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Improving Student Learning Outcomes Through Visual Media-Assisted Discovery Learning model in Science Courses

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Abstract

Discovery learning is a way of learning that directs students to find their knowledge related to the material being studied so that learning becomes more meaningful. The purpose of this research is to improve learning outcomes and student learning activities, and teacher teaching activities in science subjects through discovery learning models assisted by visual media in class V SD Inpres 1 Inti Bantaya. This study used classroom action research (CAR) carried out in 2 cycles, involving 30 fifth-grade students consisting of 12 boys and 18 girls. Data collection techniques using learning outcomes tests and observation sheets. The data obtained were processed using percentages. The results showed that in cycle 1 the discovery learning model assisted by visual media could improve student learning outcomes, both in the cognitive, affective, and psychomotor aspects, with classical learning completeness from 56.6% to 90% in cycle 2. student learning activities from 68.44% in cycle 1 to 89.21% in cycle 2. In addition, there was an increase in teacher activity in cycle 1 from 66.66% to 91.6% in cycle 2.

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Introduction

Science education is one aspect of education as a tool to achieve educational goals, namely growing individuals who understand science. Science or science contains the domains of knowledge (cognitive), attitudes (affective), and competence (psychomotor) by the principles of education that can develop all aspects of student potential (Rahayuni, 2016). For this reason, teachers are required to be more innovative, adaptive, and creative in designing engaging learning experiences that encourage active student participation and meaningful learning (Hidayat et al., 2024).

Teachers not only transfer the knowledge they already have but also help students to form their knowledge and are required to better understand the way of thinking or the perspective of students in learning (Smaldino, et al. 2014). Science subjects are expected to be a vehicle for students to get to know themselves and their surroundings and apply them in everyday life through learning practices so that students get a learning experience. One of the factors that cause low student learning outcomes in science subjects is that students are rarely allowed to find their concepts or principles from the material being studied. Students are given more memorization. This condition causes students to rarely find the concepts or principles of the material being studied. Such a phenomenon is partly due to the application of learning models and systems that emphasize more on the mastery of intellectual (cognitive) abilities and the learning process that is centred on teacher activity (Teacher-centred learning) in the classroom, so that the presence of students in class is only an object, waiting for descriptions and explanations. teacher, then record and memorize it (Nurhasnawati, 2011). The above phenomenon is also experienced by fifth-grade students of SD Inpres 1 Inti Bantaya. Based on the results of observations and document recording conducted on April 26, 2021, in the class, it was found that the implementation of science learning it was still teacher-centred, students were not allowed to find out the concepts or principles of the material being studied. This can be seen in the students who just sat quietly listening to the explanation of the material presented by the teacher. The results of document recording, the value of science lessons for class V SD Inpres 1 Inti Bantaya for the last 3 semesters are as follows: the KKM value for the even semester of the 2019/2020 school year has not been as expected. With a KKM of 70%, 15 students out of 30 students did not complete or as many as 50% of students did not complete. In the odd semester of 2020/2021, the KKM is set at 65%, 6 out of 30 students who did not complete or as much as 20% of students who did not complete. In the even semester of the 2020/2021 school year with a KKM of 65%, student learning outcomes are still low or still below the Minimum Completeness

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Criteria (KKM = 65%). Of the 30 students, only 12 students completed and 18 students scored below the minimum completeness criteria. If it is a percentage, only 40% of students whose scores have reached the KKM and 60% of students who have not reached the KKM.

Based on the problems that have been described, it is necessary to find solutions both regarding the learning process and learning media so that the learning carried out can provide better learning outcomes. The solution to improve the learning process from these problems is to apply a learning model that can encourage students to be more active, and creative and find their material concepts so that learning will be more meaningful. One of the learning models that are thought to be able to answer the problems faced is the discovery learning model.

The discovery learning model is constructivism-based. Discovery learning according to Ausubel is a way of discovery learning, students are directed to find their knowledge related to the material being studied so that learning becomes more meaningful (Marhaeni, 2013). Bruner also considers that discovery learning is compatible with the active search for knowledge by humans and in itself gives good results (Marhaeni, 2013). The discovery learning model that emphasizes discovery is considered capable of developing students' knowledge competencies. This discovery-based learning will present an active and meaningful learning atmosphere for students (Sispariyanto et al., 2019). To optimize the meaning of these learning activities, a guide is needed that can lead students to the competence of student knowledge in responding to natural phenomena that occur around them. By utilizing visual media, the discovery learning model is thought to be able to hone students' knowledge more effectively and meaningfully. According to Nuria (2019) that visual media can clarify abstract concepts and enhance learning absorption in the form of facilities and infrastructure that can provide visual experiences to students. Based on research conducted by Putri (2019) that the results of the science knowledge competence of students who follow the environmental media-assisted discovery learning model are higher than students who do not follow the environmental media-assisted discovery learning model. Research conducted by Istiana et al (2015) reveals that the application of the discovery learning model can improve learning activities, cognitive aspects, affective aspects and psychomotor aspects. Amyani et al (2018) in their research also revealed that the application of the discovery learning model can increase the activities of teachers and students. By observing the advantages of the discovery learning model, this learning model is considered capable of being one of the solutions in solving learning problems in class V SD Inpres 1 Inti Bantaya. Therefore, in this study, a discovery learning model with the aid of visual media will be used, with the hope of improving student learning outcomes in science subjects at SD Inpres 1 Inti Bantaya. Amyani et al (2018) in their research also revealed that the application of the discovery learning model can increase the activities of teachers and students. By observing the advantages of the discovery learning model, this learning model is considered capable of being one of the solutions in solving learning problems in class V SD Inpres 1 Inti Bantaya. Therefore, in this study, a discovery learning model with the aid of visual media will be used, with the hope of improving student learning outcomes in science subjects at SD Inpres 1 Inti Bantaya. By observing the advantages of the discovery learning model, this learning model is considered capable of being one of the solutions in solving learning problems in class V SD Inpres 1 Inti Bantaya. Therefore, in this study, a discovery learning model with the aid of visual media will be used, with the hope of improving student learning outcomes in science subjects at SD Inpres 1 Inti Bantaya. By observing the advantages of the discovery learning model, this learning model is considered capable of being one of the solutions in solving learning problems in class V SD Inpres 1 Inti Bantaya. Therefore, in this study, a discovery learning model with the aid of visual media will be used, with the hope of improving student learning outcomes in science subjects at SD Inpres 1 Inti Bantaya.

Materials and Method

This type of research is classroom action research (CAR) which consists of two cycles, where there are two meetings in each cycle, the cycle model in this study follows Kemmis and Mc. Taggart (Arikunto et al, 2021). This research was conducted in grade 5 SD Inpres 1 Inti Bantaya. The subjects in this study were 30 students of class V, consisting of 12 male students and 18 female students who, according to the researcher's diagnosis, had low activity and science learning outcomes. The subjects that are focused on are science subjects, with the topic of ecosystems. Using visual media in the form of video. The data analysis technique in this research is the quantitative description. The data obtained from this study are in the form of data on the results of student activity, teacher activity, student cognitive test results, attitude and psychomotor values. Data were obtained through direct observation to

determine the activity of students and teachers during the learning process carried out by the observer using an observation sheet. The test to find out the results of students' cognitive competence was carried out with 10 multiple-choice questions. To find out the increase in student learning outcomes from cycle 1 to cycle 2, the N-Gain Test was carried out. The indicator of the success of this research is the achievement of student activity of at least 60%. This minimum success indicator figure is based on the learning activity conversion guideline that the 60% figure means the quality of student activity is in the 'good' criteria.

Results and Discussion

Pre Action Activities (Pre Cycle)

Research activities begin with pre-cycle activities. This activity was carried out on Monday, November 8, 2021. Pre-cycle activities were in the form of initial observations to find out the problems faced by students. Researchers make observations of the course of learning and conduct initial reflection tests and identify existing problems. The results of the initial reflection test can be seen in Table 1.

Table 1. The results of the initial reflection test on ability

Student scores	Score
Lowest Value	30
The highest score	70
Number of Completed Students	7
Number of Students Unfinished	23
Average	61.66
Percentage of Completeness (%)	23.33

Source: Research Documentation, (2022)

Based on table 1, the value of the initial reflection test on the material for Theme 4 Sub-theme 1 (My Blood Circulation is Healthy) shows unsatisfactory results. The average student score is 61.66 with a percentage of completeness reaching 23.33%. This value is still far from the expected completeness value. The results of observations are still many students are less active in participating in learning

Activity Cycle 1

Student Cognitive Aspect

Assessment of students' cognitive aspects was observed by looking at the value of the results of the cycle 1 test. The test was used to measure students' cognitive competenc e in understanding ecosystem material. The test result data can be seen in Table 2.

Table 2. Students' Cognitive Values in Cycle 1

No	Cognitive Aspect	Results
1.	Total students	30
2.	Lowest Score	30
3.	Highest Score	80
4.	Number of Completed Students	13
5.	Number of Unfinished Students	17
6.	Average Score	65
7.	Classical Absorption power	65%
8.	Classical Learning Completeness	56.6%

Based on Table 2, it can be seen that the cognitive scores of students in cycle 1 showed an average score of 65 out of 30 students who took the test. The lowest score is 30 and the highest score is 80. The percentage of completeness reaches 56.6% where as many as 13 students fall into the category of complete students or with scores above 65. Meanwhile, 17 students enter the category of incomplete students or with scores below 65.

Attitude Aspect

The results of the assessment of the affective domain (attitudes) of students during learning using the discovery learning model in cycle 1 can be seen in Figure 1.

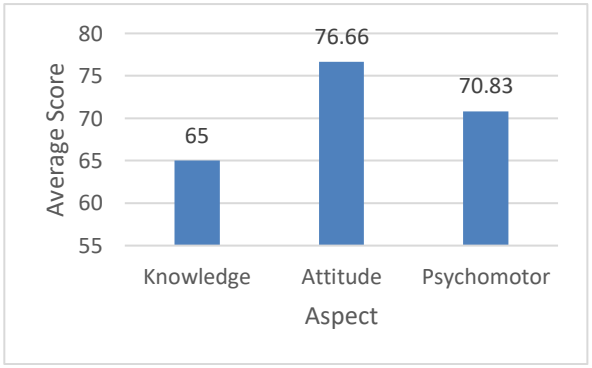


Figure 1. The average value of students' knowledge, attitudes and psychomotor in discovery learning model learning in cycle 1.

Based on Figure 1, the attitudes of students during discovery learning in cycle 1 there were 3 students who achieved an attitude score of 63 in the less category, while the category with sufficient (75 points) there were 17 students and the good category (81 score) there were 5 students and the category very good (score 88-94) there are 5 students. Based on the results of the assessment of this attitude domain, this aspect of attitude still needs to be improved.

Psychomotor Aspect

The results of the assessment in the psychomotor realm can be seen in Figure 1. Based on the picture above, the psychomotor aspects of students during discovery learning in cycle 1, there were 8 students who achieved a skill score of 50 in the less category, while in the sufficient category (score 75) there were 19 students and very good category there are 3 students. Based on the results of the psychomotor domain assessment, this aspect still needs to be improved.

Teacher and Student Activities.

In observing the implementation of the discovery learning method, the researcher was assisted by one teacher as an observer. Observers make observations of learning in class and fill in the observation sheet that has been provided by the researcher. Aspects that are assessed at the time of observation include aspects of student activity, and teacher activity. There are 17 indicators observed. The following are the results of observing student activities during the implementation of the discovery learning method in cycle 1.

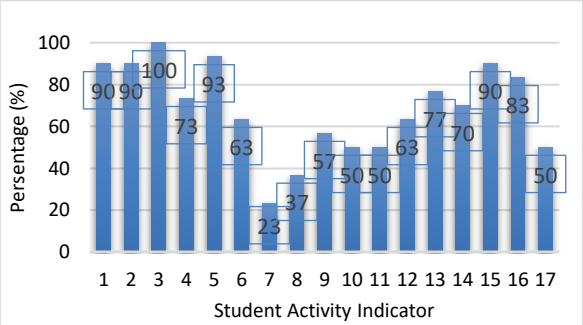


Figure 2. Student learning activities using the discovery learning method.

Figure 2 shows that student activity is still in the "enough" category. The achievement of the percentage of student activity has not been achieved in the first cycle, where student activity meets the "good" criteria if the percentage of student activity is above 70%. Observations of teacher activity carried out by observers during the learning process can be seen in the following table.

Based on the results of observations of teacher activity carried out by observers during the learning process, it shows that the number of aspects that appear in teaching activities in learning using the discovery learning model in cycle 1 there are 8 aspects of the 12 aspects observed, namely aspects 1,2,3,4,6,7,11 and 12, with the percentage of active achievement of 66.66% in the sufficient category.

During the implementation of the teaching and learning process by applying the discovery learning model, there are still some shortcomings that must be improved. Things that need to be improved in learning as a reflection of cycle 1 are as follows:

On student activities:

a) The readiness of students in participating in learning has not been maximized. Students are not used to learning with learning styles in accordance with the new learning model applied, so the learning process has not been implemented effectively.

b) There are still many students who have not consulted their findings/discussions with the teacher

c) There are still many students who have not corrected the results of answers that are less precise or incorrect.

d) In group discussions when solving problems/performing experiments in the LKPD only a few students did the assignments, while the other students just kept quiet and waited for the results.

On Teacher activity:

a) The teacher is still dominant to remind students to collect as much relevant information as possible from various sources to prove whether the hypothesis they put forward is true or not.

b) Teachers must be more active in helping and directing students to find problems

c) The teacher still asks students to record the results of the data they process

d) The teacher has not been so active in stimulating students to exchange information and their findings.

e) The teacher has not been active in leading the process of proving the data obtained

The advantages of implementing learning in cycle 1 are as follows:

a) The teacher has carried out learning in accordance with the steps of the learning model discovery learning.

b) The teacher has given questions as an incentive to make discoveries

c) The teacher has advised students to read and other learning activities that can lead to the preparation of discoveries

d) The teacher has checked students against problems that students will solve through discovery

e) The teacher has provided opportunities for students to identify problems so that students can formulate hypotheses.

f) The teacher has provided opportunities for students to discuss with each other in their respective groups.

g) The teacher has provided opportunities for students to process the data they have obtained.

h) The teacher has generalized or drawn conclusions from the findings made by students

i) The teacher has given appreciation to students for making discoveries and presenting them in class.

Referring to some of the shortcomings faced in cycle 1, a discussion was held between the teacher as a researcher and colleagues (observers) to design corrective actions to be further implemented in cycle 2.

Activity Cycle 2

Cognitive Aspect

The assessment of students' cognitive aspects was observed by looking at the value of the results of the cycle 2 test. Cycle 2 test was used to measure students' cognitive competence towards understanding the material in theme 5 (ecosystem) sub-theme 2 (Relations between living things in the ecosystem). The form of the question used is multiple choice questions with a total of 10 questions. The test result data can be seen in the following table.

Table 3. Students' Cognitive Values in Cycle 2

No	Cognitive Aspect	Results
1.	Total students	30
2.	Lowest Score	50
3.	Highest Score	100
4.	Number of Completed Students	27
5.	Number of Unfinished Students	3
6.	Average Score	78.3
7.	Classical Absorption (DSK)	78.3%
8.	Classical Learning Completeness (KBK)	90%

Source: Research Documentation, (2022)

Based on table 3, it can be seen that the cognitive scores of students in cycle 2 showed an average value of 78.3 out of 30 students who took the test. The lowest score is 50 and the highest score is 100. The percentage of completeness reaches 90% where as many as 27 students fall into the category of complete students, while as many as 3 students enter the category of incomplete students or with scores below 65. The three students are included in remedial activities so that can meet the learning mastery that has been set.

Affective Aspect

The results of the assessment of the affective domain (attitudes) of students during learning using the discovery learning model in cycle 2 can be seen in Figure 5.

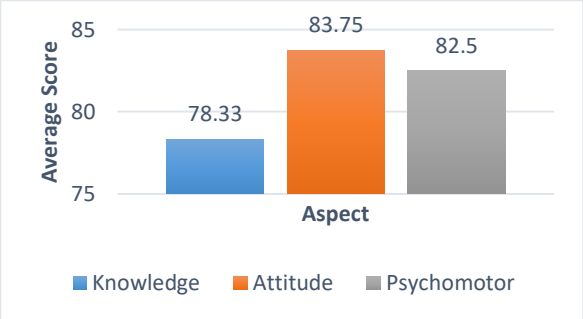


Figure 3. The average value of students' knowledge, attitudes and psychomotor in discovery learning model learning in cycle 2.

Based on Figure 3 the attitudes of students during discovery learning in cycle 2 there was an increased, there were 8 students in the sufficient category, 9 students achieved the attitude value in the good category and there were 13 students in the very good category. Based on the results of the assessment of the attitude domain, the average student score was 83.75. So this attitude aspect has increased from cycle 1.

Psychomotor Aspect

Aspects of the skills (psychomotor) of students during discovery learning in cycle 2, there was 1 student who achieved a skill score of 50 in the poor category, while in the good category (score of 76) there were 19 students and the good category was very good, there were 10 students. Based on the results of the assessment of the psychomotor domain, this aspect is still increasing. The average value of the psychomotor aspect can be seen in Figure 3.

Teacher and Student Activities Cycle 2

Based on the results of observations using the teacher's observation sheet, it was obtained a

description of the application of the discovery learning model by the teacher (researcher) was described through 12 aspects of observation. Based on observations, it shows that the teacher's activities are in the very good category with a percentage of achievement of 91.6%. One aspect that still needs to be improved in cycle 2 is the 9th aspect (the teacher still does not stimulate students to exchange information and their findings). In addition, the results of observing student activities during the implementation of learning using the discovery learning model can be seen in Figure 4.

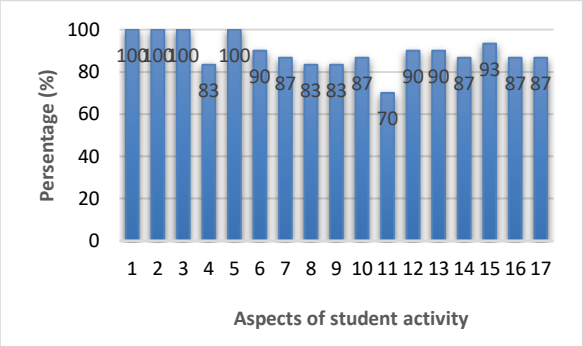


Figure 4. Student learning activities using the discovery learning method in cycle 2.

Based on Figure 4, it can be seen that the percentage of student activity in learning activities using the discovery learning method has achieved good results. From the table, it appears that all activities/indicators during the implementation of discovery learning appear. The average percentage of student learning activity in cycle 2 increased to 89.21% with a good category.

The increase in student learning outcomes from cycle 1 to cycle 2 can be seen from the N-Gain value. The results of the N-Gain calculation are presented in Table 4.

Table 4. Improving student learning outcomes from cycle 1 to cycle 2

Cycle	N	Total value	Average	N-Gain Score	N-Gain Score (%)
1	30	1950	65	0.42	41.52
2	30	2350	78.33		

Based on Table 4.9, the N-Gain value is 0.42, this means an increase in student learning outcomes from cycle 1 to cycle 2 in the medium category. This is in accordance with the criteria/category presented by Melzer in Latif et al. (2014) that the N gain value of 0.3 g 0.7 is in the moderate criteria/category.

Learning using the discovery learning model can improve student learning outcomes starting from the pre-cycle, first cycle and second cycle. The increase in the average value of students from cycle 1 and cycle 2, namely the average student learning achievement in cycle 1 was 65 and in cycle 2 it increased to 78.33, as well as the value of attitudes and psychomotor or skills values increased each from 77 to 77. 83.75 and 70.83 increased to 82.5. The increase in the average score of the students is in line with the improvement in the learning process. Both teachers and students. From the first cycle, the teacher's activity obtained a percentage of 66.66 in the sufficient category, while the student activity obtained 68.44 in the sufficient category. In cycle 2, teacher activity increased to 100%, while student activity increased to 89.21%.

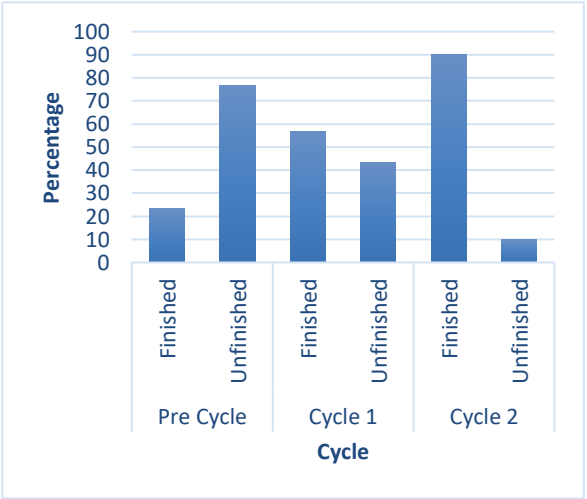


Figure 5. Comparison of Student Learning Outcomes Pre-Cycle, Cycle 1 and Cycle 2.

The results of cycle 2 reflection During the implementation of the teaching and learning process by applying the discovery learning model there are still some shortcomings that still need to be improved, but if viewed from the results of classical learning completeness, in general learning using the discovery learning model in the second cycle is very good. The 3 students who have not completed have been included in the scheduled remedial program.

Discussion

Based on the results of Classroom Action Research (CAR) which has been carried out in two cycles, learning using discovery learning models assisted by visual media can improve the learning process in cycle one and cycle two as seen in the percentage of student achievement and student

learning activities and teaching activities. in teaching. When viewed from the data on student learning outcomes starting from the pre-cycle, cycle 1 and cycle 2, it can be concluded that the use of discovery learning models can improve student learning outcomes in science subjects in fifth-grade students of SD Inpres 1 Inti Bantaya, Parigi District, Parigi Mautong Regency. Figure 5 shows that there is an increase in student learning outcomes in learning successively according to the comparison of student data who have completed learning from pre-cycle, cycle 1, and cycle 2. Pre-cycle by 23%, increased in Cycle 1 by 43% and increased again in Cycle 2 by 90%. The data on the percentage of students who completed this cycle 2, when compared to the data of students who completed the even semester of the Academic Year (2020/2021), the value of cycle 2 was still far above the KKM value for the even semester with a percentage of only reaching 60%. With the increase in student learning outcomes in learning, the application of discovery learning models assisted by visual media can improve student learning outcomes, especially in ecosystem materials.

The increase in learning outcomes (cognitive, affective and psychomotor) is due to the discovery learning model teaching students to be able to find out independently about the knowledge conveyed. Discovery learning can involve maximally all students' abilities to search and investigate systematically, critically and logically so that they can find their knowledge, attitudes and skills as a form of behaviour change. Discovery learning or discovery learning is more student-centred, not teacher-centred, in contrast to conventional learning. This explanation is in accordance with the opinion of Supradnyana (2016) that the concept of discovery learning, explains the process of forming learning by exploring and searching for knowledge, understanding, understanding and concepts independently. Furthermore, Kurniasih & Sani (2014) also suggested that the discovery learning model is a learning model in which the material is not delivered in a final form, but students are required to organize their way of learning by finding concepts and during the learning process the teacher will provide a kind of problem that has been created. previously. The results of this study are also in accordance with the results of research conducted by Savitri & Wibawa (2020) that the science learning outcomes of students who follow the audio-visual-assisted discovery learning model are higher than students who do not follow the audio-visual-assisted discovery learning model at SD Gugus XV, District Buleleng Academic Year 2015/2016. In addition, the results of this study are also supported by several studies related to the use of discovery learning models. Riantari (2017), researched the effect of discovery learning models assisted by environmental media on science knowledge competence, judging by the results of the research, the learning activities carried out could create situations that could make students learn actively to build science concepts and principles. This occurs when the learning process is carried out in the real world so that it can increase students' knowledge and learning is not boring. Research conducted by Rahayu et al, (2019) also revealed that the application of the discovery learning model can increase the activeness and thematic learning outcomes of students in class V. The percentage of student activity is 54,

In this study, the discovery learning model can improve aspects/domains of skills (psychomotor) and aspects of student attitudes. Based on observational data on the skills (psychomotor) aspects of students during discovery learning in cycle 1, 8 students achieved a skill score of 50 in the less category, while in the sufficient category (75 points) there were 19 students and the good category was very good, there were 3 students, but in cycle 2 there was an increase, there was 1 student who achieved a skill score of 50 with a less category, while in the good category (score 76) there were 19 students and in the very good category there were 10 students. This increase can be due to discovery learning which allows students to better understand the subject matter through the process of observing, asking, trying, associating and communicating the material learned during the learning process. Afifah and Sulur (2019) stated that learning using the discovery learning model with a scientific approach affected increasing students' critical thinking skills. Learning by using discovery learning can improve students' science process skills, for example at the stimulation stage, problem statement, and observation, students are invited to observe and hypothesize. At the data collection stage, students are invited to observe and plan experiments. Afifah and Sulur (2019) stated that learning using the discovery learning model with a scientific approach affected increasing students' critical thinking skills. Learning by using discovery learning can improve students' science process skills, for example at the stimulation stage, problem statement, and observation, students are invited to observe and hypothesize. At the data collection stage, students are invited to observe and plan experiments. Afifah and Sulur (2019) stated that learning using the discovery learning model with a scientific approach affected increasing students' critical thinking skills. Learning by using discovery learning can improve students' science process skills, for example at the stimulation stage, problem statement, and observation, students are invited to observe and hypothesize. At the data collection

stage, students are invited to observe and plan experiments.

At the data processing stage, students are invited to interpret, communicate and predict and at the last stage, verification, students are invited to be able to communicate. Balim (2009) states that learning through inquiry will be able to improve academic achievement, learning retention, and inquiry learning skills, both in the cognitive and affective domains of students. So, the discovery learning model is considered suitable for exploring and training students' science process skills so that they can work scientifically as scientists work.

The Discovery learning model can also increase teacher activity, from the results of this study indicate that the number of aspects that appear in teaching activities in learning using the discovery learning model in cycle 1 there are 8 aspects, namely aspects 1,2,3,4,6,7, 11 and 12, with an achievement percentage of 66.66% in the sufficient category. Furthermore, in cycle 2, the teacher's activity in learning using the discovery learning model increased by 91.6% or in the very good category, although there is still one aspect that is still considered weak, namely the 9th aspect (the teacher stimulates students to exchange information and their findings). The results of this study are supported by Amyani et al. (2018) which says that the discovery learning model can increase teacher and student activities and student learning outcomes. In addition, Sani (2014) suggests that discovery learning is a cognitive learning method that requires teachers to be more creative in creating situations that can make students learn actively to find their knowledge. Furthermore, Prasetyo & Abduh (2021) revealed that learning using the discovery learning model can increase student learning activity in the thematic learning content of third-grade technology development materials at SD Negeri 3 Pandean.

This learning method is in accordance with Bruner's theory which suggests that students learn actively to build concepts and principles. The Discovery of learning activities through experimental activities can increase the knowledge and skills of students simultaneously. This means that the ability of students in the cognitive domain has increased and has been completed to achieve the learning objectives that have been set. Discovery learning models assisted by visual media can improve learning outcomes, increase teacher activity and can increase student learning activities in science subjects in class V SD Inpres 1 Inti Bantaya.

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