

Knowledge Analysis of Biology Education Study Program Students, STKIP Asy-Syafi'iyah International Medan about Laboratory Equipment and Their Functions

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Abstract. In essence, biology education is built on the basis of scientific products, scientific processes, and scientific attitudes. The implementation of practicum activities requires facilities and infrastructure as well as subject matter related to practicum activities. The method used in the implementation of the research is descriptive research. Descriptive research is research conducted to determine the value of independent variables, either one or more variables without making comparisons or connecting one variable to another. This study is a research that seeks to answer the question. The location of the research was carried out at the Biology Education Laboratory, STKIP Asy-Syafi'iyah International Medan Jl. Farmer's Work. The subjects of this study were students of the biology education study program at STKIP Asy-Syafi'iyah Internasional Medan in the fifth semester of the Academic Year 2021/2022. The laboratory owned by the STKIP Asy-Syafi'iyah International Medan biology education study program consists of only one room. All practical activities are carried out in this room. Biological laboratories recorded until 2016 had approximately 35 types of laboratory equipment consisting of a set of glassware, teaching aids, preparations, electronic devices, tools made of wood or plastic as well as digital and conventional tools. The design of the laboratory is still very simple, the space is only filled with 6 work desks, 20 work chairs that are not up to standard in the laboratory, 2 storage cabinets for tools and materials, a sink and cleaning equipment. The laboratory of STKIP Asy-Syafi'iyah International Medan is led by a head of the laboratory.

Keywords: Practicum, Laboratory, Laboratory Equipment, Laboratory Function

I. INTRODUCTION

In essence, biology education is built on the basis of scientific products, scientific processes, and scientific attitudes. In addition, biology education is also seen as a process, as a product, and as a procedure. As a process, all scientific activities are meant to improve knowledge about nature and to discover new knowledge. As a product, it is defined as the result of a process, in the form of knowledge taught in school or outside of school or reading material for the dissemination or dissemination of knowledge. The intended procedure is a methodology or method used to find out something (research in general) which is commonly called the *scientific method* (Trianto 2010).

One way that can provide direct experience to students in understanding the concept of biology is through practical activities. This is in line with what was stated by Leite & Dourado (2013) that the main purpose of practicum (laboratory activities) is to help students to connect real objects and ideas (concepts). Practicum in biology leads students to design laboratory experiments as well as field studies. The experiments designed can connect the conceptual aspects learned in class with the methodological aspects studied in the laboratory and in the field (Hindriana, 2016). Therefore, practicum activities can provide benefits for students in practicing the skills needed, providing opportunities for students to apply and integrate their knowledge and skills (Aqib & Murtadlo, 2016).

The implementation of practicum activities requires facilities and infrastructure as well as subject matter related to practicum activities (Khamidah & Aprilia, 2014). The facilities and infrastructure used for the practicum are in the form of laboratory rooms, tools and materials, practicum guides, safety equipment such as fire extinguishers, first aid kits used for practicum activities (Utami & Agustina, 2018). The biology learning process emphasizes providing hands-on experience to develop competencies in order to explore and understand the natural surroundings scientifically. Biology education is directed to inquiry and action so as to help students gain a deeper understanding of the natural surroundings. Practicum is one of the learning methods that is able to foster curiosity, be active, creative, innovative and have honesty in dealing with a problem in the reality of life. Through practicum students gain concrete knowledge to complement the theories obtained in the classroom that are verbalistic, train scientific skills, instill and cultivate scientific attitudes and increase student learning motivation. So that biology education students who are future biology teacher candidates are required to have adequate knowledge about laboratory equipment and their functions.

In general, the function of each tool has been given, because it is impossible for all functions to be expressed in carrying out activities in the laboratory. To make it easier to understand laboratory equipment that can be used for a relatively long time and in good condition, adequate maintenance and storage are needed (Wirjosoemarto, 2004). For this reason, it is important that students of the biology education study program who in fact are prospective biology teachers must recognize and know the name of the tool and the specifications of the tool. Not only that, students also have to understand how the tool works and what the working principle is. The laboratory and its various infrastructures play an important role in the biology learning process. The laboratory is a place for students to practice the theory given in class by the teacher so that students or students have a stronger understanding of the material being studied. According to its use, laboratories are divided into two types, namely learning laboratories (*classroom laboratory*) and research laboratories (*research laboratory*). The learning laboratory has a larger size than the research laboratory. Learning laboratories can also be called school laboratories which are designed for teaching and learning processes, practicums and other activities that support the learning process.

In general, laboratory equipment can be grouped into 2, namely: (1) *Consumable*, i.e. laboratory equipment that is used once is damaged or discarded or can also be disposable, broken or easily broken. This equipment includes glassware, glass pipe, rubber pipe, filter paper, chromatographic paper, and others; (2) *Non-consumable* equipment, namely laboratory equipment that can be used continuously and not single-use. This equipment includes gas burners, vacuum pumps, microscopes, electronic equipment, etc. It is recommended that microscopes and electronic equipment be stored separately.

The method used in conducting the research is descriptive research. Descriptive research is research conducted to determine the value of independent variables, either one or more variables without making comparisons or connecting one variable to another. This study is a research that seeks to answer the question. The location of the research was carried out at the Biology Education Laboratory, STKIP Asy-Syafi'iyah International Medan Jl. Farmer's Work. The subjects of this study were students of the biology education study program at STKIP Asy-Syafi'iyah Internasional Medan in the fifth semester of the Academic Year 2021/2022. This subject was chosen with the consideration that they had carried out most of the practicums. In addition, they will go into the field through PPL activities. The object of the research is the competence of students in laboratory/practical activities, especially students' knowledge of laboratory equipment and its functions as measured by instruments that have been prepared. The research instruments were in the form of tests and questionnaire sheets. The test method is carried out by giving three (3) types of essay questions (*open-ended questions*) to find out students' understanding of laboratory equipment and their functions in more depth. The questionnaire aims to express student interest in practicum, find out the state of the laboratory, the time available for practicum, preparation and implementation of practicum as well as reports and practicum evaluation in the Biology Education Study Program.

II. METHODS

The method used in conducting the research is descriptive research. Descriptive research is research conducted to determine the value of independent variables, either one or more variables without making comparisons or connecting one variable to another. This study is a research that seeks to answer the question. The location of the research was carried out at the Biology Education Laboratory, STKIP Asy-Syafi'iyah International Medan Jl. Farmer's Work. The subjects of this study were students of the biology education study program at STKIP Asy-Syafi'iyah Internasional Medan in the fifth semester of the Academic Year 2021/2022. This subject was chosen with the consideration that they had carried out most of the practicums. In addition, they will go into the field through PPL activities. The object of the research is the competence of students in laboratory/practical activities, especially students' knowledge of laboratory equipment and its functions as measured by instruments that have been prepared. The research instruments were in the form of tests and questionnaire sheets. The test method is carried out by giving three (3) types of essay questions (*open-ended questions*) to find out students' understanding of laboratory equipment and their functions in more depth. The questionnaire aims to express student interest in practicum, find out the state of the laboratory, the time available for practicum, preparation and implementation of practicum as well as reports and practicum evaluation in the Biology Education Study Program.

III. RESULTS AND DISCUSSION

Results

The laboratory owned by the biology education study program of STKIP Asy-Syafi'iyah Internasional Medan only consists of one room. All practical activities are carried out in this room. Biological laboratories recorded until 2016 had approximately 35 types of laboratory equipment consisting of a set of glassware, teaching aids, preparations, electronic devices, tools made of wood or plastic as well as digital and conventional tools. The design of the laboratory is still very simple, the space is only filled with 6 work desks, 20 work chairs that are not up to standard in the laboratory, 2 storage cabinets for tools and materials, a sink and cleaning equipment. The laboratory of STKIP Asy-Syafi'iyah Internasional Medan is led by a head of the laboratory. In every practicum activity, the practitioner is always accompanied by a laboratory assistant in terms of preparing the tools and materials used and assisting students in carrying out the practicum based on the practicum module used. Giving tests for students is needed to determine the level of knowledge they have about laboratory equipment and their functions. In the first question, students' answers varied. On average, students answered that the number of laboratory equipment they knew was 10. In the second question regarding the function of the tools they have written in the first question most of the answers are correct. In the third question, students were given seven (5) pictures of laboratory equipment, then students were asked to write down the name and function of the equipment. Most of the answers given by students answered correctly. Furthermore, to determine student interest in the implementation of practicum, especially in the implementation of laboratory activities, laboratory conditions, time available for practicum, preparation and implementation of practicum, reports and practicum evaluation, a closed questionnaire is given.

Discussion

1. Analysis of Students' Knowledge of Laboratory Equipment

Knowledge of laboratory equipment and its functions is important for a prospective biology teacher. Because when students teach in schools, they will carry out practical activities in their learning. Based on the results of student answers on giving the test, it can be seen that the number of laboratory equipment known by students is very diverse.

Laboratory equipment written down by all students are monocular microscopes, binocular microscopes, teaching aids, genetic buttons, thermometer, test tube rack, pH indicator paper, surgical scissors, scalpel, magnifying glass, cleaning brush, stethoscope, sphygmomanometer, earthworm box, aquariums. These tools are tools that are very familiar to students. In this case, when one student mentions 10 tools, other students sometimes only mention 5 tools and when one student mentions measuring cups, the others mention measuring flasks and so on. This shows that students' knowledge is very varied.

In this study, several errors were found by students in mentioning the names of laboratory equipment. *error first*, it was found that some students still mispronounced the name of a tool such as a burette which is often called a biuret even though the two are very different things. Burette is a chemical tool that is usually used in titrations, namely as a secondary standard solution, while biuret is one of the solutions used in the method of analyzing protein levels in a sample. *error second* mentioned by the students was that some students often did not know that a tool sometimes has the same name (synonym) as a beaker is the same as a beaker and a goiter pipette is the same as a volume pipette. *mistake third*, students often cannot distinguish how many tools

have almost the same function but have different uses, such as measuring flasks, measuring cups, measuring pipettes. Although all three can be used to measure the volume of a substance, they are used differently. Volumetric flasks have several volume sizes that are commonly used for dilution of solutions, preparation of standard solutions. Measuring cups also have several volume sizes, and are usually only used to measure the volume of a solution, while pipettes have a smaller volume size range.

Students' knowledge of the function of the tool is also relatively sufficient. In question number 2, when students are asked to explain the function of laboratory equipment that students have mentioned themselves in number 1, it turns out that most students do not know its function. On the other hand, often the functions described are still wrong.

Based on the answers about laboratory equipment and its functions, it can be concluded that students of the biology education study program who will become a biology teacher are still unable to identify laboratory equipment and know its proper function. The knowledge of prospective biology teacher students who are still relatively lacking about laboratory equipment is influenced by several factors. Therefore, to find out these factors, one method of collecting data in this study is to use a closed questionnaire.

Information that can be obtained based on aspects of student interest in practicum, among others, that most students agree (and strongly agree) with the use of laboratory/practice activities. Students feel that practicum is important to carry out although sometimes students are still confused when connecting lecture material in class with practicum material. The second aspect is the state of the laboratory, which contains an assessment of the laboratory conditions, the state of tools and materials, the number of available tools and others. One laboratory room is used for several types of practicum even though the practicum time is different. Most of the students think that the number of equipment and materials is still not sufficient. Plus, some of the tools are in a state of disrepair.

Another factor that affects the implementation time of the practicum. This aspect contains questions about the number of practicums in one semester, the length of the practicum, additional practicum time when the practicum has not been completed according to the schedule or whether there is a practicum remedial time. All students (100%) felt sufficient and completed the practicum on time and mostly. However, it is better if the practicum implementation time is added and the practicum schedule and courses are not carried out at the same time.

The fourth factor that affects the practicum is preparation and implementation. Aspects of preparation include the preparation of tools and materials, making practicum journals. Students do not prepare their own equipment and materials, all are prepared by laboratory assistants. In the implementation of the practicum, based on the results of the questionnaire, there were some lecturers who gave an introduction in the form of a brief explanation of the practicum, how it worked and the purpose of the practicum, but there were some lecturers who did not give directions first, the lecturer always guided and supervised the implementation of the practicum.

The fifth aspect that influences students' knowledge of laboratory equipment and its functions is the report and practicum evaluation. Based on the questionnaire analysis, all students made an individual practicum report after completing the practicum. The practicum report is collected, and returned to the students. Discussion / discussion of the results of the practicum is not always carried out, this is influenced by time constraints. The practicum evaluation includes a preliminary test (*pre test*), work scores, reports and a final test (*post test*). The pre-test was conducted both orally and in writing. The post test is carried out with a practical exam or presentation of the results of the practicum.

IV. CONCLUSIONS

Based on the description of the research above, several conclusions can be drawn, namely (1) Knowledge of biology education study program students about laboratory equipment and its functions is relatively sufficient and needs to be improved. (2) The factors that influence the knowledge of biology education study program students about laboratory equipment and their functions can be summarized in several ways, namely (a) the number of equipment and materials is still not sufficient plus, some of the equipment is in a damaged condition; (b) a limited amount of time; (c) students are not actively involved in the preparation of tools and materials; (d) the evaluation system and practicum reports are also still not ideal and the discussion of the results of the discussion needs to be improved.

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