European Online Journal of Natural and Social Sciences 2021;
Vol.10, No 3 pp. 456-462
ISSN 1805-3602

Knowledge, Attitudes, and Behavior of Prospective Biology Teachers towards Biodiversity Conservation in Indonesia

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Received for publication: 08 July 2021.
Accepted for publication: 02 September 2021.

Abstract

This study aims to describe prospective biology teachers' knowledge, attitudes, and behavior towards biodiversity conservation in Indonesia. The research was conducted at the Biology Education Study Program at three campuses in West Java: Majalengka University, IAIN Syekh Nurjati Cirebon, and Wiralodra University. This study considered the three campuses because they had courses supporting biodiversity education programs, such as conservation biology, coastal area management, and mangrove forest empowerment. The total (n=106) participants involved in this study were Majalengka University (n=22), Wiralodra University (n=16), and IAIN Syekh Nurjati Cirebon (n=68). The instruments in this study consisted of tests and questionnaires developed referring to the World Wildlife Fund's (WWF) biodiversity literacy indicators, covering questions related to knowledge of Indonesia's biodiversity and its conservation. Meanwhile, the questionnaire instrument included attitude and behavior questionnaires related to biodiversity conservation. Data were collected via google form from April 01, 2021, to May 02, 2021. The results revealed that the prospective biology teachers' knowledge about the biodiversity and biodiversity conservation concept was low, with a percentage of correct answers of 42.6%. In addition, the prospective biology teacher students' attitudes and behavior towards biodiversity conservation in Indonesia were in a good category, as evidenced by attitudes and behaviors supporting Indonesian biodiversity conservation through various campus activities, such as nature lover organizations, conservation activities, community service, and student involvement in citizen science activities on a local scale.

Keywords: Knowledge, attitude, behavior, biodiversity conservation, Indonesia

Introduction

Biodiversity is defined as the diversity of life on earth at all levels, from genes to ecosystems and the ecological and evolutionary processes that sustain them (Gaston, 1996). On the other hand, biodiversity loss is an issue that is a global problem faced by various countries in the world (Meadows, 2011; European Comission, 2015; Adawiah et al., 2015). Many countries are even experiencing a crisis of biodiversity loss at an alarming rate, as revealed by European Comission (2015) and IUCN (2021). In this case, the IUCN (2021) predicts that 26% of mammals, 14% of birds, 34% of reptiles, 41% of amphibians, 36% of sharks, 28% of Crustacea, 33% of coral reefs, 34% of Conifers, and 63% of Cycads are at risk of extinction (https://www.iucnredlist.org/).

In addition, the survey results of the European Comission (2015) uncovered that 61% of Europeans believe that the loss of biodiversity globally is a severe problem that requires quick action to overcome. Among the countries experiencing biodiversity loss, Indonesia is one of the countries un-

dergoing very high and faster biodiversity loss than predicted (IBSAP, 2016). The clearing of forest land for oil palm plantations, which has increased by almost 30%, is one of the factors in accelerating biodiversity loss (Imanuddin, 2016). In fact, the latest data on Indonesia's biodiversity showed that Indonesia has 1,500 species of algae, 80,000 species of spore-forming plants (such as Crytogamae) in the form of fungi, 595 species of lichens, 2,197 species of ferns, and 30,000–40,000 species of seed plant flora (15.5% of the total flora in the world). Meanwhile, there are 8,157 species of vertebrate fauna (mammals, birds, herpetofauna, and fish) and 1,900 species of butterflies (10% of the world's species) (IBSAP, 2016).

The accelerated loss of biodiversity is caused by changes in the environment due to exploitation by humans (Groom, 2006). Besides, the primary threats to biodiversity loss are habitat destruction, exploitation, indirect loss, invasive species, natural disasters, and pollution (Hambler, 2004; Groom, 2006). Hence, to prevent faster biodiversity loss, it is necessary to take various effective actions, including building public awareness of the importance of biodiversity for sustainable development through education. One article of the CBD Congress held in 1992 in Rio De Jenario, Brazil, urged countries that have ratified the agreement to include biodiversity education as a curriculum content in their education system (Nation, 1992; CBD, 2016). It is because education is one of the right tools to promote ESD by raising the issue of environment, climate change, and biodiversity as one of the essential issues (UNESCO, 2016).

Moreover, the world of education plays a vital role in preparing future generations who have the attitude and concern for biodiversity and have the ability in the field of systematics to protect biodiversity from extinction (Crisci & Katinas, 2011). Environmental and biodiversity education also has a crucial position in developing sustainable attitudes, awareness, and behavior (Disinger & Roth, 1992; Nisiforou & Charalambides, 2012). As an integral part of environmental education, biodiversity education is expected to build biodiversity literacy (Trombulak, 2004; World Wildlife Fund, 1996) in learners to transform it in their lives in society. Thus, biodiversity education is critical in building public awareness of biodiversity (Adawiah et al., 2015; Nsengimana et al., 2017).

However, studies have been carried out, exposing that prospective biology teachers still did not understand biodiversity in-depth (Dikmenli, 2010) and were still limited in understanding the biodiversity concept (Fiebelkorn & Menzel, 2013). Milkisso's (2020) research also disclosed that the biodiversity knowledge of Ethiopia's students was still low. According to Wals (2014), the lack of knowledge about biodiversity occurs because the biodiversity concept is vast and multidimensional, so it is not easy to understand it. For this reason, the education system for prospective biology teachers must equip students with various knowledge, attitudes, and skills related to biodiversity and its conservation strategies and build characters, attitudes, and behaviors that support the biodiversity preservation and its sustainability.

As an integral part of environmental education, biodiversity education aims to develop biodiversity literacy (Trombulak, 2004; Moss et al., 2015) for sustainable development (UNESCO, 2012) with a focus on ESD, namely empowering students of all ages with the knowledge, skills, values, and attitudes to address global challenges, including climate change, environmental degradation, biodiversity loss, poverty, and inequality.

Materials and Methods

This study used a survey method conducted on Biology Education Study Program students at three campuses in West Java: Majalengka University, IAIN Syekh Nurjati Cirebon, and Wiralodra University. The three campuses were chosen because they had programs related to the development of biodiversity conservation in their curriculum, such as conservation biology, coastal area conser-

vation, coastal ecology, and mangrove forest management courses. The research sample (n=106) was students as prospective biology teachers. The research instrument consisted of a knowledge test about Indonesia's biodiversity and its conservation, and a questionnaire instrument developed referring to the biodiversity literacy indicators (World Wildlife Fund, 1996). The questionnaire instrument included attitude and behavior questionnaires related to biodiversity conservation. Data were collected through google form from April 01, 2021, to May 02, 2021. The data collected were then analyzed descriptively and qualitatively by interpreting them according to the findings obtained.

Results

This study's results were divided into three investigations: the research results related to knowledge aspects of the biodiversity concept and its conservation, attitude aspects, and behavioral aspects of prospective biology teachers towards biodiversity conservation in Indonesia. This research's results are described as follows.

Prospective Biology Teachers' Knowledge of the Biodiversity Conservation Concept in Indonesia

The knowledge of prospective biology teachers concerning Indonesia's biodiversity conservation was evaluated utilizing a test instrument, with indicators of understanding the biodiversity meaning, the biodiversity hotspot concept, Indonesia's biodiversity zone division, and strategies for biodiversity conservation in Indonesia. The following is a recapitulation of the prospective biology teacher's knowledge test results on Indonesia's biodiversity concept and its conservation.

Table 1. Prospective Biology Teachers' Knowledge about Biodiversity Conservation in Indonesia

No.	Indicator	Percentage (%)	
		True	False
1.	Understanding the concepts of biodiversity, mega biodiversity countries, and biodiversity hotspots	34.9	65.1
2.	Understanding the characteristics and distribution of biodiversity zones in Indonesia	46.2	53.8
3.	Distinguishing the characteristics of the flora and fauna biodiversity in Indonesia	46.5	53.5
4.	Analyzing the causes of biodiversity loss in Indonesia	40.6	59.4
5.	Biodiversity conservation efforts in Indonesia	44.5	55.5
Total		212.8	287.2
Mean		42.6	57.4

Based on Table 1, the mean knowledge of prospective biology teachers on the biodiversity concept and its conservation obtained 42.6% with correct answers and 57.4% with incorrect answers. It indicates that the knowledge of prospective biology teachers on the biodiversity conservation concept in Indonesia was still less than the ideal score required of 80%.

Prospective Biology Teachers' Attitudes towards Biodiversity Conservation in Indonesia

The instrument to measure the attitude of prospective biology teachers towards biodiversity conservation in Indonesia was developed from the affective outcome indicator on biodiversity literacy (World Wildlife Fund, 1996). This attitude questionnaire item consisted of 20 statement items. In detail, eight statement items were related to indicators of sensitivity to issues and problems concerning biodiversity, covering two sub-indicators: (1) sensitivity to biodiversity and (2) the value of

biodiversity. A total of 12 statement items were associated with indicators of personal and community beliefs of biodiversity, including four sub-indicators: (1) locus of control, (2) expectations, (3) individual responsibility, and (4) social responsibility. Overall, the recapitulation of the questionnaire results is displayed in Table 2 below.

Table 2. Prospective Biology Teachers' Attitudes towards Biodiversity Conservation

No.	Indicator	Percentage (%)			
		Strongly agree	Agree	Disagree	Strongly disagree
1.	Sensitivity to issues and issues related to biodiversity	60.6	32.4	6.3	0.7
2.	Personal and community beliefs of biodiversity	37.2	42.6	12.3	7.9
Total		97.8	75.0	18.6	8.6
Mean		48.9	37.5	9.3	4.3

From Table 2, the mean of prospective biology teachers' attitudes towards biodiversity conservation in Indonesia showed that almost all respondents had a supportive attitude towards biodiversity conservation efforts in Indonesia. It was reflected in the respondents' high sensitivity and confidence level to issues and efforts to conserve biodiversity in Indonesia. Based on Table 2, it can also be interpreted that students as prospective biology teachers have already had a good attitude and sensitivity to biodiversity. It is the primary capital in building citizens' awareness of biodiversity's importance for sustainable development in Indonesia. The attitude that has been built is expected to form behaviors and habits, which are pro-environment and biodiversity.

Prospective Biology Teachers' Behaviors towards Biodiversity Conservation in Indonesia

The behavioral aspects of prospective biology teachers towards biodiversity conservation in Indonesia were measured employing a questionnaire developed from biodiversity literacy, with the primary indicators: (1) wise actions towards the environment and biodiversity and (2) actual contribution to environmental and biodiversity conservation. The recapitulation of questionnaire results is presented in Table 3 below.

Table 3. Prospective Biology Teachers' Behaviors towards Biodiversity Conservation

No.	Indicator	Percentage (%)			
		Strongly agree	Agree	Disagree	Strongly disagree
1.	Wise actions towards the environment and biodiversity	25.7	56.5	15.5	2.3
2.	Actual contribution to environmental and biodiversity conservation	21.1	57.7	20.2	1.1
Total		46.8	114.1	35.7	3.4
Mean		23.4	57.1	17.8	1.7

Table 3 describes that almost all prospective biology teachers involved in this study showed pro-biodiversity conservation efforts through actual behavior and actions supporting Indonesia's

biodiversity conservation. These behaviors were manifested in the form of direct involvement in biodiversity conservation activities carried out by student organizations. In addition, students supported funding for biodiversity conservation through various non-governmental organizations or conservation organizations.

Furthermore, pro-behavior towards biodiversity conservation in Indonesia is an achievement of biodiversity learning developed. The formation of pro-environment and biodiversity behavior is also an essential part of the learning process carried out on the campus; thus, it is expected to make an actual contribution to the broader community.

Discussion

The results showed that students' understanding as prospective biology teachers about the biodiversity concept and its conservation in this study was still relatively low. According to Nuraeni et al.'s (2017) research, the low knowledge of the biodiversity concept in Indonesia was influenced by the way teachers teach and the lack of references to support learning. This low mastery of the biodiversity concept does not only occur in Indonesia. Research results from Dikmenli (2010); Esa (2010); Adawiah et al. (2015); Milkisso (2020) disclosed that students as prospective biology teachers in Turkey, Malaysia, and Ethiopia still did not understand the biodiversity concept in-depth and did not fully comprehend the relationship between biodiversity issues and sustainable development. In their research, Fiebelkorn & Menzel (2013) found that students as prospective biology teachers could not distinguish biodiversity from species diversity, and misconceptions occurred in understanding the genetic diversity concept.

In addition, prospective biology teachers showed supportive attitudes and behaviors towards biodiversity conservation efforts in Indonesia. These pro-biodiversity attitudes and behaviors are formed as part of students' learning and thinking process (Yli-Panula et al., 2018). For this reason, as part of Education for Sustainable Development (ESD), biodiversity education must be able to promote awareness, knowledge transfer, values, behaviors, and skills in environmental conservation. In this regard, many learning models can be used by teachers to promote biodiversity at the knowledge and thinking skill levels, such as group work models, field studies, presentations, discussions, project-based, inquiry, and others (Jeronen et al., 2017). Positive attitudes and behavior in students as prospective biology teachers indicate that they can already develop their thinking skills.

Furthermore, biodiversity education has an essential role in building public awareness of biodiversity's importance (UNCED, 2005; Trombulak, 2004), with the primary objective of developing biodiversity literacy in students. Biodiversity literacy is defined as knowledge and understanding of biodiversity concepts and behaviors that contribute to biodiversity conservation (Moss et al., 2015). Building biodiversity literacy in teachers is also crucial to support the success of biodiversity education (Fiebelkorn & Menzel, 2013).

Biodiversity education programs have been launched at the elementary school to higher education level through the learning and thinking processes, developing skills, and direct practice to build awareness through a thinking systems approach (Meadows, 2011). A good biodiversity education should enable students to explore insights into political, economic, and other aspects affecting biodiversity rather than focusing solely on science content (Gayford, 2010).

In addition, building public awareness about the importance of biodiversity for sustainable development can be done through various activities, such as citizen science (CS) activity. This activity has been proven to develop public awareness and participation in preserving biodiversity and influencing government policies to protect biodiversity (Schneiderhan-Opel & Bogner, 2020; Peter et al., 2021).

Conclusion

Students' knowledge as prospective biology teachers about Indonesia's biodiversity and its conservation was still relatively lacking. It signifies a need to improve the quality of learning with biodiversity lecture materials in universities through various forms of meaningful learning. Thus, they can transform the knowledge, attitudes, behavior, and skills of biodiversity conservation to the broader community. On the other hand, students as prospective biology teachers had shown pro-biodiversity conservation attitudes and behaviors in Indonesia. These attitudes and behaviors were implemented through campus activities, such as nature lover organizations, conservation activities, community service, and student involvement in citizen science activities on a local scale.

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