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THE EFFECTIVENESS OF PEER TEACHING IN ACHIEVING STUDENT UNDERSTANDING IN THE SUBJECT OF MILLING TECHNIQUES

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Abstract

Education is one of the important human needs that cannot be separated in everyday life. Differences in individual understanding cannot be ignored at every level of human education. Therefore, teachers are required to design learning methods that are able to increase the effectiveness of the individual needs of learners. The method used in designing this research is quasi experiment. The population in this study amounted to 36 students who were divided into two groups in one class at SMK Negeri 1 Nanggulan. The experimental design used is post-test only control group design, which consists of a control class and an experimental class, each of which has a value. The average value on the understanding of the experimental class post-test results shows a value of 82.444 higher than the mean value of the control class. N_{max} the experimental class showed 96.50 and N_{min} of 72.50. Meanwhile, the N_{max} of the control class showed 76.00 and N_{min} of 64.00. The P_{value} of homogeneity (Levene's) >0.05 is 0.081 which indicates that the data is normally distributed. Then the normality test P_{value} results are below <0.05 which is 0.040 (experimental), 0.019 (control) by comparing the significance level P_{value} <0.05 then H_0 is rejected and H_1 is accepted. Peer teaching research proves that it is effective for improving student understanding in the subject of milling techniques of multilevel milling material.

Key words: *Peer teaching, Quasi Experiment, Post-test*

INTRODUCTION

Education is one of the important human needs that cannot be separated in everyday life. Education can also be referred to as the process of systematically transferring knowledge from one person to another in accordance with predetermined standards (Haritsyah, 2020). The delivery can be through many methods according to their needs and suitability. Education is currently divided into three pathways namely formal, non-formal and informal, where in its implementation, formal education is usually carried out in formal schools ranging from primary, secondary to higher education levels. (Syaadah et al., 2022).

According to Law No. 20/2003, Chapter 6 paragraph 15, states that the types of secondary education include general, vocational, special, official, and religious education. Vocational education itself is a secondary education that prepares students to work in a particular field, thus shaping students learning experiences ranging from introduction, exploration to preparation and stabilisation of careers in the world of work.

The main focus of this vocational school, students are more emphasised on mastering the knowledge, skills, character and attitudes needed by the world of work (Syarif Sumantri et al., 2022). The skills of SMK students in accordance with their fields are very influential in determining their future steps, especially since the basis of SMK students is demam-driver, which means that students skills and knowledge are based on the needs of the world of work. (Mahanal, 2019). So it is very necessary to have a high focus in absorbing subjects in class. The classroom is a place where interaction between teachers and students takes place, equipped with pedagogical efforts that can be accounted for by the teacher (Haryanto, 2020).

Good classroom management when able to form learners who are confident, safe and comfortable in understanding the lessons delivered in the learning process. (Azman et al., 2020). However, in the teaching process that occurs in SMK in the field of mechanical engineering expertise, the most common problem faced by students today is that students do not understand the material presented by the teacher which causes students to be unable to read work drawings, read measuring instruments and leads to low assessment results.

Teachers often emphasise academics, ignoring students self-confidence and the lack of support for developing self-confidence, which causes students to not actively ask questions about the material presented. This condition can be influenced by students boredom with uninteresting learning methods and lack of confidence to ask questions for fear of being assessed. (Riyadi, 2019).

With the rapid development of technological knowledge in the aspect of education, it needs to be improved so that the world of education is not left behind. Teachers

are the main factor influencing the educational aspect. Teachers in teaching must have innovation, creativity and communication to motivate students so that students are active in learning activities to improve knowledge and skills competencies (Khoiriyah, 2021)

Students enthusiasm for learning will be affected if the teacher's learning is unchanging and boring. Therefore, it is very important to use learning strategies. Teachers should have learning strategies that are able to solve problems, think critically, and work in groups. Besides being influenced by learning strategies, student activeness also has an impact on learning outcomes. Interaction between students is as important as interaction between teachers and students. Students and teachers must have a co-operative relationship to produce a pleasant learning environment (Mufidah & Tirtoni, 2023).

According to Permendiknas number 41 of 2007 confirms that productive subjects are given with the aim that students are competent and have skills for their survival consisting of social skills with friends, personal skills, pre-vocational skills, in order to have a good assessment of knowledge and skills. (Khoiriyah, 2021).

The subject of Grasp Machining Technique is one of the subjects in Vocational High School that is oriented towards practical material aimed at Phase F students (Grade XI), However, understanding the theoretical material of this course will greatly determine the learning outcomes of students towards understanding machine operation and reading jobsheet drawings, because this is the main capital for practicum. Thus, the need for the right learning method in delivering the material of multilevel milling techniques so that students can understand the procedure of how to defraud correctly.

Peer teaching is not a new learning method in education. Peer teaching is a learner-centred learning method. Peer teaching is expected to be able to facilitate Mechanical Engineering XI grade students to prepare themselves for the frais machining technique subjects that will be taken (Hertiavi & Kesaulya, 2020). This method is done by empowering the ability of students who have high absorption, these students teach their friends who do not understand so that learning completeness is fulfilled for all. The peer teaching method is a method that has a connection between the idea of learning completeness and the use of reinforcement (Megawati, 2019).

In creating an active and efficient learning process, it is realised by choosing creative ways and triggering students to actively participate (Ramatni et al., 2023). Post-test assessment is a form of evaluation conducted by researchers to test the effectiveness and influence of the treatment given in the classroom. This evaluation can be formed in a creative way through several forms of tests that are interesting and not boring. The learning development process that begins with a pre test and post-test aims to see the extent of student development with the material that has been taught. Data from pre and post-tests appear when experiments are conducted on variables measured at the same time. The results of the pre-test will help combine the students prior knowledge with the new information so that there is material that is taught according to the students own abilities or students have not mastered the material at all (Effendy, 2016). Post-test assessment is a form of evaluation carried out by researchers to test the effectiveness and effect on the treatment given in the class.

Based on this description, the purpose of this study shows that the peer teaching learning model is an effective learning model in improving student understanding in learning theoretical and practical material, so it is necessary to study more deeply the effect of peer teaching learning models on student understanding in learning the material of milling machining techniques.

METHODS

The method used in this research is Quasi Experiment with a sample of class XI (phase F) Mechanical Engineering students of SMKN 1 Nanggulan. Students were divided into two groups as control group and experimental group.

The control group and the experimental group were given a pre-test to find out the extent of their understanding in following the subject of milling machining techniques, if there is a difference then the research can be continued. Then proceed with the learning process where the control group uses the lecture method and the experimental group uses the peer teaching method on multilevel milling material. Furthermore, students from the control group and experimental group were given a post-test to test the results.

The research hypothesis was carried out using the t-test to determine the results of significant differences between the two groups. The Null Hypothesis (H_0) is a hypothesis that has no relationship between variables, usually also called a hypothesis that there is no difference, no effect, no influence, so the null hypothesis is also called the Nihil Hypothesis, a hypothesis that is nothing. The Alternative Hypothesis (H_1) is the

opposite of the Null Hypothesis, which is a hypothesis that has a relationship between variables, namely as a hypothesis that states there is a difference, there is an effect, there is an influence from the treatment on the score (Zaki & Saiman, 2021).

The experimental design used is post-test only group design. This research involves 2 variables, namely the independent and dependent variables. Where the independent variable is the peer teaching learning method in the experimental group and conventional learning in the control group.

For the dependent variable is the achievement of student understanding in learning the material of multilevel milling techniques. The data taken is the post-test value in the work on the subject so that the appropriate instrument is needed in collecting information..

RESULTS AND DISCUSSION

The subjects in this study were 36 students, with the criteria that the subjects took mechanical engineering majors and were studying in class XI mechanical engineering at SMKN 1 Nanggulan. The research procedure, students were divided into two groups, 18 people with the control group using conventional methods and 18 people for the experimental group given the peer teaching method. After group division, students in the experimental group were further divided into 3 small groups of 6 people. There was one person appointed as a tutor. The subject used in this research is milling technique material.

The tutor selection procedure is based on several criteria, including high academic ability, good communication skills, and good interpersonal skills. The selected tutor will be in charge of leading the group learning process, explaining the material, providing explanations of tasks, assisting with tasks, and leading group discussions (Reziyustikha et al., 2017).

The criteria for tutors appointed according to Firmansyah et al., (2017) In other words, prospective tutors are students who have performed well in class. The importance of communication for prospective tutors is to trigger interaction between students so that they can work together cohesively. The importance of communication for prospective tutors is to trigger interaction between students so that they can work together cohesively. (Mukhlis, 2016)

The control class learning activities began with pre-test activities, then continued using conventional learning methods (lectures), then at the end of the multilevel milling material was given a post-test assessment. Experimental learning uses tutoring activities which are peer teaching learning activities related to certain topics in an interactive, meaningful and organised manner. The tutoring process is carried out by training people who do not understand by people who understand better. Usually peer teaching involves relationships between students that are effective in student understanding and metacognition. (Tullis & Goldstone, 2020).

Experimental class learning activities begin with pre-test activities, then proceed by forming 3 groups of 6 students, where students will interact with each other and discuss the material of multilevel milling material, then at the final stage a post-test assessment is given. The control and experimental post-test scores will later become the main data to compare the effectiveness of the two learning methods.

Data processing in this study uses JASP windows calculations, by selecting statistical techniques that compare two independent variables, namely non-parametric independent sample t-test, because when the data is tested on the boxplot there is ordinal data in the experimental class. N_{min} post-test of understanding of multilevel milling material in the experimental class showed 76.00 and the control class 64.00, while in the control class 64.00. N_{max} post-test in the experimental class was 96.50 and the control class was 72.50, while in the normality test the P_{value} score results of the control group and the experimental group are below <0.05.

The homogeneity test (Levene's) of the post-test scores of the two groups resulted in a p>0.05 value of 0.081 so that it was continued using the mann whitney u test.

Tabel 1. Main Data Analysis

Independent Samples T-Test

	W	df	p	Hodges-Lehmann Estimate	Rank-Biserial Correlation	SE Rank-Biserial Correlation
post test	324.000		< .001	14.000	1.000	0.193

Based on the results of the Independent sample t-test mann whitney u test analysis, the significance value p < 0.001 (less than 0.05) shows that the results of the post-test value of the graded grinding material of the control group and the experimental group are significantly different. Hodges-Lehmann estimate, is the median difference between the two groups. The rank biserial correlation can be considered as the effect size and interpreted as equal to r Pearson, so 0.193 is a large effect size.

The following table is a descriptive explanation of the data set that has been processed. The value (N) of 36 students divided into 2 control and experimental groups with 1 group of 18 students in the table below explains how many samples were studied in one control group and the experimental group The average value of the post-test of the graded milling machining material of the control group is 82.444 with a standard deviation of 5.344 and the experimental group was 67.444 with a standard deviation of 3.101.

Table 2. Descriptives of Group

	Group	N	Mean	SD	SE	Coefficient of variation
post-test	Experiment	18	82.444	5.344	1.260	0.065
	Control	18	67.444	3.101	0.731	0.046

So that the average achievement of the post-test value of the multilevel milling material of the experimental group using the peer teaching method has a higher value than the control group by comparing the significance level p <0.05 and smaller than 0.05, so H_0 is rejected and H_1 is accepted.

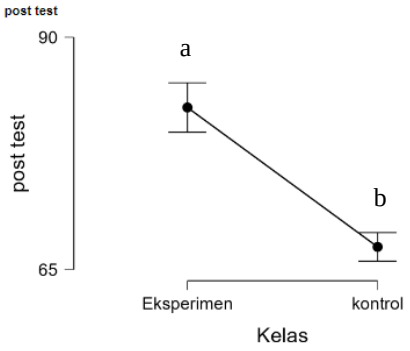

Figure 1. Graph of post-test difference between control class and experimental class

The following is a graph illustrating the difference in post-test scores on multilevel milling technique material between the control class and the experimental class using the peer teaching method, by analysing the difference in independent t-test results, mean, standard deviation and significance of post-test scores on multilevel milling material, it can be concluded that there is a real difference between learning using peer teaching and conventional methods in mechanical engineering classes learning milling techniques with multilevel milling material, where classes using peer teaching methods have higher post-test scores than classes with conventional methods.

CONCLUSIONS

Based on the results of the discussion, the following conclusions are drawn:

1. Classes that use the peer teaching method are very effective for mechanical engineering teachers when compared to classes that use conventional methods (lectures).
2. There are pre-test and post-test activities used in this study as one of the main ways of collecting data to compare the peer teaching method.
3. The mean value of students understanding of milling technique material in the experimental group is 82.444 with a standard deviation of 5.344 higher than the control group of 67.444 with a standard deviation of 3.101.
4. The results of the JASP windows analysis in the Independent sample t-test table using mann whitney u, which has a significance value of p<0.001 where p<0.05. H_0 is rejected because peer teaching does not have a significant difference in student learning outcomes and H_1 is accepted because it shows the results of the post-test scores of multilevel milling material between the control and experimental groups are significantly different.
5. The graph shows that the experimental group with the peer teaching method (a) has a real difference with the control group (b) on the understanding of student learning outcomes in milling techniques.

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