



**IMPROVING LEARNING ACTIVITIES AND LEARNING OUTCOMES USING THE DISCOVERY
LEARNING METHOD**

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ABSTRACT

This research is action research conducted in two cycles. Each cycle consists of planning, action, observation, and reflection. This research aims to improve the quality of the learning process. The Discovery learning method is used to improve the quality of learning. Stages of learning discovery methods consist of simulations, problem statements, data collection, verification, and generalization. Student learning activities are measured using an observation sheet. Student learning outcomes are measured using achievement tests in the form of multiple-choice questions. Data obtained in the study were analyzed using descriptive analysis. Data obtained from observations and achievement tests are used as a basis for improvement in the next cycle. The results of this study, discovery learning methods can improve learning activities and student learning outcomes. In the first cycle, students in the very active and active category were 63% and increased in the second cycle to 97%. In the first cycle, mastery learning reached 69% and increased in the second cycle to 87%.

Keywords: discovery learning, learning activities, learning outcomes, classroom action research.

INTRODUCTION

Article 15 of the National Education System Law 20/2003 states that vocational high school (SMK) aims to develop the potential of students to become noble, healthy, knowledgeable, capable, creative, independent, democratic, and responsible citizens [1]. Meanwhile, according to Pavlova [2], the primary purpose of vocational education is to prepare students to work. The process of preparing students to work is both technical and practical [3]. Student preparation for work includes providing information about the work chosen, developing student capacity by practicing, and developing student performance continuously to maintain student performance [4].

Vocational education focuses on the acquisition of knowledge and skills. Maclean states that vocational education is related to the acquisition of knowledge and skills so that students can work productively, be able to become empowered individuals and be able to increase socioeconomic value [5]. To obtain the skills needed for work, the active involvement of students is an essential factor in vocational education. Skills will be honed more and more as students practice more often. Therefore the active role of students during teaching and learning activities will train students to become skilled in the fields they learn.

The activeness of students in the learning process is something that needs to

be considered by the teacher so that the learning process gets optimal results. "Learning is assessed based on what someone says, writes, and does" [6]. Therefore in learning requires the active role of students to convey what has been learned. As stated by Wina Sanjaya [7], that "learning is doing," the learning process must be able to encourage student activities. Student activities in learning need to involve physical [2] and spiritual aspects in order to obtain changes in behavior that includes cognitive, affective, and psychomotor aspects [8]. Based on the description, vocational education is expected to shape students to be active, creative, and productive.

Aerodynamics is one of the productive subjects in the Vocational Aircraft Expertise Program. Aerodynamics is a subject that studies the properties of air, how air reacts with the objects in its path, and the effects it causes. Aerodynamics is essential to understand because aerodynamics gives an understanding of how an airplane can fly. From the observation, it was found that in aerodynamic learning, students have not been actively involved; the teacher is still dominant in using teacher-centered learning models. The unavailability of learning support books is also a factor in the use of teacher-centered learning models.

From observations made, the inculcation of the flight control concept is not strong enough so that misconceptions still occur. During teaching and learning

activities, the teacher is more dominant in applying the lecture method, so students become less active during the learning process. Methods like this tend to create one-way interactions, from teacher to student. Students become passive during learning so that students' ability to reason and think scientifically is not built up.

From some of the problems found, it can be concluded that the cause of the low activity, aerodynamic learning achievement is a teacher-centered teaching and learning process. In the teacher-centered learning process, students are not actively involved in the learning process; this also causes students to memorize what is conveyed by the teacher so as not to arouse student creativity in developing the concepts being learned. Therefore, the teacher's role is needed in delivering aerodynamic material to be interesting, and always involves student participation, so students become more active during the learning process. The active role of students is needed to improve student abilities, as expressed by John Dewey [9] that learning is only possible if active learners experience it themselves.

These problems can be solved by Classroom Action Research, which has the aim to solve real problems that occur in the classroom [10]. One effort to improve the quality of learning of students can be pursued by the discovery learning method. Discovery learning emphasizes a scientific approach, which emphasizes the discovery of

concepts or principles previously unknown. In applying this method, the teacher takes the role of a facilitator who allows students to be active in the learning process. With learning, conditions like this can change learning activities that were previously teacher-centered into student-centered learning.

Discovery learning involves the formulation and testing of hypotheses, not just reading and listening to the teacher [6]. This condition allows students to learn concepts with their language so that the concepts will be more readily understood [11]. Thus the understanding of the material obtained through the discovery learning method will be more profound. As revealed by Piaget, that understanding comes from discovery, and without understanding, productivity and creativity will be lost [12].

In discovery learning, what will be learned is not delivered directly by the teacher, but is found by students during the learning process through problem situations arranged by the teacher [13]. Students are required to carry out activities to identify a problem, collect and process data, prove to arrive at conclusions [14]. Knowledge obtained through this method is very personal because it results from the students' formulation so that it will strengthen understanding and memory.

The aerodynamic learning process with the discovery learning method will involve students to be active. The activeness of

students who during learning includes actively analyzing data, playing an active role in groups that are organized by students to understand a concept or solve a problem, actively reflecting the knowledge that has been learned, and actively in developing concepts learned.d.

RESEARCH METHODS

Types of research

This research is a classroom action research that focuses on solving problems that occur in class.

Place of Research

This research was conducted at SMK Bina Dhigantara Colomadu Karanganyar.

Research subject

Class XI AP3 students of SMK Bina Dhigantara with 32 students were the subjects in this study.

Procedure

The action research design chosen was the Kemmis & Mc Taggart model with an action cycle of four stages: planning, action, observation, and reflection [15].

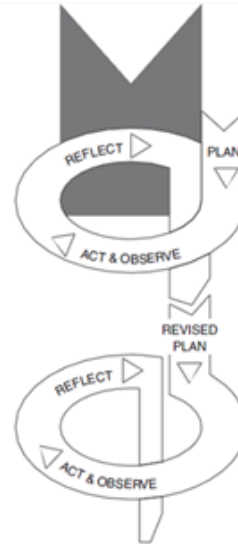


Figure 1. Kemmis & Mc Taggart spiral.
(Source: [16])

The implementation of this research, the researchers, acted as teachers who teach. In conducting research, researchers collaborate with other teachers as collaborators. Collaborators are tasked with observing and recording carefully the various situations that occur in the teaching and learning process.

This research was conducted in two cycles. Each cycle is carried out in 4 stages, namely: the planning stage, the action stage, the implementation phase, the observation phase, the analysis phase, and the reflection of the action.

The action taken at classroom action research is the application of discovery learning methods. Student activities in learning discovery learning models can be seen in table 1.

Table 1. Student activities in learning

No	Stages	Student Activities
1	<i>Simulation</i>	Students see films about flight control surfaces. Students review the material, the emergence of the elevator, Bernoulli law, and the formula elevator.
2	<i>Problem statement</i>	Identify the types of flight control surfaces based on the film being played. Make a statement regarding the cause of the change in the direction of the aircraft's movement.
3	<i>Data collection</i>	Look for sources of information about the characteristics of each flight control surface and the factors that affect the performance of the flight control surface
4	<i>Verification</i>	Prove the truth of the working principles that have been prepared by analyzing it using the Bernoulli's law and the elevator formula ($L = CL \cdot \frac{1}{2} \rho V^2 \cdot S$).
5	<i>Generalization</i>	Make conclusions about the working principle of flight control surfaces Present the results of group discussions.

Data, Instruments, and Data Collection Techniques

Data collection instruments in this classroom action research are (1) interview guide sheet, (2) observation sheet used to measure student activity, (3) Multiple choice achievement test.

Data Analysis Techniques

Qualitative data obtained were analyzed using descriptive statistics [15].

RESULTS AND DISCUSSION

Cycle I

In the first cycle, the implementation of the actions was adjusted to the Learning Implementation Plan. The researcher was assisted by two observers to observe the activity during the learning process. Cycle I was held in two meetings.

The results of observations of student activity during the first cycle were discussed and analyzed by the teacher and observer. Based on table 12, it can be analyzed that students' activeness in the very active category is 16%, the active category is 47%, the less active category is 34%, and the inactive category is 3%. So it can be concluded that students who are in the active category are 63%. These results have not reached the target set in this study, which is 80%.

In the first cycle, students have not mastered all indicators of flight control surface material. Assessment of student learning outcomes in the first cycle showed students who reached the minimum completeness criteria reached 69%, while students who had not yet reached 31%. These results have not reached the expected target of 80% of students achieving completeness.

Cycle II

Action planning in the second cycle emphasizes learning improvement activities in the first cycle that have not yet reached the target. So that student learning outcomes improve, researchers and observers agree to develop material on indicators that have not been completed by giving many problems to be discussed in groups. Next, the teacher will do the sifting to students on material that has not been completed by students, and students are allowed to ask questions about material that is not yet understood. To increase activity when the teacher's discussion encourages students to ask questions about things that are not yet understood and reminds students to take notes about the material presented by each group. After considering the learning activities of the first cycle, in this second cycle, each child was given a student worksheet.

In the second cycle, there was an increase in student learning activities. The diagram of the student activity observations results is presented in Figure 2. From Figure 2, it can be seen that the student's activeness is higher than the specified target.

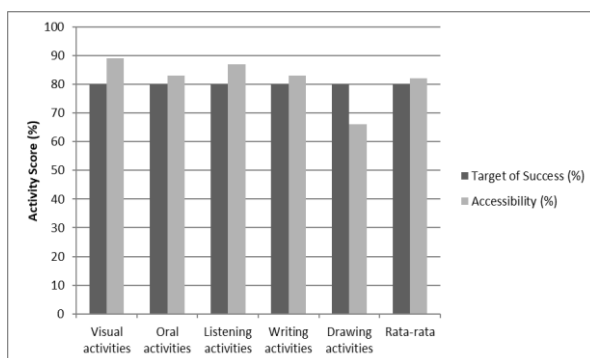


Figure 2. Bar Diagram of Observation Results of Cycle Activity Observation II

Overall, student activity using the discovery learning method has reached the specified target. The results of observations of student activity show students who are categorized as very active and active reach 97%, exceeding the target of 80%.

The results of the multiple-choice test show that AP3 grade XI students have reached the minimum completeness criteria of 87%; this means that the student learning outcomes have reached the set target of 80%.

Student Activity Achievement

Based on the results of observations made in the first cycle, aspects of the activity observed have not yet obtained the expected results. From table 4. writing activities and drawing activities have the lowest level of obscurity. The low achievement was due to each group only getting one student worksheet, so some students were not involved in filling out the student worksheet. The students' activeness has not been tackled either because the students have not been fully involved in the presentation session.

In cycle II, in order to improve writing and listening activities, each student is given a student worksheet. The teacher motivates students to dare to speak and express their ideas and ideas. The teacher allows students to ask questions, but does not answer the question directly but is thrown back to the other students. In cycle II, an increase in all aspects of activity was observed. The observations of student activities show each activity; visual activities (89%), oral activities

(83%), listening activities (87%), writing activities (83%), drawing activities (66%). The main reason for the increase is indicated because each group has completed its media presence so that each student can focus on the presentation session.

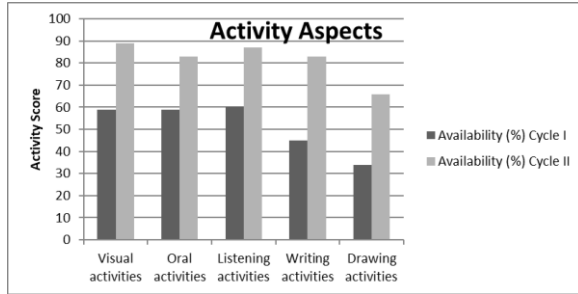


Figure 3. Bar Diagram of Activity Increase in Cycle II

Based on Figure 3 can be seen as an increase in student activity from cycle I to cycle II. Analysis of the results of observations summarized in table 2 shows that learning with discovery learning aided by student worksheets can increase student activity. Based on table 2, students who were categorized as very active and active reached 97%.

Table 2. Student activity achievement

activity	Accessibility	
	Cycle I	Cycle II
Very active	16%	69%
Active	47%	28%
Less Active	34%	3%
Not active	3%	0%

Learning Outcomes

The achievement of student learning outcomes is presented in table 3. The percentage of students who reach the minimum fertility criteria in cycle II is higher than cycle I.

Table 3. Learning Achievement

Category	Cycle I	Cycle II
Complete	69%	87%
Not complete	31%	13%

Overall this class action research can be said to be successful because of all the specified targets achieved and an increase in results obtained from the first cycle to the second cycle.

CONCLUSION

The conclusion of this research is as follows:

The Discovery learning method can increase the activity of student learning in the learning process Aerodynamics. Students in the very active and active category in the first cycle were 63% and in the second cycle increased to 97%.

The Discovery learning method can improve student learning outcomes in the learning process Aerodynamics. Mastery learning in the first cycle reached 69% and increased in the second cycle to 87%.

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