VANOS
JOURNAL OF MECHANICAL ENGINEERING EDUCATION
http://jurnal.untirta.ac.id/index.php/vanos
ISSN 2528-2611, e-ISSN 2528-2700
Volume 9, Number 1, May 2024, Pages 32 - 41

Effectiveness of Peer Teaching Learning Models in Lathe Machinery Practice Courses for Mechanical Engineering Education Program Students

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Received: 25 February 2024. Accepted: 26 March 2024. Published: 30 May 2024

ABSTRACT

The peer teaching learning model provides an opportunity for students to give each other knowledge to their peers. Peer teaching is a student-centred learning method. The purposes of this study are (1) to learn about the competence of students' lathe practice after applying the learning model of peer teaching and (2) to know about the improvement of the competency of students' lathe practice after applying the peer-teaching learning model. The method used in this research is quasi-experimental. The sample used in this research was 41 students of the Practical Class from the Mechanical Engineering Education Study Program. The data analysis used is normality test, homogeneity test, t-test, and N-Gain test. The results of the research show that (1) the competence of lathe practice of the students who apply a peer teaching learning model is in moderate categorized and (2) the application of a peer learning model is effective to improve the lathe practical competence of the students.

Keywords: Peer Teaching, Competence, Lathe Practice

INTRODUCTION

Universitas Negeri Semarang (UNNES) is one of the institute of education. Teacher Training Institute (LPTK) is a public or private college designated by the government to organize the Bachelor of Education Program (PSP) and Teacher Profession Education (PPG) to meet the needs of educators who are competent in Indonesia. LPTK consists of colleges under the auspices of the Ministry of Education, Culture, Research and Technology [1]. As a competent teacher printing agency, LPTK is decisive in improving the quality of education, because teachers are an important player in advancing Indonesian education.

One of the faculties that exists at UNNES is the Faculty of Engineering which has 15 courses of study. One of its courses is the Mechanical Engineering Educational Studies Program. The Engineering Engineering Education Study Program is one of the curricula of candidate teachers in vocational secondary schools especially in the field of machining and manufacturing.

The Engineering Lathe Practice Course is one of the compulsory courses taught in the Mechanical Engineering Education Study Program. The learning access on this course is that students are able to do work with a blower machine. A variety of practical skills are taught from basic to advanced. Basic materials are orientation of the machine, operational standards of machine use procedures, identification of auxiliary tools, and health and safety at work. Advanced materials are the operation of machine with a variety of competencies such as facing, turning, tapper, groove and threading.

The background of students in the Mechanical Engineering Education Study Program comes from high school and vocational school graduates. Students with a machining vocational school background can be assumed to have the ability to practice lathes. Meanwhile, students with a high school background do not yet have the ability to practice lathes. The distribution of the number of students with high school and vocational school backgrounds is not balanced. The number of students with a high school background is greater than students with a vocational school background.

The observation results showed that some students had difficulty carrying out lathe practices. This difficulty is especially felt by students who have a high school background. Practical Study Group 3 (Practical Group 3) has 14 students from high school backgrounds and 5 students from machining vocational school backgrounds. Practical Study Group 4 (Practical Group 4) has 15 students from high school backgrounds and 7 people from machining vocational school backgrounds. Forming small groups in class will help distribute students from different backgrounds evenly.

The classroom learning that has been carried out so far has not been able to bridge the existing problems. Limited time and the large number of competencies that must be

achieved in each course almost make it impossible for students to repeat basic concepts. One way that can be done to solve this problem is by implementing the peer teaching learning method.

The classroom learning that has been carried out so far has not been able to bridge the existing problems. Limited time and the large number of competencies that must be achieved in each course almost make it impossible for students to repeat basic concepts. One way that can be done to solve this problem is by implementing the peer teaching learning method [2].

Peer teaching is actually not a new learning method in the world of education [3]. Peer teaching learning or what is commonly known as peer tutoring learning is a student-centered learning method [4]. This learning is believes that with a pleasant atmosphere, all students' attention and concentration is focused on the learning process, so that a serious but relaxed learning atmosphere can be created [5]. Peer teaching is expected to be able to facilitate first semester students to prepare for the physics education courses they will take. Peer teaching learning model as valuable learning approach and effective that has been applied to various approaches such as medical, dentistry and various ophthalmology health college [6]. That matter possible because of the model peer teaching learning build a learning environment which allows students feel comfortable to express various difficulties in the process learning [7]. The peer teaching learning model can be applied to vocational learning. In order not to disrupt students' regular lecture schedules and the nature of peer teaching learning is only to help students master basic physics concepts, peer teaching learning should be carried out outside of regular lecture hours [8].

Novelty in peer teaching research in vocational education refers to the exploration of new approaches, methods, or combinations of existing strategies to enhance the effectiveness of peer teaching in vocational education settings. This can include the integration of different pedagogical approaches, the use of technology to facilitate peer larning, or the examination of the impact of peer teaching on specific learning outcomes [9].

Based on these considerations, peer teaching research was conducted on fourth semester students of the Mechanical Engineering Education Study Program. The aims of this research are (1) to determine students' lathe practice competency after implementing the peer teaching learning model and (2) to determine the increase in students' lathe practice competency after implementing peer teaching learning.

RESEARCH METHOD

The sample used in this research was the Practical Class 3 and Practical Class 4 classes of students from the Mechanical Engineering Education Study Program, totaling 41

students. The entire research sample was divided into two groups, namely the Practical Group 3 as the control class and the Practical Group 4 as the experimental class. The sampling technique used was Purposive Sampling [10].

The method used in this research is quasi-experimental. Quasi Experimental has a control class, but it does not function fully to control external variables that influence the implementation of the experiment [11]. The research design used in this research is Nonequivalent Control Group Design. In this design, one experimental group and one comparison group are used [12]. The research began by giving a pre-test to both groups. An overview of research diagram can be seen in Picture 1.

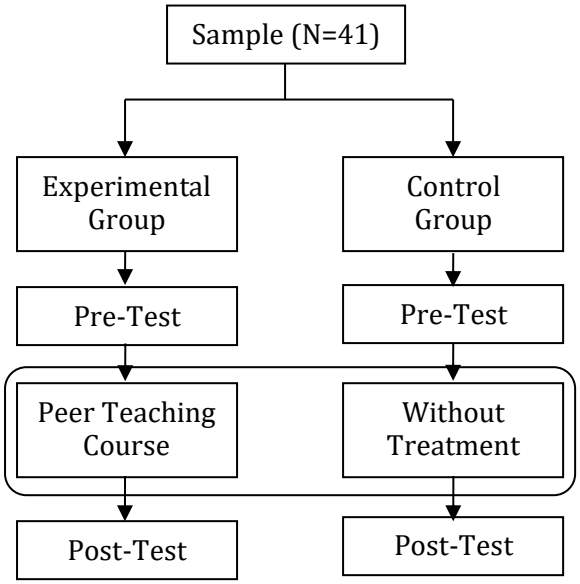

Figure 1. Research diagram

The next stage was given treatment to both groups and ended with giving a post test to both groups [13]. An overview of Nonequivalent Control Group Design can be seen in Table 1.

Table 1. Nonequivalent control group design

O_1	**X**	**O_2**
O_3	-	**O_4**

Note:

O_1 : Pretest experiment group

X : Peer Teaching Course

O_2 : Post test experiment group

O_3 : Pretest control group

\- : without treatment

O_4 : Post test control group

The data collection technique in this research is to use a test technique consisting of a pre-test and post-test [14]. The pre-test is used to measure students' initial ability students' initial abilities in mastering initial turning practice competencies in the experimental group and control group. The post test is used to measure students' final abilities in lathe practice competency in the experimental group and control group. The post test results were used as a comparison between the experimental group and the control group.

Data analysis in this research was N-Gain Test, Normality Test, Homogeneity Test and T-Test [15]. The N-Gain test was used to determine the increase in student learning outcomes in both groups. To determine that the data that has been collected is normally distributed, a normality test is used. The homogeneity test functions to determine whether the two groups are homogeneous or not. The normality test and homogeneity test

are requirements for the next statistical test, namely the t-test. The t-test is needed as a statistical test to test the hypothesis, namely whether or not there are differences in learning outcomes between the two groups [16].

RESULT AND DISCUSSION

The peer teaching learning model is a learning model that allows students to share their knowledge with their peers or teach their peers. Peer assisted learning is a learning method that allows students to discuss actively and cooperatively. Peer teaching is a procedure of students teaching other students [17]. There are two types of implementation of peer teaching, the first type is teachers and learners of the same age. The second type is a teacher who is older than the learner [18]. There are several terms in the peer teaching method, namely, tutors are students who act as lecturers who teach or provide assessments, and tutees are students who are taught or given assessments [19].

Students who have a vocational school background in machining become tutors for their classmates. Before implementing the lesson, observation and selection are carried out for prospective tutors. The tutor selection test is used so that tutors who will join in peer teaching learning really have the knowledge needed so that the peer teaching learning program can run smoothly. Students who become tutors have an advantage because they have the opportunity to learn to teach in class.

Tutees in this research are students who have a high school or non-machining vocational school background. Tutees are chosen with the aim of preparing students to engage in learning at college. Students are expected to have provisions when facing lathe practice lecture material. It is also hoped that the differences in the teaching and learning process in high school and university can be bridged by this program [20]. The implementation of the peer teaching learning model in this research was carried out outside regular lecture hours. The peer teaching learning model meeting schedule is determined based on an agreement between the tutor and tutee. Peer teaching can also be carried out during lathe practice lectures. The tutor helps the tutee in supervising and providing guidance when carrying out practice.

The data normality test aims to test whether the data being tested is normally distributed or not. Conditions and normal distribution are requirements for testing hypotheses using parametric statistics [21]. The Kolmogorov-Smirnov normality test was used in this study. The results of the Normality Test in this study show that the Asiymp.Sig (2-tailed) significance value of 0.085 is greater than 0.05. So according to the basis for decision making in the Kolmogorov-Smirnov normality test, it can be concluded that it is normally distributed [22].

The results of the pre-test and post-test homogeneity test show that the value of F_{count} = 1.572 < F_{table} = 2.217. Based on these results, the two sample data are declared homogeneous.

The t-test is a statistical test used to test the truth or falsity of the null hypothesis which states that between two sample means taken randomly from the same population, there is no significant difference.

The results of the t-test in this study were t_{count} = 3.367 > t_{table} 2.022. This means that the peer teaching learning model is effectively used to improve students' lathe practical competence.

The Gain Test (<g>) is used to determine the increase in cognitive learning outcomes before and after learning using the peer teaching learning model is calculated using a normalized gain score. The formula used to determine the Gaint Test is as shown in Equation 1.

$$N - Gain = \frac{Posttest\ Score - Pretest\ Score}{Maximum\ Score - Pretest\ Score}$$

Equation 1. The Gain Test (<g>)

Normalized gain score <g> is a suitable method for analyzing pre-test and post-test results. The level of normalized score gain is categorized into three categories (Hake, 1998), namely:

High : (<g>) > 0.7

Moderate : 0.7 (<g>) 0.3

Low : (<g>) < 0.3

The N-Gain test in this research can be seen in Table 2.

Table 2. N-gain test results for experimental group and control group

Groups	Pretest Average	Posttest Average	Max Score	<g>
Experiment	68,15	82,10	92	0,438
Control	73,81	81,18	87	0,281

Based on Table 2, the N-Gain value in the experimental group was obtained at 0.438. This value can be categorized as medium gain. This means that there is an increase in the moderate category for students' lathe practice competency after receiving peer teaching method treatment. The peer teaching method can help less active students become more active in the learning process so that it can help these students understand lessons so that they can improve learning achievement [23]. The N-Gain value for the control class was 0.281, this means that although there was an increase in student learning outcomes, this increase was very small.

The peer teaching learning model is very appropriate for getting students' participation as a whole and individually. This strategy gives each student the opportunity to act as a teacher for his friends [24]. With this strategy, students who have not wanted to be involved will participate in learning actively [25]. Because the age difference between tutors and tutees is not too great, peer teaching also provides students with the opportunity to study and work without pressure [26]. The peer teaching learning model facilitates students with different abilities. Students who are more responsive to the material being

studied can show concern and responsibility for their friends. So that students can actualize their abilities [27].

Peer teaching learning can be done more relaxed but still meaningful. Learning atmosphere in the peer teaching pattern is a stimulus for developing discussions between tutors and tutees so that both parties can practice critical thinking when facing difficult questions [28]. Peer teaching provide opportunities for tutors to gain knowledge and new skills. That matter possible because by teaching, the tutors apply knowledge into reality so it will deepen your insight the tutor himself [29]. Apart from improving learning outcomes, interaction between tutors and tutees also has a positive impact on both. These positive impacts include increasing self-confidence, improving problem-solving abilities, increasing cooperation between students and improving communication building skills [30]. Peer teaching learning is a technique that can help students to understand various different concepts, developing computing capabilities and values moral, social and emotional especially their abilities are deep express ideas [31].

CONCLUSION

Based on the results and discussion, it can be concluded that the results of the research show that the competence of lathe practice of the students who apply a peer teaching learning model is moderately categorized and the application of a peer learning model is effective to improve the lathe practical competence of the students.

REFERENCES

[1] "Permendikbud-Nomor-38-Tahun-2020".

[2] S. SARUN, "PENINGKATAN HASIL BELAJAR PEMESINAN BUBUT SISWA KELAS XI TPA DENGAN METODE TUTORIAL TEMAN SEBAYA DI SMKN 1 CIKARANG SELATAN KABUPATEN BEKASI," *VOCATIONAL: Jurnal Inovasi Pendidikan Kejuruan*, vol. 2, no. 2, pp. 136–145, 2022.

[3] S. Hai-Jew, *Practical Peer-to-Peer Teaching and Learning on the Social Web*. in Advances in Educational Technologies and Instructional Design. IGI Global, 2021. [Online]. Available: https://books.google.co.id/books?id=NdNJEAAAQBAJ

[4] R. K. Baltzersen, *Effective Use of Collective Peer Teaching in Teacher Education: Maximizing Student Learning*. in Routledge Research in Teacher Education. Taylor & Francis, 2023. [Online]. Available: https://books.google.co.id/books?id=35jeEAAAQBAJ

[5] Y. N. Febianti, "Peer teaching (tutor sebaya) sebagai metode pembelajaran untuk melatih siswa mengajar," *Edunomic Jurnal Pendidikan Ekonomi*, vol. 2, no. 2, 2014.

[6] C. H. Major, M. S. Harris, and T. D. Zakrajsek, *Teaching for Learning: 101 Intentionally Designed Educational Activities to Put Students on the Path to Success*. Taylor & Francis, 2021. [Online]. Available: https://books.google.co.id/books?id=2t4zEAAAQBAJ

[7] D. J. R. Evans and T. Cuffe, "Near-peer teaching in anatomy: An approach for deeper learning," *Anat Sci Educ*, vol. 2, no. 5, pp. 227–233, 2009.

[8] T. O. Oziegbe, *Introducing Peer Tutoring and Reciprocal Peer Tutoring in Colleges in Nigeria*. GRIN Verlag, 2023. [Online]. Available: https://books.google.co.id/books?id=sHa6EAAAQBAJ

[9] K. J. Graziano, "Peer teaching in a flipped teacher education classroom," *TechTrends*, vol. 61, pp. 121–129, 2017.

[10] R. K. Schutt, *Investigating the Social World: The Process and Practice of Research*. Pine Forge Press, 2009. [Online]. Available: https://books.google.co.id/books?id=Xl4caVEys_kC

[11] C. S. Reichardt and T. D. Little, *Quasi-Experimentation: A Guide to Design and Analysis*. in Methodology in the Social Sciences Series. Guilford Publications, 2019. [Online]. Available: https://books.google.co.id/books?id=LNGlDwAAQBAJ

[12] D. F. Chambliss and R. K. Schutt, *Making Sense of the Social World: Methods of Investigation*. Pine Forge Press, 2010. [Online]. Available: https://books.google.co.id/books?id=C_ykW73SbTcC

[13] S. Sugiono, "Metode penelitian kuantitatif, kualitatif, dan r & d," *Bandung: Alfabeta*, vol. 288, 2016.

[14] M. Zozus, *The Data Book: Collection and Management of Research Data*. in Chapman & Hall/CRC Interdisciplinary Statistics. CRC Press, 2017. [Online]. Available: https://books.google.co.id/books?id=ilAsDwAAQBAJ

[15] J. W. Creswell, *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research*. in Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research. Pearson, 2015. [Online]. Available: https://books.google.co.id/books?id=6kk-nwEACAAJ

[16] A. Ross and V. L. Willson, *Basic and Advanced Statistical Tests: Writing Results Sections and Creating Tables and Figures*. SensePublishers, 2018. [Online]. Available: https://books.google.co.id/books?id=qCdFDwAAQBAJ

[17] K. Topping, C. Buchs, D. Duran, and H. van Keer, *Effective Peer Learning: From Principles to Practical Implementation*.

Taylor & Francis, 2017. [Online]. Available: https://books.google.co.id/books?id=oTQlDwAAQBAJ

[18] A. Burgess, D. McGregor, and C. Mellis, "Medical students as peer tutors: a systematic review," *BMC Med Educ*, vol. 14, pp. 1–8, 2014.

[19] N. Byrne and C. Butcher, *An Introduction to Teaching in UK Higher Education: A Guide for International and Transnational Teachers*. in ISSN. Taylor & Francis, 2020. [Online]. Available: https://books.google.co.id/books?id=FNQHEAAAQBAJ

[20] S. Hidayat and M. Saleh, "Komparasi kemampuan kerja antara lulusan SMA dan SMK di industri permesinan modern," *IKRAITH-EKONOMIKA*, vol. 2, no. 3, pp. 45–56, 2019.

[21] D. E. McNabb, *Research Methods for Political Science: Quantitative, Qualitative and Mixed Method Approaches*. Taylor & Francis, 2020. [Online]. Available: https://books.google.co.id/books?id=E20LEAAAQBAJ

[22] J. Durbin, *Distribution Theory for Tests Based on the Sample Distribution Function*. in CBMS-NSF Regional Conference Series in Applied Mathematics. Society for Industrial and Applied Mathematics, 1973. [Online]. Available: https://books.google.co.id/books?id=zAryCrT1IUYC

[23] R. Romansyah, S. Wakhinuddin, and W. Wagino, "Penerapan Metode Pembelajaran Tutor Sebaya Dalam Meningkatkan Hasil Belajar Siswa Pada Mata Diklat Teknik Dasar Otomotif Pada Siswa Kelas X Program Keahlian Teknik Kendaraan Ringan Smk Negeri 1 Sumatera Barat," *Automotive Engineering Education Journals*, vol. 7, no. 1, 2018.

[24] H. Irawan, "Application of People Tutor Methods to Increase Learning Achievement of Mechanical Measuring Equipment to Basic Automotive Engineering," *VANOS Journal of Mechanical Engineering Education*, vol. 8, no. 1, pp. 55–65, 2023.

[25] N. P. Anggorowati, "Penerapan model pembelajaran tutor sebaya pada mata pelajaran sosiologi," *Komunitas*, vol. 3, no. 1, 2011.

[26] D. G. Young, D. E. Hoffman, and S. Frakes Reinhardt, "An exploration of the connection between participation in academic peer leadership experiences and academic success," *Journal of Peer learning*, vol. 12, no. 1, pp. 45–60, 2019.

[27] A. Wadi SMKN, J. Srikandi, and B. Korespondensi Penulis, "Penggunaan model peer teaching untuk meningkatkan motivasi dan prestasi belajar membuat batik tulis," 2019.

[28] J. Liou-Mark, U. Ghosh-Dastidar, D. Samaroo, and M. Villatoro, "The Peer-Led Team Learning Leadership Program for First Year Minority Science, Technology, Engineering, and Mathematics Students.," *Journal of Peer Learning*, vol. 11, no. 5, pp. 65–75, 2018.

[29] E. L. Rees, P. J. Quinn, B. Davies, and V. Fotheringham, "How does peer teaching compare to faculty teaching? A systematic review and meta-analysis," *Med Teach*, vol. 38, no. 8, pp. 829–837, 2016.

[30] C. A. Scott, A. McLean, and C. Golding, "How peer mentoring fosters graduate attributes.," *Journal of Peer Learning*, vol. 12, no. 3, pp. 29–44, 2019.

[31] E. T. Vasay, "The effects of peer teaching in the performance of students in mathematics," *E-International Scientific Research Journal*, vol. 2, no. 2, pp. 161–171, 2010.