

Student Teachers' Knowledge of Biodiversity

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Abstract- Within this Decade on Biodiversity from 2011-2020, educational institutions are expected to play a critical role to educate their students for better understanding of biodiversity. According to the United Nations, the ultimate aim of the Decade on Biodiversity is to ensure the integration of biodiversity considerations into work related to the core issues of sustainable development. In the Decade on Biodiversity, knowledge about biodiversity is crucial because the outcomes of human activities nowadays are affecting the equilibrium of biodiversity in the world. Biodiversity education becomes necessary to educate people and promote awareness on biodiversity. Teachers are most influential in educating people to protect biodiversity and integrate it through biodiversity education. Teachers should be knowledgeable about biodiversity to ensure the successful integration of biodiversity education in teaching. This paper reports on various aspects of knowledge of biodiversity among student teachers, thus their readiness to integrate biodiversity education in teaching. The results suggest future study directed towards the need for more concerted effort in teacher education to prepare teachers with the necessary knowledge to integrate biodiversity education.

Index Terms- Biodiversity, Knowledge, Education, Student Teachers.

I. INTRODUCTION

Education is a key factor in developing public knowledge and awareness about issues that affect biodiversity across the world. Environmental problems that affect biodiversity have become issues of great concern to many people today. A concern for biodiversity loss has led the United Nations to declare 2011-2020 as the Decade on Biodiversity. The objective of the Decade on Biodiversity is to promote public awareness on biodiversity and mainstream biodiversity consideration into priorities [1]. Moreover, CBD [2] identified the need for a biodiversity awareness programme as a national responsibility. To achieve the aim of the decade, there is a need for the public to have knowledge about biodiversity.

Today's education system no longer emphasizes environmental problems per se, but is focused on fostering environmental literacy, attitudes and values. Biodiversity is declining rapidly due to human activities such as harvesting, pollution, overexploitation, habitat destruction and modification and the introduction of exotic species [3, 4]. A deep concern that the loss of biodiversity and deteriorating ecosystem contribute to imbalance of the nature is needed among the public. Therefore, specific knowledge on biodiversity is required from teachers and

student teachers who are involved in educating future generations. As educators, they should: (1) relate new scientific knowledge to everyday life and (2) critically judge and analyse information [5]. Student teachers should be aware that they would have to equip their students for living [6] and shaping a better future. Knowledge about biodiversity is crucial because the outcomes of human activities today are affecting the equilibrium of biodiversity in the world. Teachers' insufficient knowledge is reflected in students' knowledge [6]. Therefore, Biodiversity education has been proposed to encounter the lack of knowledge about biodiversity. Biodiversity education requires a teaching approach that can educate the public to understand biodiversity. This requires the construction and critical use of knowledge, the critical analysis of the role of natural sciences and an awareness of the scientific and non-scientific aspects [7].

This study is grounded in Lee Shulman and his colleagues' work related to teacher knowledge [8]. Shulman [9] proposed seven categories of teacher knowledge: content; pedagogy; curriculum; learners and learning; contexts of schooling; educational philosophies, goals and objectives; and pedagogical content knowledge. Teachers need to comply to current standards. Thus they must have in-depth understanding of content knowledge, be flexible, and are able to guide their students in learning as well as avoid them having misconceptions. It is important that teachers see the interconnectedness of ideas that come from different areas, and be able to relate these ideas to everyday life. As such, their understanding will form a sound foundation for their pedagogical content knowledge, with which they will be able to help their students learn better [9]. In Shulman's theoretical framework, teachers need to master two types of knowledge which is content knowledge and knowledge of curricular development. Content knowledge refers to extensive and in-depth knowledge of the subject matter.

There are limited studies to determine Malaysian biology student teachers' current position with respect to knowledge of biodiversity. Thus the main objective of this research is to explore student teachers' knowledge of biodiversity.

II. METHODOLOGY

This study is a survey method to explore the knowledge of biodiversity among student teachers from the field of science.

A. Sample

This study focuses on student teachers trained to teach biology for secondary school education. The sample involved in this

study consists of 60 student teachers from science education field. These student teachers are in their fourth year of an undergraduate science education degree program. They also enrol in courses from the pure sciences including biology as well as courses in the field of education. Thus, these student teachers are expected to have sound knowledge about biodiversity.

B. Instrument

The instrument is a questionnaire divided into two sections. The first section refers to demographic data of the respondents. The second section consisting of 20 items covering knowledge of biodiversity. 15 items are presented with a four point Likert scale choice and the remainder five items are open ended questions. This paper reports findings based on part of the questionnaire and the open ended questions.

III. RESULTS AND DISCUSSION

The data revealed that overall knowledge about biodiversity among student teachers is good because the mean score obtained is 75.58% of the maximum score. Knowledge about biodiversity is essential since human activities have affected the balance of biodiversity in the world. Thus Biodiversity Education is important to educate the public and promote awareness of biodiversity. According Nováček [10], the first step in the educational process is important, and in this case it is to assess student teachers' understanding of biodiversity [10]. Therefore, the ability to define biodiversity seems important to ensure proper understanding of the topic.

A. Definition of Biodiversity

When asked whether they can define the term biodiversity, 93.4% of the student teachers reported that they can. However, only 53.8% of them can define biodiversity as variability of living things. They are not able to explain in more detail about the term. Analysis of open ended questions provided more detail about student teachers' knowledge on biodiversity. Five aspects emerged from the definition of biodiversity given by the student teachers. These are diversity, living things, species diversity, genetic diversity and ecosystem diversity. 10% of the respondents were not sure that they can define biodiversity. Aspects of genetic diversity were also not directly stated in the definition of biodiversity. Fiebelkorn and Menzel [11] also found that the teacher ignores genetic diversity as part of biodiversity and are often unable to explain the difference between species diversity and genetic diversity. Another 90% of student teachers are able to define it even though not as specific as the definition provided by the Convention on Biological Diversity (CBD). The CBD defines biodiversity as "the variability among living organisms from all sources including, among other things, terrestrial, marine and other aquatic ecosystem and the ecological complexes which they are a part. This includes diversity within species, between species and of ecosystems". Biodiversity may be considered at three levels which is genetic diversity, species diversity and ecosystem diversity. Based on the definition given by student teachers, about 54% of them can define biodiversity very generally as the variability among living organisms. About 13% defined biodiversity as the variability among living things

and non-living things. Other studies that examine the term biodiversity also showed that respondents have less exposure to the biodiversity term. According to Lindemann-Matthies and Bose [1], 60% of school students who studied in Switzerland and adults were not familiar with this term. Nevertheless, the findings of this study showed that the respondents are familiar with this term but can define it very briefly. It is agreed by [13] in a survey of 125 students at the University of Stirling, United Kingdom that respondents frequently mention the terms species, biologists, vegetation and diversity in terms of biodiversity thus showing a lack of knowledge on biodiversity.

B. Aspects of Biodiversity Knowledge

Knowledge of biodiversity is divided into four themes: threats to biodiversity, issues related to biodiversity, importance of biodiversity and biodiversity strategy. The themes are chosen according to the scope of knowledge about biodiversity that should be possessed by the teacher to ensure that prospective teachers have good knowledge about biodiversity. The mean scores for the four themes are 56%, 33%, 77% and 90% of the total score respectively. 95% of the student teachers agreed that they can list the principal threats to biodiversity. From the open ended question, the student teachers in this study can only identify five aspects of threats on biodiversity. These are human activities (15% of student teachers), illegal logging (13%), pollution (13%), development (15%) and destruction of habitat (3%). From the responses provided and the percentage of student teachers who can identify the threats, student teachers show limited knowledge about threats to biodiversity. Nevertheless, they can relate certain human activities to threats. For example, illegal logging occurs because of human greed for money and this can lead to the extinction of species, pollution and food insecurity.

They were questioned about the relevance of biodiversity to real world issues and 91.6% agreed on this relevance. Most of the student teachers are aware of the underlying issues and perspectives regarding the controversy in conservation of biodiversity. For example they were able to explain the controversy between the opinions of environmentalists and economists. This includes difference in opinion with regard to allowing activities that harm biodiversity to take place, illegal logging and the emphasis on development. They are also able to explain the decline of biodiversity as a result of development activities, deforestation, pollution and so on [3]. Biodiversity loss can cause human disease, lack of food and environmental disaster [14]. Even though some of them claim that they understand the relevance of biodiversity to real world issues, yet they are unable to provide further explanation when asked to give examples. Their numbers make up 36.4% of the student teachers. Therefore, training in biodiversity education is necessary to enhance student teachers' content knowledge for successful integration of biodiversity education.

93.3% of the student teachers agreed that they can list specific examples of the importance of biodiversity to human societies. However when they were asked to list the examples, about 33.9% said they were not sure and were unable to provide the list. Student teachers who can list specific examples of the importance of biodiversity to human societies show that they

understand the importance of biodiversity. For example, they know that biodiversity is the source of food, both for humans and animals. They also stated that biodiversity functions as a source of other needs of living organisms, such as oxygen, habitat and medicine. They commented that biodiversity is necessary for the continuation of the energy cycle. They can even provide examples of the species that is used to provide medicine, such as the Bitangor tree. From the answers given, student teachers can relate biodiversity with economic development, social development and environment. It is also agreed by [15] and [7] that biodiversity education is related with social relationships and the environment.

Respondents in this study (85%) indicate that they knew the strategy to protect biodiversity and ways to promote the importance of biodiversity to society. Some of them also suggest that we need to explore biodiversity around us to enable others to understand the concept of biodiversity. Exploring the forest, different habitats and visit to gardens are also suggested as ways to provide experience about biodiversity. Campaigns through social and mass media are also recommended as alternative ways to promote biodiversity. The findings support the study by [16]. Respondents understand the concepts related to the biodiversity in nature, landscape management and have a clear concept about the functions of biodiversity. However, the case study conducted by [17] in Utah showed that the respondents have less knowledge on the concept of biodiversity. Nevertheless, the respondents remained concerned about the extinction issue of endangered species and habitats. Meanwhile in the [11] study, prospective science teachers were found to have basic knowledge about strategies related to biodiversity and strategy for conservation. The concept of biodiversity has been described as a difficult concept by [18] and other studies have shown understanding and knowledge about biodiversity is very limited [11, 13]. The difficulty of the concept resulted in respondents to have a relatively limited knowledge about environmental issues such as the greenhouse effect, ozone layer depletion and acid rain. In addition, according to [19], the majority of student teachers are not sure about the term biodiversity and this resulted in their incompetence to teach biodiversity issues in the classroom. It is also agreed by [11] that prospective science teachers were found to have limited knowledge about strategies related to biodiversity and conservation.

Student teachers should be knowledgeable about principal threats to biodiversity in order to integrate biodiversity education in their teaching.

IV. CONCLUSION

The findings from this study show that student teachers possess good knowledge about biodiversity. They will be able to give proper guidance to their pupils about biodiversity when they become teachers. However, some of them show limited knowledge about biodiversity and methods of addressing biodiversity. Thus, there is a need for future studies directed towards identifying the needs of student teachers in their training program to enhance their knowledge about biodiversity, thus enhancing their ability to integrate biodiversity education.

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