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The Effect of Implementing Contextual-based Shop Talk on Students Cognitive Learning Outcomes in Machining Practices

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ABSTRACT

Practical learning in mechanical engineering requires a material delivery strategy that helps students effectively understand work procedures, work safety, and the sequence of machining processes. However, interview results with lecturers indicate that student learning outcomes in the Advanced Machining Process course still vary, particularly among students with limited practical experience before entering college. This study aims to determine the effect of the application of contextual-based shop talk on students' cognitive learning outcomes in machining practice. The study used a quantitative approach with a one-group pretest-posttest design. The research data comes from the cognitive learning outcomes of 21 students during their studies. Data analysis was carried out using descriptive statistics and the Wilcoxon signed ranks test. The results showed that the average posttest score was higher than the pretest score. The results of the Wilcoxon signed ranks test indicate that the Sig. (0.001) < 0.05, meaning that there was an effect of the application of contextual-based shop talk on students' cognitive learning outcomes in machining practice.

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INTRODUCTION

Vocational education plays a role in preparing a competent workforce that is ready to enter the world of work. This is relevant to Stefanus et al. (2023), who explained that the goal of vocational education is to prepare individuals to enter the workforce after completing their education. Vocational higher education is required to produce graduates who master the theory and practical skills needed in the world of work. In the field of mechanical engineering, practical competency is a crucial aspect because most work activities in the workplace, especially in the manufacturing industry, are related to machine operation, production processes, and the direct completion of technical work. Therefore, the practical learning process must be structured systematically and effectively so that students can achieve the competencies targeted by the learning. The success of practical learning is not only determined by the availability of facilities and infrastructure but also influenced by the learning strategies implemented during the learning process.

One of the courses that has an important role in forming the competency of Mechanical Engineering students is Advanced Machining Processes. This course is a practical machining course designed to improve students' ability to operate machine tools and complete machining work with a higher level of complexity. In its implementation, students are required to be able to understand working drawings, determine machining parameters, apply work safety procedures, and produce products according to specified specifications. This competency requires good conceptual understanding and psychomotor skills so that the practice process can run effectively. Therefore, learning in this course requires an approach that is able to help students understand the work before practical activities.

Interviews with the instructor responsible for the Advanced Machining Processes course revealed that a number of students continue to experience challenges during practical training sessions. The lecturer's observations indicated that students sometimes experienced difficulties in properly and correctly compiling work preparation, understanding work instructions, determining the sequence of work processes, and connecting the material they had learned with the practical implementation in the workshop. Furthermore, some students also required further assistance in the use of equipment and in determining appropriate machining parameters. These conditions can affect the smoothness of the practical process and the achievement of expected competencies. Therefore, efforts are needed to help students gain a better understanding before the practical activities are carried out.

Interview results also indicated that students had varying levels of practical readiness. According to lecturers' teaching experience, students from different educational backgrounds often exhibited varying learning needs when taking practical courses. Some students appeared to adapt more quickly to the workshop environment and work procedures, while others required more time to grasp the processes. These differences in characteristics are normal, given that students enter higher education with diverse learning experiences. This presents a challenge for lecturers in designing learning that optimally accommodates the needs of all students.

Various studies have shown that the success of practical learning is greatly influenced by the quality of material delivery before the practice is implemented (Gamage et al., 2020). Jaleniauskiene & Kasperiuniene (2023) explain that learning media that present visualizations of work processes can improve student readiness before carrying out practical work. Sepp et al. (2022) state that a combination of visual and verbal material delivery can improve student understanding of the steps of practical work. This research shows that providing clear information before practice is a crucial factor in supporting successful learning.

Oliveira & Bonito (2023) stated that delivering systematic work instructions can improve students' skills in carrying out practical activities. Nguyen et al. (2021) stated that discussion activities can increase student participation and engagement. Furthermore, research by Ashman et al. (2020)

explained that explicit instructions given before carrying out a task can improve students' mastery of procedural knowledge and learning outcomes. The results of this study indicate that the success of practical work depends not only on individual abilities but is also influenced by how information and work instructions are conveyed to students. Thus, learning strategies are needed that can help students understand the work more deeply before the practical work begins.

One approach that has the potential to be applied to practical learning is the shop talk. A shop talk is a method of delivering material in a workshop or laboratory, conducted briefly and focused, either at the beginning or end of a lesson, lasting 5-10 minutes. This is intended to provide students with an initial understanding of the work process, implementation stages, and procedures required before undertaking a practical assignment (Saputra & Purwoko, 2021). This activity aims to ensure that all students have a shared understanding of the work to be performed. In addition to improving work readiness, shop talk also serve as a means of communication between educators and students to reduce errors and increase productivity. This concept is considered relevant for practical learning in vocational higher education.

In the context of Advanced Machining Process practical learning, the application of contextual-based shop talk allows lecturers and students to discuss the objectives of the practical, the theoretical basis supporting the practical, practical procedures, mistakes to avoid during the machining practical, and evaluation of the practical activities. Contextual-based shop talk are a communication method linked to the world of work. This activity provides an opportunity for students to ask questions and clarify things that are not yet understood. In addition, students can get a clearer picture of the work to be done so that they are better prepared when entering the practical area. The interaction that occurs during the contextual-based shop talk can help students connect theory with the practical work to be done. Thus, contextual-based shop talk can improve students' learning readiness and the quality of practical implementation.

Although various studies have discussed the importance of material delivery, the use of learning media, and communication strategies in practical learning, research on the application of shop talk in vocational higher education is still limited. This condition indicates a need to conduct further research in the context of mechanical engineering vocational education. Based on the description, there is a research gap in the form of limited empirical evidence regarding the application of shop talk in machining practical learning in vocational higher education. The novelty of this research is the use of contextual-based shop talk in the practical learning of the Advanced Machining Process course. The results of this study are expected to support the development of more effective practical learning in vocational higher education.

METHOD

This study used a quantitative approach with a quasi-experimental method to examine the effect of implementing contextual-based shop talk on students' cognitive learning outcomes. The research design used was a one-group pretest-posttest design. The study was implemented in the Advanced Machining Process course. The research subjects were 21 students. Subject selection was based on the classes assigned during the lecture process, so no randomization of group members was performed.

The treatment given in this study is the application of contextual-based shop talk in the Advanced Machining Process course. The contextual-based shop talk are conducted in the form of briefings containing explanations of the objectives of the practice, the theoretical basis supporting the practice, the practice procedures, errors to avoid during the machining practice, and an evaluation of the practice activities. This activity is designed to help students understand the work performed during practical learning.

Data collection was conducted using an instrument to measure students' cognitive learning outcomes in the Advanced Machining Process course. The data used were student learning outcomes before and after participating in the entire series of practical activities. Descriptive statistics are used to analyze student learning outcome data. Before hypothesis testing, the data were first tested for normality and homogeneity. Next, hypothesis testing was conducted using the Wilcoxon signed ranks test because the paired data did not meet the normality assumption.

RESULTS AND DISCUSSION

This study involved a group of students who received treatment in the form of contextual-based shop talk implementation. Table 1 presents a summary of descriptive statistics.

Table 1. Descriptive Statistics of Student Learning Outcomes

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Pretest	21	72.3810	13.00183	40.00	90.00
Posttest	21	85.2381	6.79636	70.00	90.00

The learning outcomes of students' cognitive abilities in the Advanced Machining Process course show that they have an average value of 72.3810 for the pretest data and 85.2381 for the posttest data. The highest value in both data sets reached 90.00, while the lowest value in the pretest data was 40.00 and in the posttest data was 70.00. The standard deviation value (Std. Deviation) in the pretest data was 13.00183, and the posttest data was 6.79636.

Normality testing was performed using the Shapiro-Wilk test because the sample size was less than 50 students. Table 2 presents the results of the normality test.

Table 2. Results of the Normality Test

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.197	21	.032	.911	21	.057
Posttest	.377	21	.000	.697	21	.000

a. Lilliefors Significance Correction

The test results show that the significance value of the pretest data is 0.057 and the posttest data is 0.000. The results of these two data shows that one of the data sets is smaller than 0.05 (0.000 < 0.05), so that the data is not normally distributed.

The data homogeneity test was conducted using data from the pretest and posttest, which are shown in Table 3.

Table 3. Results of the Homogeneity Test

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Value	Based on Mean	5.236	1	40	.027
	Based on Median	4.959	1	40	.032
	Based on Median and with adjusted df	4.959	1	38.388	.032
	Based on trimmed mean	5.535	1	40	.024

Table 3 provides information that the significance value based on the mean was obtained at 0.027. This data indicates that it is less than 0.05 (0.027 < 0.05), so the variance of the pretest and posttest data is not homogeneous.

Hypothesis testing was conducted using the Wilcoxon signed ranks test to determine whether there was an effect of the application of contextual-based shop talk on students' cognitive learning outcomes in machining practice. The test results are presented in Table 4.

Table 4. Results of the Wilcoxon Signed Ranks Test

Test Statistics[a]

	Posttest - Pretest
Z	-3.473[b]
Asymp. Sig. (2-tailed)	.001

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Table 4 provides information that the Sig. (2-tailed) value obtained is 0.001. The Sig. (0.001) value < 0.05, so H_0 is rejected and H_a is accepted. It can be concluded that there is an influence of the application of contextual-based shop talk on students' cognitive learning outcomes in machining practice.

These findings indicate a tendency for the implementation of contextual-based shop talk to support the practical learning process, resulting in better student learning outcomes, as seen from pretest and posttest results. This indicates that technical communication can help students understand the objectives of the practical, the theoretical basis, the practical procedures, mistakes to avoid, and the evaluation of the practical activities. This provides students with a clearer picture of the work they perform during the practical.

Contextual-based shop talk contribute to improving students' cognitive readiness by activating previously acquired knowledge and providing a clear orientation from beginning to end. Furthermore, contextual-based shop talk encourage active learning as students engage in discussions, question and answer sessions, and reflection on experiences related to the practical activities. This process helps students develop a deeper and more meaningful understanding. In terms of procedural understanding, contextual-based shop talk help students understand the sequence of work, the function of each stage, and the technical basis underlying the implementation of these procedures. Thus, students are better able to apply concepts, make appropriate decisions, and resolve problems that arise during the practical activities, thus positively impacting learning outcomes in the cognitive domain.

Theoretically, shop talk is communication through a short discussion conducted to support the implementation of practical activities. Effective communication goes beyond simply providing one-way feedback (Ahamad et al., 2022). In vocational education, this activity plays a crucial role because it can help students build mental readiness and conceptual understanding before undertaking practical work. Students not only know what to do but also understand the technical rationale behind each step. This understanding is crucial in machine learning because even small errors in machine operation or equipment use can impact the quality of the resulting product. Contextual-based shop talk in the workplace has the potential to improve the quality of practical learning conceptually.

The results of this study are in line with various studies that demonstrate the importance of material delivery strategies and pre-practice briefings in improving student readiness. Gericke et al. (2023) explained that practical learning that begins with a systematic explanation of work procedures can improve students' understanding of the steps to be taken. Recker et al. (2024) also explained that the success of practical learning is determined not only by the availability of workshop facilities but also by the quality of instructional communication provided before the practice takes place. These findings support the results of this study, which show that contextual-based shop talk influence students' cognitive learning outcomes in machining practice.

Contextual-based shop talk serve as a means to convey comprehensive information to students, from the beginning to the end of the practical activity. Students are expected to be better prepared before operating the machine. Thorough planning can be realized through the preparation of work preparation.

Work preparation is prepared well and completely according to the supporting materials that have been provided, then consulted with the instructor. Work preparation that has been declared suitable can be used as a guideline when conducting practical work. This is relevant to the results of research by Badawi & Wahyudi (2016), which explains that finished work preparation must be used as a mandatory guideline in practical work. Thus, the basic understanding of theory provided through contextual-based shop talk helps students in compiling work preparation appropriately, so that practical implementation can take place effectively and in accordance with standard operating procedures.

Overall, the research results indicate that contextual-based shop talk have the potential to be a supporting learning strategy that can be applied to practical courses in vocational higher education. Therefore, the application of contextual-based shop talk is worth considering as part of a machining practical learning strategy, especially when combined with other approaches oriented towards improving practical skills and strengthening students' basic competencies.

CONCLUSION

The results of the study concluded that there was an effect of the application of contextual-based shop talk on students' cognitive learning outcomes in machining practice, as reviewed from the results of the pretest and posttest as well as testing using the Wilcoxon signed ranks test. Through discussion activities and technical briefings before practice, students gained understanding and had better readiness when carrying out practice. The research findings showed that contextual-based shop talk has the potential as a supporting strategy for practical learning because it is able to strengthen technical communication and student readiness before carrying out practice.

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