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Analysis of Students' Ability to Apply Physics Concepts through Environmental-Based Worksheets on Junior High School

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Abstract *– This research is a descriptive research with a quantitative approach that aims to determine the students' ability to apply physics concepts in junior high school by using environmental-based worksheets. The sample of this research were 31 students of class VIII$_A$ SMP Negeri 1 Kolaka, taken by using purposive sampling method. This research was carried out in 6 meetings with the subject matter of light and optical instruments. Data collection was conducted by using observation, evaluation, and tests at the end of each teaching cycle; analyze the data through the results of quantitative analysis. The results showed that in the light material, the average score of students' application of physics concepts was 19 out of a total of 30 questions with a high percentage of students belonging to 25.80%, while for optical instruments, the average score of students' physics concept application was 21. from a total of 30 questions with a high percentage of students, 54.8%. Thus, it can be concluded that the provision of environmental-based worksheets can improve the ability of students to apply physics concepts on class VIIIA of SMP Negeri 1 Kolaka.*

Keywords: *environmental-based worksheets; physics concepts; student's ability*

I. INTRODUCTION

In the current era of revolution 4.0, various modern educational tools support the teaching and learning process at school and at home. This is the first step in the advancement of education for children. Children as objects of education are directed to become human beings who are knowledgeable and literate in information technology (ICT). The development of information and communication technology (ICT) today has contributed significantly to the dissemination of information, especially the dissemination of educational information (Sari et al., 2022). For this reason, children must be provided with facilities and equipped

with various 21st century skills as educational support to complement their life skills.

We cannot deny that to face global competition in today's world of education, we need modern and up-to-date equipment. However, it must also be accompanied by the use of skills for teachers and students. This is of course directly related to the potential of the surrounding environment and the competence of existing human resources in managing education with these modern tools. Therefore, educators need to equip themselves with various abilities and strategies for using various forms of technology in learning. The practicing teachers explored various strategies to integrate specific technology tools into their lessons in a consistent manner with constructivist pedagogy (Keengwe et al., 2011).

The condition of the teacher's lack of understanding in the use of technology will be very inefficient to be able to achieve learning objectives. This is because in order to achieve the learning objectives it is necessary to develop interesting and fun learning atmospheres. A good learning process is when students are more active than teachers, because the learning process like this is more interesting and the material is easier to understand (Sukariasih et al., 2019; Hunaidah et al., 2019), so that it can grow the confidence of both educators and students. In addition, technology is enabling multi-modal teaching, changing curricula and spawning rich forms of online research and collaboration (Glenn et al., 2008).

It must be admitted that the government's attention to the world of education is quite large, including: curriculum improvement through the concept of an independent curriculum, procurement of adequate learning facilities and attention to welfare for teachers. The implication of this requires teachers to be more professional by presenting more innovative solutions, so as to create a learning environment and the ability to manage education that further improves the quality of the teaching and learning process to be effective and meaningful, especially in learning physics. Thus in learning, science should be oriented to an approach that gives more opportunities for students to develop their ideas by providing a problem that needs solutions (Saputra et al., 2021).

However, there is a classic problem found in the physics learning process in schools, namely the low score of physics subjects in both formative and summative assessments. In the case at SMP Negeri 1 Kolaka, based on observations made by researchers, learning physics seemed to be not effective. The teacher still uses monotonous methods such as lectures, discussions and information. As a result, students experience a kind of boredom, sleepiness and even antipathy towards physics subjects. One of the most important

things that students must have especially in physics or science subjects is process skills because process skills include domains of attitudes, knowledge, and skills have a contribution to students' learning in school (Sukariasih et al., 2019).

On the other hand, it is undeniable that physics is one of the fields of study that students do not like (Akhfar & Saputra, 2020). Based on the definition of physics as a science that studies all natural phenomena and events in real life through physical concepts, an instrument for generating interest and the ability to apply these concepts is needed. Observing this, learning will be more effective if using environmental-based worksheets, where students will be more directed to learn in the open. Thus, environment-based physics learning has a significant impact in increasing students' mastery of concepts and eco-preneurship (Sunarti et al., 2020). Learning with an environmental approach has a positive impact in junior high school students' understanding (Karyadi et al., 2019).

Learning by giving environmental-based worksheets will make students learn physics with joy and meaning to find something in physics, so that students can increase their thinking abilities to the maximum to absorb knowledge that is both given by the teacher and obtained by themselves in the learning process. The previous research has revealed that the level of effectiveness of the developed environmental-based worksheets was very good or a percentage value of 95% effective (Dermawati et al., 2019). Other research show that students' learning outcomes achieved good category after using environmental-based science learning. In addition, the result if implementation of environment-based learning media indicate that the the media is effective to improve students' mathematical problem-solving abilities (Parwati et al., 2019). Those findings mentioned earlier become the basis for this research to find out the students' ability in understanding physics concepts and these also become a novelty in this research. Hence, the researchers intend to conduct an analysis by quantitative the ability of students to apply physics concepts through environmental-based worksheets.

II. METHODS

This research is a descriptive method with a quantitative approach with implementation stages including planning, action, implementation, evaluation and direct reflection, then these stages are arranged in one cycle of activities (Tiro, 2008). In this study, there is only one type of variable (single variable) namely the ability of students to apply physics concepts through the provision of environmental-based worksheets. The ability to apply the concept of physics is the total score concerning the students' ability to apply or use the materials that have been studied in everyday life.

Giving environmental-based worksheets is learning by filling out worksheets which are answered by students with their own thoughts, where the questions in the worksheets are related to events that are often experienced by students in their daily lives, which are then followed up by the teacher by checking the worksheets.

This research was carried out at SMP Negeri 1 Kolaka on 2020/2021 academic year. The implementation was carried out for 4 months, starting from the first week of March to the last week of June 2021. The subjects in this study were class VIIIA with a total of 31 students consisting of 17 female students and 14 male students. In addition, this study also involved 2 teachers of physics subjects at the research location schools as observers during the implementation of the learning process and practicum.

This research was carried out for 6 meetings which were divided into two cycles with the subject matter of light and optical instruments were a series of interrelated activities. In a sense, the implementation of the second cycle was a continuation and improvement of the implementation of the first cycle. The procedure for implementing the actions taken follows (McTaggart et al., 2017) which consists of 4 main components. The four components can be written as follows: (1) Action planning stage; (2) Stages of implementing activities; (3) Evaluation stage; and (4) Reflection stage (Tiro, 2008).

The quantitative data collected were obtained from the ability test of the application of physics concepts and observation sheets. For the purposes of descriptive statistical analysis, the distribution table of the mean score and standard deviation was used. To obtain a clear picture of the student's position determination based on the test scores of the ability to apply the concept of physics, then grouping is carried out in three categories, namely low, medium and high categories.

III. RESULTS AND DISCUSSION

The results of the analysis ability test for the application of physics concepts and analysis of observations from each action implementation in each cycle can be described as follows:

The results of the analysis ability to apply the concept of light on cycle I can be see on following table.

Table 1. The descriptive analysis of ability to apply the concept of light.

No	Statistics	Statistical Value
1	Sample	30
2	Highest score	26
3	Lowest score	9
4	Average score	19
5	Standard deviation	3.3

Table I shows an analysis of students' learning ability in understanding the concept of light in cycle I. The data from the analysis in cycle I shows that of the 30 samples given the concept understanding test, there were already students who obtained a maximum

score of 26, but there were students who received the lowest score with a score of 9. The average score of all students was 19 with a standard deviation of 3,3. The scores of research subjects can be grouped into 3 categories which are presented in the following frequency on figure 1.

By looking at the data collected on this research, the largest percentage of students' ability test scores for applying physics concepts is in the medium category, which is 67.6%. This is because in the first cycle, environmental-based worksheet is a new thing that is obtained by students, so they are still fixated on the old learning, even though they already know the worksheet. In more detail, the percentage of student activity data is presented in the following figure.

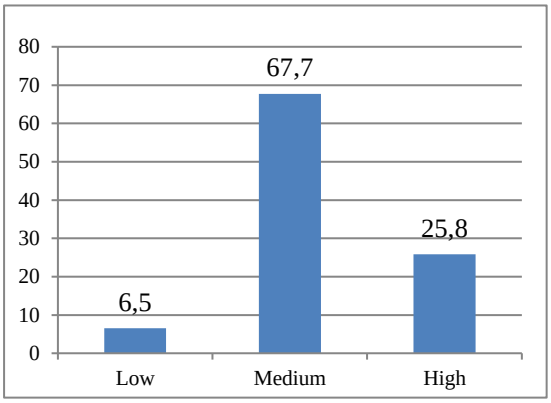

Figure 1. Level of students activity on learning in cycle I

The results of observations made during the learning process in cycle I, researchers still found that there were students who were less active in attending lessons and conducting experiments, so that students who were less active interfered with their active friends.

Based on the results of test analysis and the results of student observations during the implementation of the teaching and learning process and practicum and the results of discussions with physics teachers (observers) as well as the results of filling out questionnaires by students to obtain responses or input for improvement and refinement of the implementation of actions in cycle II with subject matter of optical instruments.

The results of the analysis ability to apply the concept of optical instruments can be see on following table.

Table 2. The descriptive analysis of ability to apply the concept of optical instruments.

No	Statistics	Statistical Value
1	Sample	30
2	Highest score	26
3	Lowest score	18
4	Average score	21
5	Standard deviation	2.1

Table 2 shows an analysis of students' learning outcomes in understanding the concept of optical devices in cycle II. Data analysis results in cycle II show that of the 30 samples given a concept understanding test it has shown an increase in understanding marked by students getting the lowest score with a score of 18, the average score of all students' acquisition also increases to 21 with a standard deviation of 2, 1. This explains if there is a significant increase in understanding

because there are no more students who get a score of 9.

The largest percentage of students' ability to apply physics concept test scores in cycle II was in the high category, namely 54.8%. This is because in the second cycle, there have been improvements from the first cycle so that the results obtained are better or increase.The results of observations made during the teaching and learning process and practicum in cycle II, researchers saw a positive increase, students were active in following lessons and practicums.

The results of giving tests and direct observations during the process of implementing the teaching and learning process and practicum, are then communicated with the physics teacher (observer) to obtain responses as well as to know the final results of the implementation of the action or research. In more detail, the percentage of student activity on cycle II is presented in the following figure.

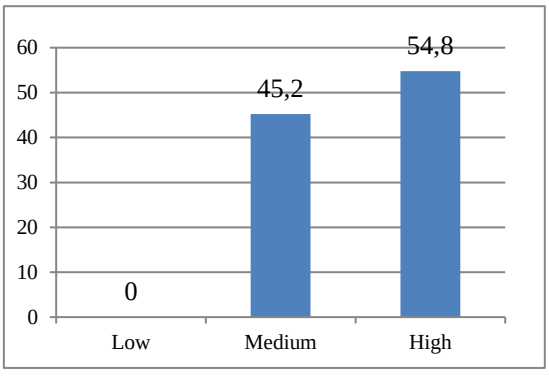

Figure 2. Level of students activity on learning in cycle II.

Based on the results of data analysis that has been carried out, the results of this study reveal that students who initially had a low level of application of physics concepts, can actually be improved by providing environmental-based worksheets. The increase in the average score obtained by students is seen by the increasing frequency and percentage of student activity in participating in the teaching-learning process and practicum. Practicum activities in schools during the pandemic are very difficult to conduct because they require tools and materials that must be demonstrated directly by teachers and students (Saputra et al., 2021).

According to Arikunto (2010), the indicator of student success in the teaching and learning process is if the student's learning mastery reaches 65%. The test results in the first cycle showed that the level of application of students' physics concepts to the material being taught was around 64%, it was said that the success of students in applying physics concepts through the provision of environmental-based worksheets in the first cycle had not been achieved.

While in the second cycle, the results of the application of physics concepts through the provision of environmental-based worksheets reached a percentage of about 73%. It means that physics concepts require the ability to practice thinking and reasoning so that one's reasoning abilities can be develop (Saputra et al., 2022). In addition, using environment-based worksheets can significantly improve students' scientific

literacy, so that the ability to practice thinking can be optimized (Syukur et al., 2021). Environment-based learning is needed to increase students' activity through environmental empowerment, which can solve the problems in society as well as to improve students' scientific literacy (Harisna & Sutarto, 2020).

With this percentage in the second cycle, learning completeness on the application of students' physics concepts through the provision of environmental-based worksheet is achieved. So it can be concluded that in the second cycle there was an increase in the application of students' physics concepts by 9%. In the other result, the implementation of environment-based learning media is effective to improve students' problem-solving abilities (Parwati et al., 2019).

The success of students in the application of physics concepts through the provision of environmental-based worksheets is very supportive of learning outcomes because students are usually very interested and motivated when studying in the open or in the surrounding environment. The approach learning with environmental-based worksheets is make student's have collaborative problem-solving ability who does not only sharpen the students' cognitive competency but also their social attitude (Rosa & Aththibby, 2021). Hence, students can directly relate the subject matter to the phenomena that exist in nature. Beside that, environmental-based worksheets also related to science process skills student's because science process skills are the skills that manually and socially involve thinking skills (Ika & Doa, 2021).

In the first cycle, the effort to provide environmental-based worksheets filled by students was still awkward. This is because students are not used to learning in the open or the surrounding environment. After making observations and improvements in the next cycle, students' ability to apply physics concepts through the provision of environmental-based worksheets is increasing.

This increase was due to improvements in the implementation of learning or practicum in cycle II. The evakuation is in the form of: (1) increasing the experimental time so that students are not in a rush in conducting experiments so that the filling of environment-based worksheets can be carried out optimally; (2) using LCD Projector in teaching, and (3) multiplying examples of questions.

From cycles I and II, the results of observations showed an increase in students' learning activity, as well as in conducting experiments and filling out environmental-based worksheets. This is due to the emergence of students' interest and motivation when studying in the open or in the surrounding environment. Students are not used to connecting the physics concepts they have learned with their application in solving problems in their environment, let

alone designing or creating creative products (Sunarti et al., 2020), the worksheets are suitable for use in learning combined with the surrounding environment in the worksheet is proven to help improve creative thinking skills students (Safira & Susilo, 2022), and that students' involvement in environmental projects had a statistically significant positive impact on their environmental knowledge and science attitudes (Al-Balushi & Al-Aamri, 2014).

The score of students' ability to apply physics concepts in cycles I and II also increased by 9%. This is in line with the previous research that show the positive result to help students' understanding about science knowledge based on environmental cognitive (Erdawati et al., 2019) and the understanding of students to environmental character is usually more contextual because students will recognize the immediate surroundings (Nurkhalisa & Mastura, 2017). Based the quantitative and qualitative data analysis during the study, it is known that the application of the concept through the environment-based worksheets that have been implemented has increased.

IV. CONCLUSION AND SUGGESTION

Based on the results of research and data analysis that has been carried out, it can be concluded that the provision of environmental-based worksheets can improve the ability of students to apply physics concepts on class $VIII_A$ of SMP Negeri 1 Kolaka. The increase percentage ability of students to apply physics concepts from cycle I to cycle II is 9%.

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