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BIODIVERSITY LITERACY IN SCIENCE EDUCATION FOR BIODIVERSITY CONSERVATION

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ABSTRACT
Teaching the concept of biodiversity in learning activities especially science education is an important urgency to bring up biodiversity literacy competence. This article aims to examine the concept of biodiversity and ecosystems in science education activities, the level of student literacy on biodiversity, and several learning models in science education that can be applied in increasing the biodiversity literacy of students. The method used in this study is Knowledge mapping that begins with mapping students' knowledge about biodiversity, covering the breadth of knowledge and depth of knowledge; Focus Group Discussion (FGD) involving students and lecturers; Experiments applying three learning models in lecture activities for biodiversity materials and comparing the three models tested. Results obtained from the study is that literacy competence biodiversity is a form that can be grown on the p Education science. The existence of biodiversity literacy capabilities will further have a positive impact in efforts to maintain, protect, increase awareness of the importance of biodiversity. The application of biodiversity literacy can be built into several models, techniques or learning patterns that are appropriate to aspects of the surrounding environment, environmental issues that occur, and the ability of students. Participant's learners who have literacy skills biodiversity is good, will have a character of sensitivity to any changes that exist in the surrounding environment. The presence of this character in the later stages can me n make learners make efforts to establish, maintain and preserve biodiversity and ecosystems.

KEYWORDS: Science education, biodiversity literacy, e- system

INTRODUCTION
Biodiversity (biodiversity) began to experience extinction, whereas to form the biodiversity of a biological community around the world takes millions of years to develop. Ecosystem diversity has been disturbed by various human actions so that various animal species are no longer found and various plant varieties are lost. According to the IUCN 2015 s ecara particular, the world's smallest monkey species found in North Sulawesi has puka extinction (IUCN, 2016). According to Khino, the extinction of biodiverse as is a serious threat especially caused by the use of both legal and illegal (Halawane et al, 201 1). A similar view was expressed by Lubis who stated that the extinction was caused by radical climate change (Lubis, 2011). Experts consider that various human actions have caused radical changes in natural conditions that require careful responses (Lubis, 2011; Khino, 2014; Iskandar & Iskandar, 2018).

Concerns about the condition of ecosystems have been shown by experts where they show nature conservation is an urgent matter to be carried out (CDFG, 2016). Nature conservation involves humans so that human knowledge and awareness in conservation becomes necessary. To achieve an adequate knowledge and awareness requires variations and learning methods, especially in inspiring students to be active and participatory (Schaal, Matt, & Grübmeyer, 2012). Specifically the combination of active, participatory, and

collaborative learning methods and activities in the field can enhance biodiversity knowledge and skills (Ramadoss, 2011; Orion, 2003). Learning biodiversity needs to accommodate students' daily experiences with varied learning methods so that students can comprehensively define the meaning and characteristics of the biodiversity (Lindemann-M et al., 2009; Dikmenli, 2010). The existing study not only emphasizes the physical aspects of conservation, but also pays less attention to the methodological aspects that guarantee the transfer of knowledge and the formation of public awareness in biodiversity conservation. This paper is based on the argument that the use of scientific approaches and follow-up methods will change the level of student literacy and their competence in diversity conservation. The scientific approach can be formulated through variables that are accommodating to the empirical experience of students so that the scientific approach is not only able to increase student knowledge, but also stimulates empathy to give birth to a commitment to conservation of diversity.

METHOD

Using Knowledge mapping, this study begins with mapping students' knowledge about biodiversity, both covering the breadth of knowledge and the depth of knowledge related to biodiversity. Focus Group Discussion (FGD). FGDs involve students and lecturers involved in science education that focuses on biodiversity studies. The discussion was held in two separate groups to get openness from each party in issuing opinions, then conducted an experiment on the application of 3 learning models in lecture activities for biodiversity material, as well as comparing the three models tested.

RESULTS AND DISCUSSION

Biodiversity and ecosystems on the activity of science education

Teaching concepts in biodiversity and ecosystems in science learning activities, should be done by analyzing real natural phenomena, especially concerning biodiversity that exists in everyday life. However, in its implementation, most learning activities related to ecosystems and biodiversity are mostly carried out with traditional and classical approaches, such as providing examples that do not lead directly to the object being studied or providing examples that are less relevant to the object of study itself. While on the other hand in learning science competence that must be achieved is a comprehensive ability to analyze the processes that occur in ecosystems and biodiversity. Examples of competencies in question are for example students must be able to communicate the results of the application of the concept of ecosystems and biodiversity based on written observations (activity reports, posters, learning journals, portfolios), students are able to analyze problems and implement ecological problems and construct them in the form of scientific report descriptions.

From these examples it can be said that, if the learning model that is carried out is only more classical in nature without inviting students to see and observe the biodiversity in real, then, resulting in achievement of student competency will be low. Schaal, Matt, & Grübmeyer (2012) suggested that Biodiversity is an important part of learning science. In holistic learning biodiversity include ecological aspects and socio-economic. This becomes very important in giving variations of learning and learning methods in inspiring students.

Specifically, the combination of active, participatory and collaborative learning methods and activities in the field can enhance biodiversity knowledge and skills (Ramadoss, 2011, Orion, 2003). In addition, Lindemann-M. Et al., (2009) and Dikmenli (2010), suggest the same thing namely, that in teaching biodiversity teachers must be able to relate it to the daily life experiences of students and by using variations of learning methods so that students can completely define meaning and comprehensive biodiversity characteristics. The learning process of science education emphasizes on providing hands-on experience to develop competencies in order to explore and understand the nature around scientifically. (Ali, Suastra, & Sudiatmika, 2013). Science education is directed to inquiry and act so that it can help students to gain a deeper understanding of the natural surroundings (Kubicek jkubicek@mus-nature.ca, 2005).

With thus Educational science will encourage learners to get closer to nature where he stood. The study of ecosystems and biodiversity is part of studies in science education is a way of thinking, a method for conducting investigations and a form of knowledge about the interaction of living things with their environment. Biological interaction will cause variations both from the smallest level, namely genes, species level, and a more level, namely ecosystem. That variation is a biodiversity. Science learning aims so that

students can achieve and develop their competence by focusing on direct experience in exploring and understanding the natural environment scientifically. Therefore students are expected to move as much as possible both through observation, experimentation, and discussion to find answers to various phenomena that occur in the natural surroundings. (Astuti, Sunarno, & Sudarisman, 2012).

Some learning models in science education are appropriate in increasing students' biodiversity literacy

The application of bodiversity literacy in learning can be done with various learning models. One model that can be used is the project based learning (PjBL) learning model. According to Thomas (2000) that Projet-Based-Learning (PjBL) has five criteria in between, centrality; that this criterion has two corollaries. First, the project is a curriculum. At PjBL, the project is the core teaching strategy, students are struggling and learning the core concepts of the material through the project. Second, centering which means that if students learn something outside the curriculum, it is not categorized as PjBL; briefing question; that PjBL is focused on questions or problems that encourage students to learn the concepts and principles of the core or main subjects of the lesson. The project definition for students (students) must be made in such a way that there is a relationship between the activity and conceptual knowledge that lies behind it. Projects are usually carried out by asking questions whose answers are uncertain (ill-defined problems).

Projects in PjBL can be thematically designed, or a combination of topics from two or more materials; constructive investigation; that PPA involves students (students) in constructivism investigations. An investigation can be in the form of process design, decision making, problem discovery, problem solving, discovery, or the model development process. The core activities of the project must involve the transformation and construction of knowledge (new knowledge or skills) on the part of the students (students). If the core activities of the project do not represent "difficulty levels" for students (students), or can be done by applying information or skills that are ready to be learned, the project in question is nothing more than an exercise, and not the intended PjBL project; o tonomi; that the core of the project is not teacher-centered, in the form of text rules or already in the form of a package of assignments. For example, laboratory assignments and learning booklets are not examples of PJs. PjBL prefers independence, choice, working time that is not rigid, and the responsibilities of students (students) rather than traditional projects and traditional learning; realisme; that the project characteristics give authenticity to students (students). These characteristics may include topics, assignments, the role played by students (students), the context in which project work is carried out, the products produced, or the criteria by which products or performance are assessed. PjBL involves real life challenges, focuses on authentic (not simulative) questions or problems, and their solutions have the potential to be applied in the real field. Therefore the Project Base Learning learning model is expected to have an influence on biodiversity literacy capabilities.

Enhancing students' biodiversity capacity

A form of learning development that utilizes the potential of ecosystems and biodiversity has become one of the alternative strategies in an effort to improve students' skills in terms of ecosystem conservation and biodiversity so that it will have the following impact, namely the emergence of conservation character. That indirectly students who have the ability to biodiversity literacy will have a sensitivity character to any changes that occur in the surrounding environment. The existence of this character in the next stage can make students make efforts to maintain, preserve and preserve ecosystems and biodiversity. Considering the importance of cultivating this character, the strategy from the aspect of education is expected to provide a change in thinking patterns and touch awareness. Education, both formal and informal, must contain values in the four pillars of education, namely; learn to know, learn to do, learn to understand yourself (identity), and learn to live together and respect each other on the basis of equality and tolerance in society.

Utilization of the potential of ecosystems and biodiversity as study material in science learning, can be categorized as an effort to grow the character for the conservation of natural resources and instill the ethical values of human relations with nature integrative in students. Character education can be realized in the form of behavior towards the environment and make efforts in the form of preservation of natural resources. Natural learning resources can be an option in supporting the learning process, because it gives students the opportunity to learn the object of the lesson directly. In addition, by having direct interaction with objects studied students are able to not only recognize but also find out, analyze, prove and make conclusions in their

own way about the object learned so that they can indirectly become someone who has worked scientifically. The intended scientific is that students not only make their own opinions without facts, but are invited to seek answers to a problem or a phenomenon that is real or directly observed, which is called a scientific approach or scientific approach. Learning with a scientific approach is a learning process that is designed so that students can actively construct concepts, laws or principles through certain scientific stages of an existing phenomenon, event or event (Riyono, 2013). The scientific approach is one of the learning strategies that is expected to be able to improve the competence of students and is the main foundation in the development of the 2013 curriculum. 65 of 2013 concerning the standards of the primary and secondary education process has signaled the need for a learning process that is guided by the principles of a scientific/scientific approach. Efforts to apply scientific approaches in the learning process are characteristic and become a strength in the existence of the 2013 curriculum. On the other hand it can be said that students in the learning process should not only use books as learning resources, but students can be directed by teachers to explore the environment as a learning resource. Students can utilize the surrounding environment as a source of learning, students are also expected to be able to observe and discover their own knowledge through what they observe in the ecosystem and biodiversity in the surrounding environment, as well as gaining direct learning experiences. As stated by Rachmawati and Daryanto (2015) that the learning process directly produces knowledge and skills directly or what is called instructional effect. Biology is one branch of science that studies about the interaction of living things with their environment, it does not have to always be conveyed by reading and memorizing and not just the interaction of communication and material from the teacher to students. Science learning must be able to create direct interaction between students and learning objects studied in this case are ecosystems and biodiversity.

CONCLUSION

Biodiversity literacy is a form of competence as well as an approach to science education. Efforts to conserve ecosystems and biodiversity can be done through the aspect of education, namely by increasing biodiversity literacy competencies. Projet-Based-Learning learning model and can be developed with a scientific approach. Achieving the character of conservation is an ultimate goal of increasing biodiversity literacy competencies, and having high relevance to life development skills, resting on the empowerment of skills and local potential in each region.

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REFERENCE

1) Ali, LU, Suastra, IW, & Sudiatmika, AAIAR (2013). Science Learning Management in terms of the nature of science in junior high schools in East Lombok Regency. E-Journal of Ganesha University Education Postgraduate Program.
2) Astuti, R., Sunarno, W., & Sudarisman, S. (2012). Science Learning With Science Process Skill Approach Using Modified Free Experiments Method and Guided Experiments Viewed From Scientific Attitudes And Student Learning Motivation. Journal of Inquiry.
3) Dikmenli, M. (2010). Biology student teachers' conceptual frameworks regarding biodiversity. Education, 19 (3).
4) Erdogan, Mehmet, Zdrauka Kostova, and Thomas Marcinkowski. 2009. "Components of Environmental Literacy in Elementary Science Education Curriculum in Bulgaria and Turkey". Eurasia Journal of Mathematics, Science and Technology Education, 5 (1), pp. 15-26.
5) Halawane J, EHN Hidaya, and J, Kino, (2011). Prospects for Jabon Merah (Anthocephalus macrophyllus Roxb.) Development Solutions for Future Timber Needs. Forestry Research and Development Center. Manado Forestry Research Center.

6) Kubicek jkubicek@mus-nature.ca, JP. (2005). Inquiry-based learning, the nature of science, and computer technology: New possibilities in science education. Canadian Journal of Learning & Technology. https://doi.org/Article .
7) Lindemann-Matthies, P. et al. (2009). The integration of biodiversity education in the initial education of primary school teachers: four comparative case studies from Europe. Environmental Education Research, 15 (1), 17-37.
8) Primarck, Richard.B, Mochamad Indrawan, Jatna Supriatna. 2007. Conservation Biology. Indonesian Torch Foundation. Jakarta.
9) Rachmawati, Tutik and Daryanto. 2015. Learning Theory and the Educative Learning Process. Yogyakarta: Gava Media.
10) Ramadoss, A. (2011). Biodiversity Conservation through Environmental Education for Sustainable Development - A Case Study from Puducherry, India. International Electronic Journal of Environmental Education, 1 (2).
11) Riyono, K., 2013. Approaches and Strategies Learning Approaches and strategies in learn g in http: //ebook_pengawasmadrasah.wordpress_pendekatansaintifik.pdf .
12) Schaal, S., Matt, M., & Grübmeyer, S. (2012). Mobile Learning and Biodiversity - Bridging the Gap between Outdoor and Inquiry Learning in Pre-Service Science Teacher education. Procedia - Social and Behavioral Sciences. https://doi.org/10.1016/j.sbspro.2012.05.479
13) Thomas, JW2000. A Review of Research on Project-Based Learning. http://www.bie.org/index.php/site/RE/pbl_research/29
14) Utina, R., E. Nusantari, AS Katili, & Y. Guest. 2017. Coastal Ecosystems and Natural Resources; application of conservation character education. Issue 1, Printing 1, Yogyakarta: Deep English.