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Improving students' competence on software inventor by applying peer tutoring methods

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Abstract
This study aims to improve students' learning outcomes in the subject of Technical Drawing using peer tutoring at SMK Negeri 2 Solok. This research employs a Classroom Action Research (CAR) approach conducted in two cycles. Each cycle consists of 3 class periods (3 x 45 minutes). In the first cycle, students focused on 2D drawings, while in the second cycle, the learning emphasis shifted to 3D drawings. The research results indicate a significant improvement in students' learning outcomes, with a completion rate of 73.91% in the first cycle, increasing to 86.20% in the second cycle. Peer tutoring proved effective in helping students understand the material and enhancing their skills in using Autodesk Inventor. Thus, this method can be considered a viable alternative learning strategy to improve student outcomes.

Keywords : peer tutoring; learning outcomes; Technical Drawing; Autodesk Inventor; Classroom Action Research

Introduction

Education can be defined as a process that takes place within educational institutions, where the primary goal is to achieve behavioral changes in students through teaching and learning. In the context of vocational education, it plays a crucial role in preparing individuals with the skills and knowledge that align with societal needs. The teaching and learning process is the core of education, where through this process, educational objectives are realized in the form of changes in student behavior (Ambiyar dalam Saputra, 2020). Vocational education aims to equip learners with skills, knowledge, and competencies relevant to the demands of industry and society (Pohan et al., 2014). Moreover, education is expected to bring about changes in individuals, encompassing aspects of thinking, behavior, and skills (Salim dalam Saputra, D. K., Nurdin, H., Refdinal, R., & Rifelino, 2020). Thus, education is not merely the transfer of knowledge but also a transformative process that prepares individuals to face challenges in the workplace and everyday life.

In Indonesia, there are vocational high schools designed with curricula aimed at preparing students to enter the professional workforce (Primalwalti et all., 2015). Vocational schools help students acquire the competencies needed to enter the job market or pursue further studies in higher education (Suci et all., 2024). SMK Negeri 2 Solok is a vocational school that offers several skill programs. The mechanical engineering field is one of the primary options for students. Additionally, this program has strong connections with the industrial world (Praltiwi & Jalsril, 2020). At SMK Negeri 2 Solok, particularly in the Mechanical Engineering department, Manufacturing Drawing lessons are provided to students in grades XI and XII. In this course, students learn various methods of creating 2D and 3D drawings. In the learning process, teachers still play an active role, which is commonly referred to as a teacher-centered approach.

Based on the results of the researcher's observations along with the subject teacher of the Manufacturing Drawing class, it was found that students often feel rushed, unfocused, and quickly bored during both learning and practical sessions, which affects their learning outcomes. Conventional teaching methods in technical drawing, which require

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students to memorize difficult material, have made students feel less comfortable and decreased their motivation (Walnkhalde et all., 2022). Conventional learning is an approach focused on traditional methods and structures, where the teacher plays the role of the main instructor, and students typically sit in class, listen to the teacher's explanation, and receive learning materials in textual form. This method tends to be one-directional, where knowledge transfer occurs from the teacher to the students with minimal interaction, rendering students passive recipients of information. This issue is reflected in the student's final exam results.

Table 1. Manufacturing Engineering Drawing school final exam results

CLASS	N STUDENTS	≤75		≥75	
		n students	Persentase	n students	persentase
XI TPM 1	25	3	12%	22	88%
XI TPM 2	25	9	24%	16	64%

From the results of the data table, it is observed that the Final Semester Examination scores show that only 64% of the students in class XI TPM 2 were able to meet the Minimum Mastery Criteria (KKM) set, whereas 88% of the students in class XI TPM 1 achieved it. This difference indicates the presence of obstacles in the learning process experienced by the students in class XI TPM 2, particularly in understanding and using the Inventor application. One of the reasons for the low scores of students in using the Inventor application is influenced by several factors. The learning process still has many students struggling with difficulties, and there is also a lack of appropriate instructional medi. Students face challenges in understanding the concept of drawing with CAD software. One approach considered effective in addressing this issue is the peer tutoring method. This method allows students who are more proficient in a certain field to help their classmates who are experiencing difficulties. In addition to providing a more comfortable learning environment, peer-to-peer relationships tend to be closer, which facilitates communication.

According to Kuswaya Wihardit (dalam Nurubaleti & Nugralheni, 2022), peer tutoring is defined as a student helping other students in the same grade level. Peer tutoring is a learning method aimed at meeting the individual needs of learners. The essence of the peer tutoring method is the learning process where students are assisted by their classmates who have greater competence to support them in understanding or mastering a particular learning concept (Malhsup et all., 2020). Palmizal & Octadinata (2019) stated that the peer tutoring method encourages meaningful learning by involving learners in active learning activities and mutual teaching.

The main advantage of the peer tutoring method is its ability to create an environment that encourages students to ask questions and engage in discussions without fear or embarrassment. According to Syaiful Bahri Djamarah and Aswan Zain (dallalm Ridalwalti, 2022), some of the benefits of tutoring activities include: 1) In some cases, it produces better results for students who tend to hesitate or feel nervous when interacting with educators; 2) For the tutor, the act of tutoring reinforces the concepts being taught. When the tutor (the student) explains to their peers, it is as if they are relearning and internalizing the material. According to Galbraith & Winterbottom the initial perception of students towards the role of the tutor evolves from interest to expertise and authority, motivated to learn the material without embarrassment and gaining the ability to answer questions. Thus, the peer tutoring method can be a solution to improve students' learning outcomes. Based on this background, this study aims to analyze the effectiveness of the peer tutoring method in enhancing students' skills in using the Inventor application in the subject of Manufacturing Drawing Techniques for Grade XI at SMK Negeri 2 Solok.

Methods

The research uses the Classroom Action Research (CAR) method, aimed at improving learning outcomes in the classroom. The research follows the Kemmis and McTaggart model, which consists of four stages: planning, action, observation, and reflection. The first cycle focuses on

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teaching 2D drawing using a peer tutoring method, where students are divided into groups with one student acting as the tutor. In each cycle, the steps include material planning, the learning action, observation of the implementation, and reflection to evaluate students' learning outcomes. The second cycle continues with the 3D drawing material. The research instrument is a measurement tool used in conducting research (ALdib, 2019). An instrument is a vital tool in research because it allows the instrument to be reused by other researchers who have similar needs and contexts. To make the research process run more smoothly, research tools are used to facilitate data collection (Ralhim et all., 2021). In this research, the data collection process uses a student assessment sheet as the research instrument, while data analysis is qualitative, with scores based on criteria such as design, work process, work results, time, and attitude.
Data collection in the research is then analyzed to produce clear findings. The data analysis technique used in this research is the percentage of students who achieve the specified criteria. The percentage results are calculated using the following formula:

$$\%\text{completeness} = \frac{\text{number of students who completeds}}{\text{number of students}} \times 100\%$$

Results of the actions were considered successful if at least 75% of the students achieved the Minimum Completeness Criteria (KKM), according to the standards outlined by Wijaya (2020:71). The analysis of the comparison of completeness was conducted in each cycle to measure the improvement in student learning outcomes. The learning process was considered successful and qualified if at least 75% of the students achieved the Minimum Completeness Criteria (Mulyalsal dallalm Indalh Halfizhalh, 2022).

Finding and Discussion

Finding

This research uses Classroom Action Research (CAR). The aim of this research is to improve the learning outcomes of Manufacturing Engineering Drawing by using peer tutoring methods at SMK Negeri 2 Solok. This research was conducted in 2 cycles, with each cycle consisting of 3 meetings (3x45 minutes). The results from the assessment of the 2 cycles are as follows:

Cycle 1
The assessment of student learning outcomes is based on the psychomotor competence of the students. The students' performance is evaluated by the researcher in collaboration with the teacher. The student learning outcomes are indicated by the evaluation results in the form of assignments given to 23 students throughout the learning process. With the detailed scores presented in the table below, the results of the student learning outcomes in Cycle 1 are as follows:

Table 2. Cycle 1 Assessment Results

NO	ANALYSIS COMPONENT	CYCLE 1
1	Students who completed (%)	73,91 %
2	Students who not completed (%)	26,09 %
3	Maksimum score	88,75
4	Minimum score	63,75
5	Mean	77,88

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Based on the table presented, it shows that student learning outcomes in the Cycle 1 learning process resulted in 26.09% of students not passing, while 73.92% of students passed. From this data, it can be concluded that in the first cycle, students who achieved a passing score had not reached the graduation target of 75% for each cycle.

Cycle 2
The assessment of student learning outcomes is based on the psychomotor competence of the students. The students' performance is evaluated by the researcher in collaboration with the teacher of the subject. The student learning outcomes are indicated by the evaluation results in the form of assignments given to 23 students throughout the learning process.

Table 3. Cycle 2 Assessment Results

NO	ANALYSIS COMPONENT	CYCLE II
1	Students who completed (%)	86,20
2	Students who not completed (%)	13,8
3	Maksimum score	96,25
4	Minimum score	65
5	Mean	85,33

Based on the table presented, it shows that the student learning outcomes in the learning process of Cycle II resulted in 86.20% of students passing, while 13.80% of students did not pass. From these data, it can be concluded that in the second cycle, students who achieved the passing score have met the target proficiency of ≥ 75% for each cycle, and planning for the next cycle is discontinued.

Discussion
the scores of students' skills using the Inventor application through the peer tutoring method in cycles I and II, as shown in the following table.

Table 4. Perbalndingaln Cycle I daln II

NO	ANALYSIS COMPONENT	SIKLUS I	SIKLUS II	DESCRIPTION
1	Students who completed (%)	73,91 %	86,20 %	Increased (12,29%)
2	Students who not completed (%)	26,09 %	13,04 %	decline (13,05%)
3	Maksimum score	88,75	96,25	Increased
4	Minimum score	63,75	65	Increased
5	Mean	77,88	85,33	Increased

Based on the results obtained from cycle I, the implementation of the peer tutoring method has been successful. The average student performance in cycle I and II was 73.92% and 86.20%, respectively. This indicates an improvement from the previous average of 75%, in accordance with the findings of Trialnto (dallalm ALulial, 2024) where the percentage of student performance

achieving 75% indicated an improvement in recognizing student performance results. The average percentage in cycle I was 73.91%, which, according to Trialnto (dallalm ALulial, 2024) did not meet the minimum criteria of 75% required for this study.
The increase in the percentage of student performance in cycle II shows that the learning process using the peer tutoring method positively influenced the improvement in student performance results. The improvement in student performance using the peer tutoring method was also experienced by previous researchers, such as Galspalr Nalju Kalduwu Walli, Wignyo Winarno, and Taltik Retno Murnialsih (Walli et al., 2020), in their study titled "Improving Students' Activities and Performance Results through the Peer Tutoring Method," which reported that student performance in cycle I was 60.71%, while in cycle II it improved to 78.57%. The percentage increase in student performance was 17.86%.
Overall, the results from cycles I and II demonstrate that the use of the peer tutoring method has a positive impact on student learning outcomes. The improvement in applying the peer tutoring method was seen not only in terms of scores but also in the quality of learning and student engagement in group activities. Therefore, it can be concluded that the use of the peer tutoring method can significantly enhance student learning outcomes when applied in the Autodesk Inventor application for engineering drawing subjects in the field of manufacturing techniques.

Conclusion

Based on the results of the actions taken, it can be concluded that: The implementation of the peer tutoring method improved the skills of students in class XI TPM when using the Autodesk Inventor application in engineering drawing subjects at SMK Negeri 2 Solok. The skill levels of the students improved in cycle I but did not meet the success indicator set by the researcher, which is ≥75%. Therefore, cycle II was necessary. In cycle II, the skills of the students achieved the success indicator of ≥75%.

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Declaration

Author contribution

Diaz Ilyasa Nazri as a researcher and data collector for the facility relationship. Primawati, S.Si., M.Si. is a provider of direction and methods in research; Dr. Rizky Ema Wulan Sari, M.Pd.T. Evaluating research methods, Sri Rizki Putri Primandari, Ph.D. data analysis and evaluating Background of the Problem.

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Conflict interest

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