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*Research Article*

# Biology science practicum learning: An evaluation study in junior high school of Ngemplak-Indonesia

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ABSTRACT

Practical activities are the main activities of learning biology whose implementation is rarely evaluated. This study aimed to determine the quality of biology practicum which includes planning and implementation of biology practicum and student learning outcomes thereafter. The population in this study was students, teachers and and laboratory assistant in Junior High School (JHS) 2 Ngemplak, Indonesia. Purposive sampling was used as sampling technique, in which the sample were 93 students of class VIII A to VIII C, 1 teacher and 1 laboratory assistant. The instruments used in this study were observation sheets. The evaluation criteria were adjusted based on the Regulation of the Minister of National Education. Data were analyzed descriptively and qualitatively. The results inform that the planning and implementation of biology practicum activities were in good categories. In addition, student learning outcomes have also exceeded the minimum completeness score. The results of this study indicate the importance of practicum activities and their contribution to biology learning outcomes. Therefore, the implementation of practicum is highly recommended to be optimized in other schools.



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## INTRODUCTION

Practicum activities include important learning activities that support the success of studying Biology. Through practicum activities, students' cognitive, psychomotor, and affective learning outcomes can develop optimally. During practicum activities, their science process skills will be empowered (Duda, Susilo, & Newcombe, 2019; Wiwin & Kustijono, 2018). This learning activity can also train students to carry out scientific methods and apply scientific attitudes (Arlianty, Febriana, & Diniaty, 2017; Wiwin & Kustijono, 2018). Therefore, practicum activities cannot be separated from biology learning.

As part of the Natural Sciences subject, biology learning does not only focus on learning outcomes. Besides learning outcomes, student success in studying biology must also be based on processes and attitudes because science is not only a product, but also a scientific process and attitude. In connection with this explanation, students should not only be encouraged to memorize concepts but also understand the process of

obtaining these scientific concepts. The form of learning that is most appropriate to realize this target is inquiry-based learning which involves experimental activities through practicum in the laboratory (Jeffery, Nomme, Deane, Pollock, & Birol, 2016; Leite & Dourado, 2013).

Based on the seventh grade syllabus for junior high school science, some learning objectives must be achieved by students through observation and experiment activities which require laboratory facilities, both indoors and out of the field. Biology contains many abstract concepts (Çimer, 2012; Hadiprayitno, Muhlis, & Kusmiyati, 2019). The presence of practicum activities can provide a direct description of the biological phenomena that cannot be obtained if students only study biology from textbook in the classroom (Jeffery et al., 2016). Therefore a practicum is needed to facilitate students learn and gain experience directly (Mariyam, Lestari, & Afniyanti, 2015; Mellish, Ryan, Pearson, & Tuckey, 2019).

However, based on an interview with a science teacher at Eight Grade JHS 2 Ngemplak on March 21, 2017, the teachers preferred to do learning activities in the classroom and preferred to do demonstrations and lectures rather than doing practical work. Moreover, practicum activities in this school are still rarely carried out due to various problems related to incomplete laboratory facilities and infrastructure as well as lack of available biology lab guides and practicum worksheets. The teacher also lack of knowledge about how to operate the tools and materials that utilize during practicum activities. Then, the limitations of existing learning time make practicum learning ineffective and the lack of assessment results from the practicum learning process which is only limited to tasks. In fact, students' psychomotor skills cannot develop optimally if their teacher just implement lecture methods during learning (Hasruddin & Rezeqi, 2012).

The implementation of the practicum learning process itself is inseparable from good planning. The importance of the teacher's role in paying attention to practicum learning planning is expected to be able to provide opportunities for students to understand the process of learning activities inside the laboratory or outside the laboratory. Therefore, in line with that, Ramadhani and Titisari (2019) explained that the practicum must be prepared properly and correctly so that the practicum learning activities that will be carried out can help students learn optimally.

Related to many obstacles faced by JHS 2 Ngemplak, a study that explore biology learning activities implement in this school is need to be conducted. Various studies examining biology learning have been conducted by previous researchers. The majority of these studies evaluate science learning implementation (Momsen et al., 2013) or evaluate the learning resources (Novitasari, Ramli, & Karyanto, 2019; Yang, Liu, & Liu, 2019). However, research that focuses on evaluating the process of practicum activities is still rarely conducted. Research that examines practicum activities is limited to surveys of teacher opinion (Osuafor & Amaefuna, 2016) or teacher competence (Parmin, Sajidan, Ashadi, Sutikno, & Fibriana, 2017) related to practicum activities. Therefore, the aimed of this study was to explore whether the practicum activities at JHS 2 Ngemplak have been running well or not. Apart from that, this research will also explore how the practicum learning process occurs in the laboratory, the readiness of the teacher in carrying out learning activities in the laboratory, the role of laboratory assistants in the laboratory and the readiness of students in carrying out practical learning and seeing the results of practicum learning. Various important findings will be obtained from this study. These findings will be very valuable to improve the quality of the learning process, especially the quality of JHS biology learning in Indonesia.

## METHOD

This research is evaluation research. This research was carried out at eight grade JHS 2 Ngemplak. The population in this study were junior high school student grade VIII class A until F, VIII grade teachers and laboratory assistants. This research was conducted during the 2017/2018 academic year and involve 188 students as research subject. The sampling technique used in this study was purposive sampling. The sample selection criteria were classes that were taught by the same teacher. The result, obtained three classes (VIII A, B, and C) as research samples.

The research criteria were adjusted based on the Minister of National Education Regulation. Aspects observed in this study include planning, implementing, and evaluating activity during biology practicum learning. Data collection techniques used were observation and documentation techniques. The instruments used in this research was observation sheets. The observation sheet consisting of 36 statement. The instrument consists of two aspects, namely (1) preparation and (2) implementation of practicum activities. Aspect (1) consists of three indicators, i.e., teacher preparation (6 items), laboratory assistant preparation (3 items), and student preparation (2 items). Aspect (2) consists of three indicators, i.e., opening activities (6 items), main activities (14 items), and closing activities (5 items). Each item used a Guttman scale with yes and no category

Data obtained from observation sheets were analyzed using the percentage formula according to Sugiyono (2012) as seen in formula (1), where p is the percent number, $\sum$ is the total score obtained and N is the ideal

number of scores for all items. When the percentage is more than 50% it will be in the "good" category, if 50% will be in the "sufficient" category, and if it is lower than 50% it will be in the "not good" category.

$$P = \frac{\sum}{N} \times 100\% \quad (1)$$

## RESULTS AND DISCUSSION

Practicum is an important activity that should be found in every biology class. Before starting the activity, practicum preparation is a crucial stage so that the learning process becomes more optimal. At JHS 2 Ngemplak, the practicum planning stage involved several activities. Based on Table 1, teacher planning was included in the good category with a percentage of 83.33%. One of the activity conducted by the teacher is to make a lesson plan. Related to Menteri Pendidikan Nasional Republik Indonesia (2013), lesson plans are translated from the syllabus to direct learners' learning activities in an effort to achieve basic competencies. The ability to make lesson plan is the first step that must be possessed by the teacher. Preparing lesson plan is a very important stage in every learning process due to planning stage greatly affects the quality of learning outcomes.

**Table 1.** The results of observations of practical learning planning

| No. | The observed aspect | Descriptors | Class (%) | | | Average (%) |
|---|---|---|---|---|---|---|
| | | | *VIII A* | *VIII B* | *VIII C* | |
| 1. | Practicum learning planning | Teachers | 83.33 | 83.33 | 83.33 | 83.33 |
| | | Laboratory assistant | 100 | 100 | 100 | 100 |
| | | Students | 40.32 | 66.66 | 43.54 | 50 |
| | Average | | 74.55 | 83.33 | 75.62 | 77.77 |
| 2. | Practicum learning implementation | Opening activities | | | | |
| | | 1. Teachers | 3 | 4 | 4 | 61.11 |
| | | Main activities | | | | |
| | | 1. Teachers | 4 | 4 | 4 | 100 |
| | | 2. Students | 112 | 95 | 99 | 83.15 |
| | | 3. Laboratory Assistants | 2 | 2 | 2 | 50 |
| | | Closing activities | | | | |
| | | 1. Teachers | 1 | 2 | 2 | 83.33 |
| | | 2. Students | 56 | 41 | 59 | 56.52 |
| | Average | | 76.39 | 65.54 | 72.96 | 72.35 |

The readiness of the teacher in planning learning is very important, because if the teacher does not prepare and plan well, the practicum learning process will not run well and the learning objectives will not be achieved. This is in line with the results of Khamidah and Aprilia (2014) that reported that readiness before practicum has a large influence on practicum process. Teachers are human resources who become planner, actors as well as determining the achievement of educational goals, so that planning and teacher preparation are determinants of the learning process and determinants of evaluation (Hasanah, Prasetyo, & Lukiati, 2017; Ramdiah, Abidinsyah, Royani, & Husamah, 2019). Unfortunately, according to the observations, the teacher has not prepared a pretest. In fact, conducting a pretest will encourage students to prepare themselves more before doing practicum activities. By better preparing themselves, the process and practicum activities will be smoother because students will better understand what they are going to do. In addition, the existence of a pretest has been reported to be able to optimize the effectiveness of learning (Simkins & Allen, 2000).

Then, based on Table 1, laboratory assistants were able to prepare for practicum activities well (the percentage reaches 100%). Laboratory assistants have prepared tools and materials according to the practicum activities to be carried out. Laboratory assistants also help teachers prepare worksheets. In preparing practicum activities, laboratory assistants must coordinate with teachers. This coordination is important because the harmony between the teacher and laboratory assistants will ensure that the practicum runs well (Khamidah & Aprilia, 2014).

Furthermore, preparations made by students were included in “enough” category with a percentage of 50%. Preparations made by students before practicum learning are considered very important. According to Decaprio (2013), students who take practical activities in a science laboratory must make sufficient preparation before entering laboratory room. However, students’ interest in reading theory books related to the material to be practiced need to be concerned. Even though the teacher has given time to read, students still seem could not be more serious to prepare themself. Student readiness greatly affects learning activities that will be carried out in the classroom and in the laboratory. This is in line with Hasruddin and Rezeqi (2012) who stated that

students' self-readiness is very important to achieve success in learning activities. Meanwhile, according to Hasanah et al. (2017) preparing to attend lessons is something that needs to be considered by students.

After the preparation, the next step is practicum implementation. Based on Table 1, each indicator has shown a good percentage. The average percentage of class VIIIA was 76.39% (good), class VIIIB was 65.48% (good), and class VIIIC was 72.96% (good). Teacher were observed at the beginning of the activity, the main activity and the end of the activity. Based on the observation results, the teacher has implemented four of the six aspects. Teacher observations on initial activities include the teacher closely supervising the practicum, guiding students, answering student questions and giving instructions if students experience difficulties and providing motivation for students to do practical work seriously. At the end of the activity, teacher gave posttest to students. Then, together with students, the teacher concludes the learning activities that has been conducted.

Providing motivation at the beginning of learning is an important activity that must be done by the teacher. Through motivation, teacher could give special stimulus at the beginning of learning that aims to grab the attention of students. Providing good motivation can stimulate students to focus and be interested in following the activity of learning. Motivation is an important factor in learning and affect learning success (Gbollie & Keamu, 2017; Redondo & Martín, 2015). With the motivation of the students, their interest in learning will increase. Together with motivation and learning efficacy, students' interest to learning will optimize the learning process (Artino, 2012; Ayllón, Alsina, & Colomer, 2019; Daskalovska, Gudeva, & Ivanovska, 2012; Harackiewicz, Smith, & Priniski, 2016).

Apart from teachers, observations were also made on laboratory assistants. The observation results informed that the laboratory assistant recorded the presence of the teacher and students and served the teacher and students in during practicum activity. On the other hand, laboratory assistant was not recording the damage of laboratory equipment and did not provide first aid due to there were no accident during practicum. The presence of laboratory assistants is very important in supporting the implementation of laboratory activities. The laboratory assistant helps the preparation of equipment until clean and restore all equipment after practicum finished. Besides that, according to Decaprio (2013), the existence of a laboratory assistant is very important in determining the success of the research process, practice, and experimentation of a particular object. For this, a laboratory assistant should have adequate hard skills and soft skills. Initiatives, perseverance, creativity, skills, skills and knowledge mastered by laboratory assistants often help the efficiency and effectiveness and productivity of the laboratory.

Furthermore, students have carried out all four aspects of the components of main activities. These observations include carrying practical work instructions, using tools and materials correctly, discussing observations with groups, taking notes on observations made.

After practicum activities, students' learning outcomes were collected. The data of students' learning outcomes are presented in Table 2. Based on Table 2, almost all students have exceeded the predetermined minimum score limit (the minimum score limit is 76). There was only one student who was below the minimum mark. Based on the information from the teacher, this student has mental retardation. Therefore, this student have difficulty accepting the lessons given by the teacher. The high percentage of students who passed the minimum score is related to learning experiences that lead students to understand the scientific process. This kind of learning can optimize student learning success (Jeffery et al., 2016; Leite & Dourado, 2013).

**Table 2.** The results of practicum learning

| No | Class | Percentage of passing (%) | Category |
|---|---|---|---|
| **1** | VIII A | 96.77 | Good |
| **2** | VIII B | 100 | Good |
| **3** | VIII C | 100 | Good |
| **Average** | | 98.92 | Good |

The success of every aspect observed is very much needed in the learning process. Along with the implementation of practical learning Biology, teachers should be able to maximize their performance so they can achieve good results. Teachers have a very big role in the teaching and learning process (Ramdiah et al., 2019). The success of practicum learning is inseparable from good planning by the teacher, good preparation by laboratory assistants and students and with good cooperation when carrying out the learning process while carrying out practicum activities. In addition, the teacher also plays a role in conducting learning assessments. By conducting an assessment of the learning process, students will know their abilities clearly so that students can improve and improve the quality of learning.

## CONCLUSION

This research has observed the class 8 biology practicum at JHS 2 Ngemplak. The results of the study concluded that in general the practicum activities were going well, both at the practicum planning stage and at the implementation stage. Teachers and laboratory assistants have performed their roles quite well. Student learning outcomes also show satisfactory results because the majority of students have exceeded the minimum value limit.

Despite showing satisfactory results, several recommendations still need to be made. First, practicum activities should be more carefully planned and scheduled so that the preparation made by teachers, laboratory assistants and students become more optimal. Second, the teacher must encourage students to be more enthusiastic about learning theoretical basics before the practicum starts. Third, the preparation of laboratory equipment needs to be taken into consideration for the school and the education office because limited laboratory equipment is a major obstacle in organizing practicum in various schools.

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