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Application of the Discovery Learning Model to Improve Students' Science Process Skills on Virus Material

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Abstract

Based on the results of a researcher interview with one of the biology teachers at SMAN 3 Gorontalo, science process skills have been applied before, but in their implementation they do not get maximum results so that science process skills in students do not develop. The purpose of the study was to improve the science process skills of students who used the Discovery Learning model on virus material. This type of research is descriptive quantitative with Pre-Experimental Design research methods and One group pretest and posttest designs. The subjects in this study were 31 students of grade X-4 SMA Negeri 3 Gorontalo. The indicators of science process skills observed in this study consist of aspects of observing, interpreting, applying concepts, grouping, and communicating. The results obtained the average pretest score was 45.21%, and the average posttest score was 77.75%. From the results of the study, it can be concluded that the science process skills of grade X students of SMA Negeri 3 Gorontalo can be improved through the application of the Discovery Learning model

Keywords: *Discovery learning, Science process skills, Virus*

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INTRODUCTION

Learning is the process of interaction between students and educators in a learning environment which includes teachers and students who exchange information. Learning also affects student learning outcomes, depending on how the learning process takes place. The qualification criteria for students' skills and competencies that are expected to be achieved after completing their school period at the secondary school level include aspects of behavior or attitudes, self-skills and knowledge (Kemendikbud, 2016). To achieve educational goals, an innovation or improvement in the learning process is needed.

Changes in the learning process are needed to improve the quality of learning specifically. According to Ariyansyah & Nurfathurrahmah (2022), science process

skills are the ability of students to apply scientific methods in developing their knowledge, understanding science and discovering science. These skills need to exist in every student to provide knowledge so that it can be applied in his life.

The reality is that science process skills are still poorly developed in schools, because there are still many teacher-centered teaching and learning activities. One of the causes of low student science process skills is that teachers do not provide opportunities for all students to participate in the learning process. Students' science process skills are still low resulting in students tend to be silent and only receive information from the teacher, so in the implementation of learning science process skills professional teachers are needed. Teachers besides being facilitators are also motivators and inspirers. Student center learning mechanism. In addition, teachers must be creative and innovative in developing learning methods or looking for learning problems, thereby improving the quality of learning (Hasan & Ahmad, 2019).

The science process skills studied in this study are basic science process skills. According to Rahayu & Angg (2017), these basic science process skills include observing, measuring, inferring, grouping or classifying, predicting and communicating. Based on the results of an interview conducted by researchers with one of the biology teachers at SMA Negeri 3 Gorontalo, it was found that learning activities based on science process skills had been applied before, but in its implementation did not get maximum results so that the science process skills in students did not develop. This results in students' understanding of a subject matter being less than optimal which can affect the completeness of student learning. Based on these data, an effort is needed to train students' science process skills so as to improve student learning outcomes. The science process skills that will be examined in this study are only five science process skills, namely observing, interpreting, applying concepts, grouping, and communicating.

Based on how to develop students' science process skills, a learning model is needed that can support the emergence of student science process skill activities, one of the optimal learning models for training science process skills is Discovery Learning. According to Ali & Setiani (2018), the Discovery Learning learning model used during the educational process, provides insight into understanding biological concepts. The Discovery Learning learning model has the potential to give students greater opportunities about learning in the process of completing tasks. Students perform tasks such as observing, classifying, making conjectures, explaining, measuring, and highlighting conclusions. According to Fitri & Derlina (2015) which states that Discovery Learning helps students to improve cognitive skills and processes.

Biology learning is one branch of science that studies living things, one of the biological sciences that studies living things, namely virus matter. Viruses are one of the smallest living things that can only be seen through an electron microscope and can be a source of disease for other living things. The sub-chapters of virus material studied are virus characteristics, virus body structure, virus shape, replication and the role of viruses in life. Many students have difficulty understanding the concept of viral material. The material to be used in this study is viral material. So with the indicator of science process skills by applying the Discovery learning learning model, it is expected to help students to learn or understand the concept of virus material.

METHOD

This research was carried out in the odd semester of the 2022/2023 academic year in grade X of SMA Negeri 3 Gorontalo. The type of research is descriptive quantitative using Pre-experimental design with One group pretest and posttest design. This study began with the provision of a pretest. The subjects in this study were all 31 students of grade X-4 SMA Negeri 3 Gorontalo. This study used data collection techniques by making observations on students and teachers using student activity observation sheets, and teacher activity observation sheets. Learning outcome tests in the form of pretest and posttest which include several indicators of science process skills, namely the skills to classify, interpret, predict, formulate hypotheses and skills to apply concepts.

Teacher and student Activity Sheet Analysis

Analysis of teacher and student activity sheets can be calculated using**,** the following by (Purwanto, 2010) formula:

$$\% \text{ Every aspect} = \frac{Score\ of\ each\ \ aspect\ achieved}{Total\ score\ eachh\ aspect} x\ 100\%$$

Table 1. Criteria for Learning Implementation (Prayudo et al., 2018)

Activites (%)	Criteria
86 < p	Very Good
71 < p ≤ 85	Good
51≤ p ≤ 70	Not Good
P ≤ 50	No Good

Table 2. Learner Activity Criteria (Trianto, 2010)

Activities (%)	Criteria
76-100	Very Good
51-75	Good
26-50	Not Good
≤ 25	No Good

Analysis of Student Learning Outcomes

Based on research by Kastawaningtyas & Martini (2018), that to find out the criteria for increasing student science process skills, a normalized gain analysis <g> is carried out which is expressed in a mathematical formula, which is as follows:

$$g\ = \frac{posttest\ score - pretest\ score}{100 - pretest\ score}$$

Mustofa et al., (2021) The results of N-Gain are then categorized into three groups, namely in the following table 3.

Tabel 3. Normalized N-Gain Criteria

Presentation	Classification
0,0 < (<g>) ≤ 0,3	Low

0,3 < (<g>) ≤ 0,7	Medium
0,7 < (<g>) ≤ 1,0	High

RESULT AND DISCUSSION

The following are the results and discussions obtained after conducting research which includes observations of teacher activities, student observations and student learning outcomes.

Results of Observation of Teacher Activities

The results of the percentage of teacher activity during learning will be presented in figure 1.

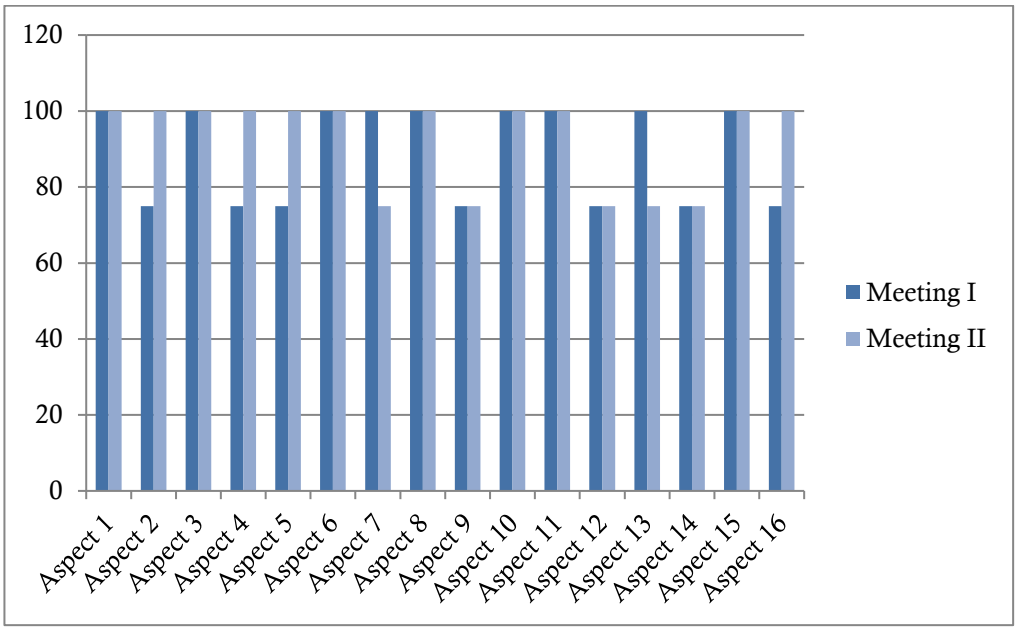

Figure 1. Presentage of Teacher Activity

The results of observations at meeting 1 teacher activities that have a percentage of 50% value are in aspects (organizing students to put forward hypotheses related to the observed images, directing students to observe learning material, organizing students to make presentations and providing opportunities for other groups to ask questions), teacher activities with a percentage of 75% marks are in aspects (conducting attendance and conditioning the class, deliver learning indicators/objectives, display images related to the material, distribute student worksheets to students, guide students in small group discussions, provide material reinforcement, respond to questions from students who do not understand, provide opportunities for students to conclude the material, conclude the material, close learning with prayers and greetings) while teacher activities that get 100% scores are in aspects (giving greetings and praying, provide apperception and motivation of learners, organizing students into groups). In meeting II, teacher activity increased in every aspect. Teacher activities that get a score of 75% are in aspects (directing students to observe learning material, organizing students to make presentations and providing

opportunities for other groups to ask questions, providing material reinforcement, providing opportunities for students to conclude the material) while teacher activities that get 100% scores are in aspects (giving greetings and praying, conducting attendance and conditioning the class, provide perception and motivation of students, convey learning indicators/objectives, display images related to the material, organize students to put forward hypotheses related to observed images, organize students into several groups, distribute student worksheets to students, guide students in small group discussions, respond to questions from students who do not understand, conclude the material, close learning with prayers and greetings). According to Latjompoh & Bau (2021), in addition to the use of learning media that can support the learning process, the teaching model can also support the implementation of learning activities that can affect student active participation and learning motivation so that it can help teachers to train student skills.

Based on Figure 1, the percentage of teacher activity during the learning process at meeting II has increased. The average percentage of teacher activity at meetings I and II obtained very good criteria. In meeting I obtained a score of 89% and meeting II obtained a score of 92%. According to Hasan & Ahmad (2019) stated that in the industrial era 4.0 teachers must be creative and innovative in developing learning methods or finding solutions to learning problems, teachers in addition to facilitators are also motivators and inspirers, and teachers must have the ability to analyze.

Results of Student Activity Observations

The results of the percentage of student activity during learning presented in figure 2. Based on Figure 2, student activities at meeting I had the lowest score, namely 67% (Enough) on aspect 3 (students gave responses to the teacher's perception) and aspect 9 (students presented the results of group work). According to the theory of Rusmana et al., (2018), several problems that often arise in schools are one of them is students who tend to be passive when learning directly, one of the obstacles often faced by students is the lack of courage to speak. Students tend not to dare to fatten their opinions, students trust their friends' abilities more than their own abilities so students do not dare to argue or ask.

The results of observing student activities at meeting II reached up to 85% which were included in the very good category, namely in the aspect of students presenting their observations in front of the class. Student activities in the learning process greatly support the continuity of teaching and learning activities, because the existence of student activities in teaching and learning activities indicates that learning takes place well and optimally so that the learning process is of higher quality. According to Aliwanto (2017) student learning activities need to be improved considering that the importance of student activities in achieving learning goals, student activities greatly contribute to their learning outcomes.

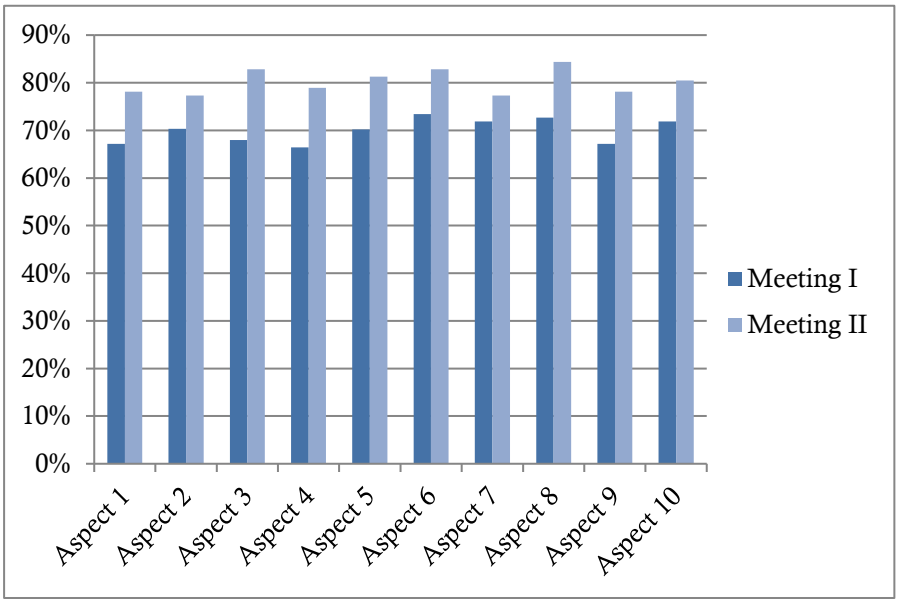

Figure 2. Student Activity Percentage

Student Learning Outcomes

The results of students' science process skills can be analyzed using students' pretest and posttest scores. The results of the pretest and posttest were obtained that of the 31 students who took the pretest on science process skills, only 2 people met the specified completeness and 29 others did not complete. This is based on the minimum completeness criteria at SMA N 3 Gorontalo is 75. The results obtained in the posttest score have increased. This can be seen in Table 3.

Table 3. N-Gain Analysis of Learning Outcomes

N-Gain Value	*Pre-test*	*Post-test*	N-gain	Criteria
Average	45.21	77.75	0.6	Medium

Based on Table 3, it can be seen that the average difference in scores in the pre-test only reached 45.21%, while in the post-test the average score obtained was 77.75%. From the average result, the value obtained is then normalized so that the N-gain value obtained at 0.6% is included in the medium criterion. This is because when students do the pretest, students do not fully understand the material contained in the pretest question items. According to Adri (2020), the pre-test is useful for encouraging students to be more active in learning and also provides an overview of the material to be learned. In learning outcomes after students follow the teaching and learning process using the Discovery Learning learning model based on science process skills, students better understand the material learned and experience improvements in their learning outcomes. This can be seen in Table 3 of the n-gain analysis posttests obtained an average score of 77.75, but there are still some students who have not met the KKM. However, students who have not met the KKM have increased from before. According to Munir (2016) stated that student learning outcomes in schools are 70% influenced by student abilities and 30% are influenced by the environment. In addition to student

ability factors, there are also other factors such as learning motivation, interest and attention, study attitudes and habits, and many other factors.

The application of the Discovery learning model based on science process skills in the learning process has an influence on student learning outcomes. The Discovery learning model has advantages so that students are motivated to be active in understanding the concepts learned, namely when collecting data accompanied by group discussions, besides that the Discovery learning model also requires students to discuss seriously with the discovery process and provide opportunities for students to give each other the opinions they have in determining the most appropriate answers so that students' ability to think and Understanding the material will be unearthed during learning. According to Putri & Suliyanah (2015) Discovery learning is a learning model that involves students directing their abilities so that they are more active in the learning process. Meanwhile, according to Susanti et al., (2016) the Discovery learning model is a learning model that involves students in carrying out activities that are able to develop science process skills, where students play an active role in discovering and investigating a concept so as to gain knowledge from their own findings.

CONCLUSION

Based on the results of research and discussions that have been carried out, it can be concluded that the science process skills of grade X 4 students of SMA Negeri 3 Gorontalo can be improved by applying the Discovery Learning model. This can be seen from the results of student learning which is also supported by teacher and student activity instruments during the learning process. In addition, based on pretest and posttest results on virus material which refers to science process skills which include hypothesis skills, classification skills, interpreting skills, predicting skills, and concept application skills.

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