more involved in facilitating attitude change, guiding children to get values, and facilitating children to be able to build their own knowledge through an active process rather than just teaching factual knowledge.

3. METHOD

The method used in this research was a case study. The data were collected through literature review, observation, and asemi-structured interviews with four teachers in four different kindergartens in Tasikmalaya. Those technique were used to make sure the validation of data and to support data interpretation.

The primary data were collected through constant observations of science learnings to explore science quality learning in those kindergartens.

3.1. Participants

The participants in this research were four teachers from four kindergartens in Tasikmalaya. The four teachers from different kindergartens were selected purposively based on two criteria, namely, the teachers had been certified and they had taught in kindergarten for 5 years.

As for the selection of the four kindergartens, only kindergartens that had been accredited with grade A. It was chosen to see how far the implementation of science learning in the well-accredited kindergartens. This research aims to: (1) Explore the quality of the implementation of science learning in schools that have good standards and quality, (2) Examine whether the accreditation and certification that meet the criteria in line with the quality of the learning, and (3) Discover the obstacles that they experienced.

3.2. Ethical Issue

Before conducting this research, the researchers had informed and asked for a permit to the headmasters and teachers. Researchers informed about the purpose, the methods used, and the results of the study to the participants and their personal information were confidential.

4. RESULTS AND DISCUSSION

4.1. Hands-On Activities

The results of observations showed that science learnings were focused on practical activities that led to hands-on activities. However, there were still teachers who have not

optimized the provision of opportunities for children to try hands-on activities.

At school D, which had already applied the BCCT model, hands-on experience had been running quite optimal. The teacher gave several choices of activities at the center of natural materials. After the teacher had given directions related to the types of activities and procedures, they were allowed to choose some activities that they liked most such as trying to mix water that has different colors and experimenting with candles placed in a glass to introduce the concept of the nature of air.

Whereas, in school A, science learning was carried out to introduce the concept of floating and sinking by conducting the egg and salt water experiment. However, the experiment was done by the teacher himself, while the children just observed it. Thus, the hands-on experience activity was not optimal.

4.2. Implementation of Science Process Approach

In learning which is based on the science process, learning is oriented towards observing, asking questions, making predictions, making conclusions, communicating, etc (Qonita et al., 2019; Syaodih & Mulyana, 2017).

“A teacher put hard-boiled eggs and raw eggs into a transparent container filled with water. Before the two eggs were put in a container, the teacher told the children that the teacher would do magic and told them that the hard-boiled eggs would sink while the raw eggs would float. Then, teacher put eggs into a container, the child observed the events, but both eggs were sunk and none were floated” (Source: Teacher’s learning observation field notes).

It seems that the process of science was still not optimal since the observation results indicated that the majority of sensory stimulated was sight to gather information. It should be understood that the process of observation is not only looking at objects or process but also optimizing the five senses to gather information (Qonita, et al., 2019).

In terms of asking questions, it was shown that the teachers asked questions more often than the children. Therefore, it is necessary for the teachers to stimulate the children, so they would ask actively.

Meanwhile, regarding communicating, the teacher provoked the children to convey ideas, summarize learning outcomes, and retell what had been learned. During activities, verbal activities were done more frequent. In fact, the communication process can be done in a variety of creative ways such as by artwork.

4.3. Science Programs Relating to SDGs Topics

The implementation of science learning programs in kindergarten was still limited related to themes with scientific contents.

Teacher B: "Science learning is carried out according to the learning theme, if there is science in the theme, then we learn science, if there is not, then there is no science learning."

Teacher C suggested that other themes could be linked to science even though it was only an introduction.

Teacher C: "Science activities are usually conducted on particular themes such as myself, animals, plants, and the universe. However, other themes can also be linked although only limited to the introduction."

Teacher A: "Just like others, most scientific activities are carried out on certain themes such as to get to know 'diriku' or myself, 'Tumbuhan' or plants, 'hewan' or animals and 'alam semesta' or the universe. Nevertheless, I rarely do science activities that involve processes. It is because I am already old, I really don't understand science and how to convey it to children so they can understand".

Science programs are still focused on conventional science such as experiments and observations surroundings. The most commonly found of science learning programs are activities related to "volcano eruption" and "floating and sinking".

In teaching conventional science, they still had misperception. The teacher considered learning science was regarding the level of knowledge, not process and attitude. The experiments conducted did not develop hands-on experience or process skills of children, yet the activity was regarded as magic, so that learning became more enjoyable without introducing the concept of science to them.

Teacher A: "Usually when conducting a volcano eruption experiment, the teacher conducts the experiment, then the children observe what is happening. Usually, the children are always happy and excited"

The teachers had not linked the science learning program to sustainable development issues. Only topics related to natural disasters were sufficiently related to the issues of SDGs. The link between science and the SDGs was only limited to the provision of knowledge and there was no science learning program that was more oriented towards SDGs.

4.4. Group Work

Some topics in science were learned in groups. It was formed randomly by the teachers without distinguishing between male and female students. Each group got the same opportunity to get the same experience. Moreover,

the children who worked in groups can collaborate well, not degrading or mocking each other, or dominating the group. This was in accordance with the principles of the SDGs relating to equality, fairness, opportunity and equal access to each child (United Nations Educational, Scientific, and Cultural Organization, 2008; Blatchford, Smith & Samuelsson, 2010; Öztürk & Olgan, 2016; Rieckmann, 2017).

5. CONCLUSION AND RECOMMENDATION

Science education is an undeniable need for the 21st century and to promote SDGs. The school accreditation and teacher certification cannot fully guarantee for the implementation of science and quality education. It is because there are still several issues such as the age of the teacher, busyness, facilities, and difficulty access to get the latest information for kindergarten teachers in a small city. Even when the schools were well-accredited with qualified teachers, the implementation of science learning still faces many obstacles, especially for schools that do not achieve accreditation quality standards. This is an issue that must be taken into account by policy makers to regulations better.

Integrating science into the curriculum is not enough, schools need to provide proper facilities and to improve teacher's competence in comprehending early science to promote the quality of science education.

Support, equality of facilities and quality, clarity of curriculum and dissemination of information are required. Then, society also needs to support academics in conducting research and development related to more innovative science learning in order to improve teaching quality and to promote SDGs.

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REFERENCES

- Annan-Diab, F., & Molinari, C. (2017). Interdisciplinarity: Practical approach to advancing education for sustainability and for the Sustainable Development Goals. *The International Journal of Management Education*, 15(2), 73-83.
- Blatchford, J. S., Smith, K. C., & Samuelsson, I. P. (2010). *Education for sustainable development in the early years*. World Organization for Early Childhood Education
- Cleminson, A. (1990). Establishing an epistemological base for science teaching in the light of contemporary

notions of the nature of science and of how children learn science. *Journal of Research in Science Teaching*, 27(5), 429-445.

Daly, H. E. (1990). Toward some operational principles of sustainable development. *Ecological Economics*, 2(1), 1-6.

Duran, D. C., Gorgan, L.M., Artene, A., Duran, V. (2015). The components of sustainable development- A possible approach. *Procedia Economics and Finance*, 26, 806-811

Frisk, E., & Larson, K. L. (2011). Educating for sustainability: Competencies & practices for transformative action. *Journal of Sustainability Education*, 2(1), 1-20.

Harding, J. F., Connors, M. C., Krauss, A. F., Aikens, N., Malone, L., & Tarullo, L. (2019). Head start teachers' professional development, well-being, attitudes, and practices: understanding changes over time and predictive associations. *American Journal of Community Psychology*.

Hart, R. A. (2013). *Children's participation: The theory and practice of involving young citizens in community development and environmental care*. Routledge.

Holbrook, J. (2009). Meeting Challenges to Sustainable Development through Science and Technology Education. *Science Education International*, 20, 44-59.

Karaarslan, G., & Teksöz, G. (2016). Integrating sustainable development concept into science education program is not enough: We need competent science teachers for education for sustainable development- Turkish experience. *International Journal of Environmental and Science Education*, 11(15), 8403-842

Manchishi, P. C., & Mwanza, D. S. (2018). Reforming School Experience in Pre-Service Teacher Preparation for Quality Teacher Graduates. *Multidisciplinary Journal of Language and Social Sciences Education*, 1(2), 1-26.

Owens, T. L. (2017). Higher education in the sustainable development goals framework. *European Journal of Education*, 52(4), 414-420.

Öztürk, D. K., Olgan, R. (2016). Analysis of pre-school teachers' views on the importance of education for sustainable development by means of location and household type in childhood. *International Journal of Environmental & Science Education*, 11(13), 630-6313

Qonita, Q., Syaodih, E., Suhandi, A., Maftuh, B., Hermita, N., Samsudin, A., & Handayani, H. (2019). How do kindergarten teachers grow children science process skill to construct float and sink concept?. *Journal of Physics: Conference Series*, 1157(2), 022017

Rieckmann, M. (2017). *Education for sustainable development goals: Learning objectives*. UNESCO Publishing.

Syaodih, E., & Mulyana, E. H. (2017). When science becomes an approach in early learning: know it, understand it and do it!. *Journal of Nusantara Studies (JONUS)*, 2(2), 98-106.

Torquati, J., Cutler, K., Gilkerson, D., & Sarver, S. (2013). Early childhood educators' perceptions of nature, science, and environmental education. *Early Education & Development*, 24(5), 721-743.

Tytler, R. (2007). Re- imagining Science Education: Engaging Students in Science for Australia's Future. *Australian Education Review* 51. *Australian Council for Educational Research*.

United Nations Educational, Scientific, and Cultural Organization. (2008). *The contribution of early childhood education for sustainable society*. Paris: UNESCO

United Nations Educational, Scientific, and Cultural Organization. (2010). *Reaching the marginalized, Global monitoring report 2010*. Paris: UNESCO.