



The Implementation of the Discovery Learning Model Using a Scientific Approach to Improve the Science Learning Competency of Class VII Students of SMPN 21 Padang

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Keywords	Abstract
Classroom Action Research, Discovery Learning, Learning Competencies	<i>This research aims to improve the learning competence of class VII students at SMPN 21 Padang for the 2017/2018 academic year through the application of the Discovery Learning learning model on the material of the organization of life and the interaction of living things with the environment. This research is Class Action Research (PTK) which was carried out in two cycles. Each cycle consists of planning, implementing actions, observing and reflecting. The research subjects were class VII3 students at SMPN 21 Padang in the 2017/2018 academic year. Data sources are teachers and learners. Data collection techniques through tests and observation sheets. The collected data was then analyzed descriptively qualitatively. Based on the research results, it can be concluded that the application of the Discovery Learning model can improve students' learning competence. The results of the research obtained that the percentage of pre-cycle attitude completeness competency was 79.3%, cycle I was 81.26%, and cycle II was 88.13%. The skills competency of pre-cycle students was 65.20%, cycle I was 72.33%, and cycle II was 74.00%. The knowledge competency of pre-cycle students was 66.43%, cycle I was 75.89%, and cycle II was 83.39%.</i>

1. INTRODUCTION

Education can be formulated from a normative angle, because education is essentially an event that has norms, meaning that in educational events; educators (teachers) and students (students) adhere to standards, norms of life, views on individuals and society, moral values, decency, all of which are sources of norms in education (Sardiman, 2011). Education can also be interpreted as a process of changing the behavior of students so that they become adult humans who are able to live independently and as members of society in the natural environment around them wherever the individual is.

A good teaching and learning process will improve learning outcomes, activities and student achievements. To improve student learning outcomes, one of the ways is influenced by the application of learning strategies. Learning strategy is a learning model that can

improve learning outcomes, interest, motivation, student activity, interaction between students and collaboration between students to master the material. According to Hamalik (2012), learning is not a goal but a process to achieve a goal. So, learning is the steps or procedures taken.

Based on the problems found in class VII3 SMPN 21 Padang, several problems were found in the learning process at school. Among them is that students' knowledge competency is still low, namely still below the KKM, which is 70. This happens because in knowledge competency, students' ability to remember or memorize is quite good, but their ability to understand, apply, analyze and evaluate is not yet able to answer them.

The author also found almost the same problems with his students, for example not completing assignments given by the teacher on time, students being inactive during the learning process, students also lacking motivation in class. The learning models that teachers often use are lectures and group discussions. Students are not yet motivated to listen to the teacher's explanation seriously, students often chat and even joke with their friends when the teacher explains the lesson. In the group discussion learning process, only a few students are actively working on discussion tasks, namely two students from a group of four or five members, while the other students are waiting for the results of their friends' work.

In overcoming the problems mentioned above, it is necessary to carry out learning that can support a good understanding of science concepts, including the use of the Discovery Learning learning model which is part of student-centred learning. Student-centered learning (Student Centered Learning), students are expected to be active and independent participants in the learning process, who are responsible and take the initiative to recognize their learning needs, find sources of information to be able to answer their needs, build and present their knowledge based on their needs. as well as the sources he found (Aris Pongtuluran, 2000).

In applying the method Discovery Learning in class, there are several procedures that must be implemented in learning activities, in general as follows.

1) Stimulation (stimulation/providing stimulation).

First of all, at this stage students are faced with something that causes confusion, then they continue not to make generalizations, so that the desire to investigate for themselves arises. Besides that, teachers can start learning activities by asking questions, suggesting reading books, and other learning activities that lead to preparation for problem solving. Stimulation at this stage functions to provide conditions for learning interactions that can develop and help students to explore.

2) Problem statement (statement/identification of the problem).

After carrying out stimulation, the next step is for the teacher to give students the opportunity to identify as many problem agendas as possible that are relevant to the learning material, then choose one problem and formulate it in the form of a hypothesis (temporary answer to the problem question). Providing students with opportunities to identify and analyze the problems they face is a useful technique in building students' understanding so they are used to finding problems.

3) Data collection (data collection)

This stage functions to answer questions or prove whether the hypothesis is true or not, by giving students the opportunity to collect various relevant information, read literature, observe objects, interview sources, carry out their own trials and so on. The consequence of this stage is that students learn actively to find something related to

the problem they are facing, so that students accidentally connect the problem with the knowledge they already have.

4) Data processing (data processing)

Data processing is the activity of processing data and information that has been obtained by students either through interviews, observations, etc., and then interpreting it. All information resulting from reading, interviews, observations, and so on, is all processed, randomized, classified, tabulated, even if necessary, calculated in a certain way and interpreted at a certain level of confidence. Data processing is also called coding/categorization which functions as concept formation and generalization. From this generalization, students will gain new knowledge about alternative answers/solutions that need to be proven logically.

5) Verification (proof)

At this stage, students examine carefully to prove whether or not the stated hypothesis is true with alternative findings, connected to the results of the data that has been processed. Verification aims to make the learning process run well and creatively if the teacher gives students the opportunity to discover a concept, theory, rule or understanding through examples they encounter in their lives. Based on the results of processing and interpretation, or existing information, statements or hypotheses that have been previously formulated are then checked, whether they are answered or not, whether they are proven or not.

6) Generalization (drawing conclusions/generalizations).

The generalization stage is the process of drawing conclusions that can be used as general principles and apply to all the same events or problems, taking into account the verification results.

According to Sudjana (2010), learning outcomes are the abilities that students have after receiving learning experiences. Furthermore, Warsito (in the Ministry of National Education, 2006) stated that the results of learning activities are characterized by changes in behavior in a positive direction that are relatively permanent in the person learning. In connection with this opinion, Wahidwarni, et al. (2010) explains that someone can be said to have succeeded in learning if he is able to show changes in himself. These changes include their thinking ability, skills, or attitude towards an object. Based on the background that has been described, the author is interested in conducting classroom action research with the title: *The Implementation of the Discovery Learning Model Using a Scientific Approach to Improve the Science Learning Competency of Class VII Students of SMPN 21 Padang*

2. RESEARCH METHOD

This type of research is classroom action research (PTK) which is carried out in class through learning activities using the Discovery Learning learning model. Classroom Action Research aims to determine the improvement in learning outcomes of class VII3 students through the application of the Discovery Learning learning model.

The research subjects were students of SMPN 21 Padang Class VII3, even semester of the 2017/2018 academic year with a total of 28 students, as well as material on the organization of life and the interaction of living things with their environment. This research is Classroom Action Research (PTK) which was carried out in 2 cycles. Each cycle consists of four stages, namely: planning, action, observation and reflection.

This research was carried out in an iterative cycle. There are four main activities in each cycle, namely 1. Planning, 2. Action, 3. Observation and 4. Reflection. The research cycle with its stages is shown in Figure 1.



Figure 1. Classroom Action Research Stage (Arikunto, 2012)

The data collection techniques used were observation and giving tests. Observations were carried out to obtain attitude and skills competency data. Tests are given to obtain knowledge competency data.

a. Knowledge Competency Data

Knowledge competency is taken through written test results with a minimum completeness criteria (KKM) = 70. Students are declared complete when they obtain learning results ≥ 70 . To find out individual learning results, equations are used.

$$\text{Completeness} = \frac{\text{total score obtained}}{\text{Maximum score}} \times 100\%$$

Assessment guidelines are based on the criteria and predicates set out in the Minister of Education and Culture's Regulation on the assessment system number 53 of 2015, as seen in Table 1.

Table 1. Number intervals, predicates and descriptions of students' knowledge assessment results.

Interval angka	Predikat	Deskripsi
>89 – 100	A	Sangat baik
>79 – 89	B	Baik
≥ 70 – 79	C	Mulai Berkembang
< 70	D	Kurang

Ministry of Education and Culture (2017)

The number of students who complete individually will influence classical completion. Classical completion means students who have completed individually are large in number or equal to ≥ 80 of the total number of students.

Attitude Competency Data

Analysis of attitude competency data uses observation assessment sheets which aim to see students' attitudes and behavior during the learning process. The way to obtain the data is to look at each indicator of student attitudes that appears in each lesson. Analysis of attitude competency data uses the following formula.

$$\text{Final Score} = \frac{\text{acquisition score}}{\text{maximum score}} \times 100$$

Nilai	Kategori
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91-100	Amat baik
81-90	Baik
71-80	Cukup

Table.2. Conversion of attitude competency values in discussions and PBM

Skills Competency Data

Analysis of skills competency data uses a performance assessment sheet which aims to see students' skills. Skill competency data analysis uses the following formula.

$$H = B/C \times 100$$

Information :

H = Participant's skill competency value
educate

B = Score obtained

C = Maximum score

Nilai	Predikat
86 – 100	Sangat Baik (A)
71 – 85	Baik (B)
56 – 70	Cukup (C)
< 55	Kurang (D)

3. RESULT AND DISCUSSION

A. Research Results

Based on the findings regarding the application of the Discovery Learning learning model with a scientific approach to improve the science learning competency of class VII students at SMP N 21 Padang, it can be explained as follows.

1. Pre cycle

Pre-cycle activities were carried out in one meeting, with a time of 3x40 minutes, namely on Monday 12 March 2018. The pre-cycle learning carried out can be described as follows.

- 1) Preliminary activity: The teacher greets and asks how students are doing while taking attendance. The teacher carries out apperception and motivation by asking the question "What happens if the environment around us is dirty?" The teacher conveys the learning objectives and explains the various forms of assessment that will be taken. The attitude assessment that will be taken is curiosity and critical thinking. Meanwhile, the assessment for skills is an assessment of skills in preparing reports and presenting reports.
- 2) Core activity: The teacher starts the core activity by asking the definition of environmental pollution. Continue by explaining various environmental pollution. Only a few students pay attention and respond to what the teacher says. The teacher explains the lesson using the lecture method. The students did not ask the teacher any questions. The teacher then asks the students to sit in groups by combining two tables consisting of four or five people, then the teacher distributes discussion sheets to work on together in their groups. It is hoped that after discussion and working on the activity sheet, students will be able to understand the material being studied. Discussion activities did not go well. Students play a lot and chat with their friends. It was quiet for a moment

after being reminded and a moment later it started making noise again. There are even students who are continuously reprimanded but still make a fuss and don't pay attention. Only one or two people from each group actively tried to complete the activity sheet. Students often look bored flipping through books that are used by one and the other and they don't have any other books apart from books borrowed from the library.

- 3) Closing Activity: The teacher and students discuss the results of the activity sheet by asking group representatives to read the answers. The teacher guides students to formulate the correct answer. The teacher closes the lesson by providing a conclusion. The teacher carries out daily evaluations or tests by giving a pre-cycle final test in the form of multiple choice questions.

Based on the pre-cycle carried out, it is known that students' learning competencies in learning are as shown in Table 4

No	Kompetensi Belajar	Rata-rata Kelas	% Ketuntasan	% Tidak Tuntas
1	Kompetensi Sikap	79,3	53,57	46,43
2	Kompetensi Keterampilan	65,20	67,86	32,14
3	Kompetensi Pengetahuan	66,43	60,72	39,28

Table 4. Learning Competencies of Pre-Cycle Students

Based on Table 11, it is known that the learning competency of students before the research was still low, seen from the percentage of student completion which did not reach 85%. The number of students who completed and reached the KKM was 21 people (60.72%) and those who did not complete were 9 people (39.28%). Attitude competence is also still relatively low, as evidenced by the results of observations of two indicators observed during the learning process, namely curiosity and critical thinking. These two attitude indicators have a low percentage of completion, namely 53.57% and the remaining 46.43% are incomplete.

In skills competency, the same problem also occurs, namely the low percentage of completeness among students. The indicators observed in the skills aspect are the skills in making reports and making presentations. These two skill indicators have a low percentage of completion, namely 39.28% of 11 students in the very good and good categories, while 60.72% of 17 students did not complete in the quite good category.

2. Cycle I

The activity stages in cycle I consist of three meetings and in the fourth meeting there is a daily review I. The stages carried out in classroom action research are the planning, acting, observing and reflecting stages. The stages in implementing activities in Cycle I can be explained as follows:

a. Planning (Planning)

The initial activities in cycle I were carried out based on observations that had been made regarding the problem of students' low learning competency as evidenced by the low achievement of the KKM. Based on this, the researcher planned a class action using the DL model. The aim of implementing the DL model is expected to be able to overcome the problem of low learning competency of students.

In this activity, a learning strategy is developed that focuses on a student-oriented learning process using the GDL model. The planning carried out in cycle I was based on the problems encountered during initial observations. Before carrying out this research, the following things need to be done:

- 1) Prepare lesson plans that characterize DL model learning.
- 2) Prepare LKPD that characterizes DL model learning
- 3) Prepare test questions on student learning outcomes in the form of a written test at the end of cycle I to measure students' knowledge and mastery of the material provided. This question has been tested on class VIII students. Data from test results is processed using the Anates application.

b. Action (Acting)

At this stage the teacher carries out actions in accordance with the learning implementation that has been prepared previously in accordance with the DL model. The DL model has several stages, namely stages 1) Stimulation, 2) Problem statement, 3) Data collection, 4) Data processing, 5) Verification, 6) Generalization. Implementation of the action consists of preliminary, core and closing activities. Implementation of actions in cycle I was carried out three meetings. Meetings one, two and three are the implementation of the learning process, while at the fourth meeting a daily review of cycle I is held.

1) First meeting

The first meeting in cycle I was held on the submaterial discussed, namely cells as structural and functional units of life.

a) Preliminary Activities

Before starting the lesson, the teacher conditions students who are still noisy to calm down and occupy their respective seats according to the groups that have been assigned. Researchers direct students to pray before learning begins. Researchers check student attendance. Researchers carry out apperception and motivation. The researcher read out the indicators and lesson objectives as well as the benefits of learning in today's material.

b) Core activities

Stimulation Stages. Before the stimulation activity was given, the researcher generally explained briefly about single-celled organisms. Stimulation is given by playing a video about single-celled organisms, namely *Euglena*, sp. Based on the video shown by researchers, students can see that *Euglena* consists of one cell and that in *Euglena*, sp's body there are several components called cell organelles.

After the video about single-celled animals was shown, the researchers asked the students to ask questions about what they observed. One of the students asked, Buk, "What is the name of the part in the cell?" Before answering questions, the researcher asked other students to answer their friends' questions. However, none of the students wanted to answer the questions. Researchers answered the question "that there are several organelles found in cells, including the cell nucleus". The researcher asked other students to ask questions but no students asked. Because there were no students asking questions, to focus the students' attention, the researcher displayed the same questions as the questions in the LKPD on the whiteboard.

c) Closing

In the closing activity the researcher reviewed the results of the learning activities. Researchers provide opportunities for students to ask questions if there are concepts they do not understand. Researchers provide follow-up in the form of homework by asking

students to read material related to the lesson at the next meeting, namely about networks. The researcher closed the lesson by reading greetings.

c. Observation (Observing)

Observation activities are carried out on the learning process through observation. Observations were carried out by two science teachers as observers. The objects observed include students' competencies during the learning process in classroom action research. Student competency in attitude and skill competency is seen using an observation sheet. Observations were carried out in accordance with the student competency assessment format by two observers.

d. Reflection

Reflections are obtained based on competency assessment sheets and field notes

Based on the analysis of the student competency assessment sheet in cycle II, it can be seen that there is an increase at each meeting. The learning competency of students individually and classically is said to be complete, reaching a percentage of 70% for attitude and skill competency, but for knowledge competency it has not yet reached classical completeness. The researcher and observer agreed to continue the action until cycle III. This is because researchers want to maximize students' competence in implementing the DL model so that they can exceed 70% of classical completeness and the results of cycle II reflection will no longer occur in cycle III.

Increasing aspects of students' attitudes and skills will have an influence on increasing aspects of students' knowledge, because if students show good attitudes and also have good skills in the learning process it will have a positive impact on mastery of material concepts. Based on the reflection results of cycle III, the researcher and observer agreed to stop the action until cycle III. This is because the analysis results obtained from student competency in cycle III have increased and are very high. The learning competency of students individually and classically has exceeded the predetermined limit, namely 70%.

Results of Pre-Cycle, Cycle I and Cycle II Improvements

1. Knowledge Competency

The increase in knowledge competency can be seen in Table 5 and described in Figure

1.

Table 5. Knowledge Competency Value

No	Siklus	% ketuntasan
1	Pra Siklus	66,43
2	Siklus I	75,89
3	Siklus II	83,39

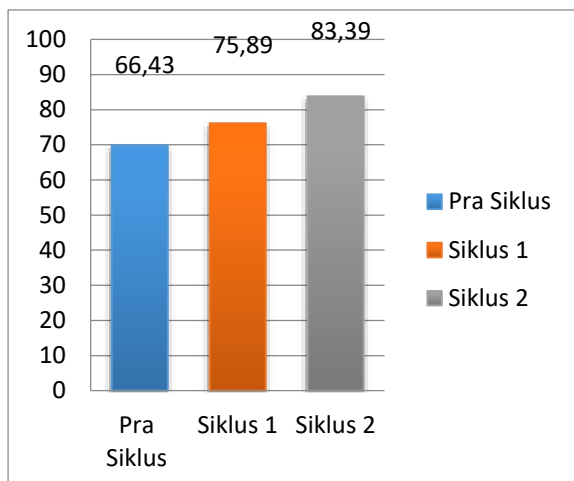


Figure 1. Increasing Knowledge Competency

B. Discussion

Learning outcomes are the level of mastery achieved by students in participating in teaching and learning programs in accordance with the stated objectives. Student learning outcomes are a manifestation of the output of a process that cannot be separated from the input of the process. The quality of the learning process is one element that influences learning outcomes, both cognitively and affectively.

The attitudinal competence of students by applying the DL model at each meeting has increased. This can be seen from the rubric that the observer has filled in during the observation. Attitude competency observations were carried out using five observation indicators, namely honesty, discipline, responsibility, politeness and self-confidence. In the pre-cycle, students' attitude competency completion was very low, namely 79.25%. In the first cycle, the completeness of students' attitude competency had increased, namely 81.06%. In cycle II, the completeness of students' attitude competencies has increased to 88.13%. The use of the DL model in cycle II has shown a high increase in attitudinal competence and has exceeded the classical completeness set at 70%.

This increase in attitudinal competence is due to the learning process in the pre-cycle not yet using the DL model. Students carry out learning using lecture, discussion and question and answer methods. Students' attitudes such as responsibility and self-confidence are still lacking. The learning process tends to be boring because there is no stimulation that makes students increase their sense of responsibility and self-confidence.

The attitudes of students in cycles I and II who have implemented the DL model are seen from indicators, one of which is the responsibility seen by students who are serious about solving problems from the stimulation provided, asking questions more often, actively discussing with group friends and reading literature from various sources. Confidence in students who complete stimulation solutions in the DL model is higher as seen from the indicators that students are able to solve problems correctly, answer questions in their own language and are able to generate new ideas from the problems presented. Based on this, it can be concluded that the DL model can improve and maximize students' attitudinal competence in the learning process. This is in accordance with the opinion of Sudjana (2006), changes in a person's attitude can be predicted, if a person has mastery of knowledge. It can be understood that aspects of knowledge influence each other's values for aspects of students' attitudes.

Based on the explanation above, it can be concluded that applying the DL model in learning can increase students' attitudinal competence. This is in accordance with the research results of Melani (2012) which concluded that the DL Model had a positive effect on the scientific attitudes and cognitive learning outcomes of Biology students at SMA Negeri 7 Surakarta where students were able to develop scientific attitudes such as curiosity, distinguishing facts from opinions, honesty with facts, cooperation and responsibility.

The skills competency of students by applying the DL model has increased at each meeting. This can be seen from the rubric filled in by the observer during the observation. Observation of students' skill competencies is carried out using two assessment categories, namely: assessment of making reports and making presentations. In the pre-cycle, students' skill competency completion is very low, namely 65.18%. In the first cycle, students' skills competency completion had increased, namely 85.71%. In cycle II, students' skill competency completion had increased to 89.05%. The use of the DL model in cycle II has shown a high increase in skill competency and has exceeded the classical completeness set at 70%.

This increase in competency is due to the learning process in the pre-cycle not yet using the DL model. Students carry out learning using discussion and question and answer methods. Student skills such as making reports and giving presentations are still lacking. The skills of students in cycles I and II who have implemented the DL model when viewed from the two indicators and overall it can be seen that using the DL model increases students' skill competency. This is also supported by increasing knowledge and attitude competency results which have an impact on improving skills. As according to Sudijono (2009), the results of learning this skill aspect appear in the form of skills and the ability to act individually. The learning outcomes for this skill aspect are actually a continuation of the learning outcomes for the knowledge aspect (understanding something) and the learning outcomes for the attitude aspect (which only appears in tendencies to behave).

Based on the explanation above, it can be concluded that applying the DL model in learning can improve students' skill competencies. This is in accordance with the research results of Nur (2012) which concluded that science learning using the DL model has been proven to train students in developing science process skills so that the essence of science as a process and product of science learning can be implemented optimally.

The knowledge competency of students by applying the DL model has increased at each meeting. This can be seen from the evaluation in the form of written test results by students at the end of each cycle. The purpose of this evaluation is to determine the level of students' mastery of the material after completing the lesson. In the pre-cycle, students' knowledge competency completion was very low, namely 69.89%. The learning process in the pre-cycle does not yet use the DL model. Students carry out learning using lecture, discussion and question and answer methods. Students' awareness of conducting discussions and asking questions to answer the questions contained in the LKPD is still low. This makes students less motivated in learning because students have to memorize a lot of concepts given by the teacher. Memorizing activities are not liked by students, on the contrary, students will understand the material better if it is contextual to everyday life.

In cycle I, the completeness of students' knowledge competency has increased to 75.89%. The learning process in cycle I already uses the DL model. In cycle II, the completeness of students' knowledge competency had increased to 83.39%. The use of the DL model in cycle II has shown a high increase in knowledge competency and has exceeded the classical completeness set at 70%.

The use of the DL model in cycles I and II has shown a high increase in knowledge competency compared to before. The Discovery Learning model encourages students to learn independently so that they discover lesson concepts for themselves and answer contextual problems. Another impact of DL can stimulate students to solve problems that occur in real life. The application of DL motivates students to discuss with groups to answer the problem formulation that has been given. The formulation of this problem is in accordance with the stimulation provided by the teacher so that students are active in learning. The stimulation given by the teacher at each meeting is different, such as observing videos and pictures. Students are used to applying the DL model so that students can easily discuss with the group to answer the problem formulation that has been given. The different stimulation provided by the teacher makes students more motivated and active in the learning process.

5. CONCLUSION

1. The application of the Discovery Learning learning model can improve students' behavioral competence in science learning in class VII SMPN 21 Padang. The percentage of pre-cycle completeness was 79.30%, cycle I was 81.26%, and cycle II was 88.13%.
2. Application of the Discovery Learning learning model can improve students' skill competency in science learning in class VII SMPN 21 Padang. The percentage of pre-cycle completeness was 65.20%, cycle I was 72.33%, and cycle II was 74.00%.
3. Application of the Discovery Learning learning model can increase students' knowledge competency in science learning in class VII SMPN 21 Padang. The percentage of pre-cycle completion was 66.43%, cycle I was 75.89% and cycle II was 83.39%.

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