Education Development Based On Practicum To Develop Reflective Thinking Students Of Biology Teachers

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Abstract. This study aims to produce a practicum model in a virtual laboratory that can provide reflective thinking skills for prospective biology teacher students on the topic of invertebrate zoology. A qualitative approach was used in this study with a case study method. The research found that the development of V-Lab invertebrate zoology programs is very helpful for prospective teachers to understand real invertebrates and improve reflective thinking skills of prospective biology teacher students, where they can relate their knowledge to everyday life. Invertebrates are a branch of biology that must be mastered by prospective teacher students, with the existence of this v-lab program makes it easy for students to understand the material and reflect it in life. Based on the results of the analysis it can be concluded that the virtual practicum on the concept of invertebrate zoology has a significant effect on improving the reflective ability of prospective teacher students.

1. Introduction

Biology is the science of living things or scientific studies of life. As a science, biology studies various issues related to various phenomena of living things of life at various levels of the organization of life and the level of interaction with environmental factors in the dimensions of space and time. Biology as part of science consists of products and processes. Biological products consist of facts, concepts, principles, theories, laws and postulates related to the life of living things and their interactions with the environment. National Education System Law Article 20 paragraph 3 of 2003 which states that "National education functions to develop and form dignified national character and civilization in order to educate the life of the nation, aims to develop the potential of students to become believers and fear of God Almighty, noble, healthy, knowledgeable, capable, creative, independent, and a democratic and responsible citizen." The aim of national education is a formulation of Indonesian human quality that must be developed by each education unit. Therefore, the formulation of national education goals is the basis for the development of national character education, including in biology subjects [1].
Development of thinking skills, mastery of essential scientific concepts, scientific attitudes, and technological activities are needed to prepare students who are literate in science and technology. Reflective thinking skills have not been developed much, while the need for the 21st century is the development of life skills which include instilling and developing students’ thinking skills are highly demanded. In addition, the media also plays an important role in helping students understand a material. Virtual-based lectures become one of the learning models that can facilitate students to understand the material better, especially in the field of abstract science [2,3,4].

Current zoological lectures have not yet developed inquiry-based learning activities optimally. This condition is caused by learning activities supported by practicums that are only demonstrative and laboratory-based learning activities that are still centered on the teacher or lecturer (teacher-centered learning) [5]. The implementation of lectures in universities is also not running optimally, this is due to the large number of lecturers who using lecture strategies and verification practices, so that students' reflective thinking skills are still low [6]. With V-Lab, it is expected to make prospective teacher students better understand and be able to reflect invertebrate zoology material better [7,8,9]. The following is the Road Map from this study.

![Figure 1. Road Map from this study](image)

2. Methods
The approach used in this study is a qualitative approach, while the research method used is a case study method. The instruments used in this study were observation sheets, reflective thinking skills tests and questionnaire sheets to see student responses to learning activities and interviews.

3. Results And Discussion
Program development is carried out by examining Invertebrate theory, lecturing invertebrate zoology to form story boards for V-lab programs, program content in the form of Invertebrate World content application that describes the form and function indirectly from invertebrates based on the classes of each phylum. The program is given to students then investigates content to answer problems after being given a student program directed to develop their reflective skills by analyzing the content they have learned. Worksheets prepared refer to the needs of students to be able to link contextually learned content that is often found in life so as to make learning more interesting and challenging.

Reflective is the giving of active, persistent, and careful consideration of forms of knowledge and supports the consequences that arise from giving these considerations [10]. Dewey suggested three criteria to give consideration, namely active, persistent, and careful. This means, before giving consideration, one must actively observe the activities or work done by that person. Consideration must
be based on observations. Thinking student relativity involves 3 activities, namely 1) returning to experience, activities to recall or detail important events; 2) presenting feelings to erase things that are felt to be obstructed and 3) evaluating experiences, involving reexamination of experience based on existing intentions and knowledge, this knowledge also involves integrating new knowledge into one's conceptual framework [11].

V-Labs is a series of learning activities that emphasize the critical thinking process and own analysis of the answers to a question in question. Students are trained to make assumptions, their own point of view based on the facts and problems that are being faced and can reflect their thoughts. The virtual practicum-based learning process that is carried out to develop students' reflective thinking skills is carried out in a limited period of time, so that the improvement of students' reflective thinking skills that occur in the middle category.

Each stage of learning in virtual practicum activities is a process for students to develop reflective thinking skills. Every learning activity in the classroom, it is very possible for students to experience difficulties. Moreover, this virtual lab is still relatively new to students. In this activity, researchers motivate students who have difficulty trying to do virtual labs again, directing students to discuss with other groups if they experience difficulties during virtual practicum, and help students who have difficulty in carrying out virtual practicums. In connection with the learning process, with the implementation of virtual practicum-based learning, students look very enthusiastic and motivated to participate in learning activities, especially with the availability of virtual practicum activities for students. This is in line with the opinion of Sahin and Yildirim 1999 in [12] who reported that the use of virtual laboratories as teacher support tools can make the learning process strong and increase students' learning motivation, providing opportunities for students to learn independently and manage their time needed depending at the speed of their learning.

In general, it can be said that virtual practicum-based learning has the same effect on improving students' reflective thinking skills. Both classes experienced a significant increase in the medium category. Virtual practicum-based learning provides a good learning experience and helps in developing and familiarizing students' reflective thinking skills.

4. Conclusions And Recommendations

4.1 Conclusions

The results showed that reflective thinking skills with the N-gain category were moderate. Learning with Virtual Laboratory can challenge students to develop their reflective skills on this material so that it can reflect into everyday life. Students find it easier to understand the benefits of invertebrates in life and it is also a provision for prospective biology teachers to teach biology comprehensively and not be separated from their life applications.

4.2 Recommendation

Based on the findings of the research conducted, here are some suggestions to complete this research, including (1) the settings of the V-Lab program should be compatible on every computer and even tab. (2) setting the implementation time of practicum-based learning must be highly considered and emphasized to students, so it is not too engrossing when implementing virtual practicum-based learning which results in the completion of practicum targets.

5. References

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