

THE EFFECT OF LEARNING DISCIPLINE AND K3 UNDERSTANDING ON LEARNING OUTCOMES OF LATHE MACHINING

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Abstract

This study aims to analyze the influence of learning discipline and understanding of Occupational Safety and Health (K3) on the learning outcomes of lathe machining practices of students at SMK Turen. This study uses a quantitative approach with an ex-post facto design. The research sample consisted of 32 students who participated in lathe machining practices. Data regarding learning discipline and understanding of K3 were collected using a questionnaire, while data on learning outcomes were obtained through documentation. The data were analyzed using multiple linear regression with the help of IBM SPSS Statistics. The results showed that learning discipline did not have a significant partial effect on learning outcomes of lathe machining practices, with a significance value of 0.075, while understanding of K3 also did not have a significant effect with a significance value of 0.074. Simultaneously, learning discipline and understanding of K3 did not have a significant effect on learning outcomes, as indicated by an F value of 1.718 and a significance value of 0.197. The regression model produced an R value of 0.326 and an R Square of 0.106, indicating that the model explains 10.6% of the variation in learning outcomes, while the remaining 89.4% is related to factors outside the model. The analysis also showed a very high correlation between learning discipline and understanding of K3 ($r = 0.962$) and a VIF value of 13.429 indicating high multicollinearity between the independent variables. These findings indicate that the learning outcomes of lathe machining practices in the analyzed sample cannot be significantly explained only through learning discipline and understanding of K3. Further research needs to consider other relevant variables and use larger and more representative samples.

Keywords: learning discipline; Occupational Safety and Health; K3; learning outcomes; lathe machining

1. INTRODUCTION

Vocational education is designed to equip students with practical competencies relevant to the demands of the workplace. In machining education, students are not only required to understand theoretical concepts but also to demonstrate technical skills through practical activities. Lathe machining practices involve machine operation, measurement, workpiece preparation, and adherence to established work procedures. Therefore, learning outcomes in this field can be influenced by various behavioral, technical, safety, and learning factors. Learning discipline is a behavioral factor that can contribute to the learning process. Discipline can be reflected in students' punctuality, adherence to learning rules, responsibility in completing assignments, and consistency in participating in learning activities. Previous quantitative research has reported a relationship between learning discipline and academic achievement, although the strength of this relationship may vary across educational settings.

Occupational Safety and Health (OHS) is another important component of vocational machining education. Practical machining activities expose students to various potential hazards related to machines, cutting tools, workpieces, and workshop procedures. Therefore, students need a sufficient understanding of OHS to recognize hazards and follow safe work procedures. Previous research has shown that understanding OHS can be related to safety behavior in workshop practices. Research specifically examining machining workshops has also identified various occupational safety risks and emphasized the importance of implementing appropriate risk control measures. Furthermore, several studies in vocational education have examined the relationship between OHS knowledge, workshop facilities, and learning outcomes in lathe machining. Previous research has shown that learning discipline and Occupational Safety and Health can be related to student learning outcomes in various educational contexts. Bayhaqi et al. (2025) reported a significant influence between learning discipline and student learning achievement,

while Suartini and Suarni (2024) found a significant relationship between learning discipline and learning outcomes. In vocational education, Ratnaya (2023) specifically studied learning discipline in vocational high school students majoring in engineering. Research focusing on Occupational Safety and Health (K3) also showed relevant results. Fuadi et al. (2025), for example, studied occupational safety and health and learning outcomes in the lathe machining engineering subject of vocational high school students. Sihombing et al. (2025) also studied OHS knowledge and workshop facilities in relation to learning outcomes in lathe machining engineering. However, the results of this study cannot be directly generalized to every vocational learning context. Previous studies have examined learning discipline, OHS, workshop facilities, and other learning factors separately or in different educational environments. This study specifically examines learning discipline and OHS understanding simultaneously as predictors of students' lathe machining practice learning outcomes at SMK Turen. The results show different empirical findings, namely that neither learning discipline nor OHS understanding has a significant partial influence on learning outcomes, and neither variable has a significant simultaneous influence. This difference indicates that the contribution of OHS discipline and understanding to practical learning outcomes may depend on contextual factors and be influenced by other variables not included in the research model. Based on this background, this study aims to analyze the influence of learning discipline and understanding of K3, both partially and simultaneously, on the learning outcomes of students in lathe machining practice at SMK Turen. The results are expected to provide empirical information for vocational educators and serve as a basis for further research on factors related to learning outcomes in practice.

2. METHOD

This study used a quantitative approach with an ex-post facto research design. The study was conducted at Turen Vocational High School and focused on students participating in lathe machining practice. The ex-post facto design was chosen because the variables studied occurred naturally and were measured without any experimental manipulation. The population of this study consisted of students participating in lathe machining practice at Turen Vocational High School. Based on available research data, the sample analyzed consisted of 32 students. Due to the relatively limited number of students involved in the study, the study used the available students as the research sample. Thus, a total of 32 respondents were included in the statistical analysis. This study involved three variables. Learning discipline was set as the first independent variable (X_1), understanding of OHS as the second independent variable (X_2), and learning outcomes of lathe machining practice as the dependent variable (Y). Learning discipline refers to students' consistency in following learning rules, completing learning activities, managing time, and demonstrating responsibility during the learning process. Understanding of OHS refers to students' understanding of occupational safety and health principles, procedures, potential hazards, and safe work practices in the workshop. Learning outcomes refer to students' achievements in lathe machining practice based on assessment documentation available from the school.

The data used in this study consisted of primary and secondary data. Primary data were obtained through a questionnaire measuring learning discipline and understanding of K3. Secondary data consisted of students' lathe machining practice learning outcomes obtained through documentation. The research questionnaire consisted of 40 statements using a Likert scale. Twenty items were used to measure learning discipline (X_1), while another 20 items were used to measure understanding of K3 (X_2). Several negative statements were reverse-scored before the total score was calculated. The questionnaire data was then processed to obtain a total score for each independent variable. Prior to hypothesis testing, the research instrument was evaluated to ensure its suitability for use in data analysis. Item validity was assessed using item-total correlation, while reliability was assessed using Cronbach's Alpha. The reliability analysis revealed very high internal consistency for the learning discipline instrument, with a Cronbach's Alpha value of 0.967 for the 20 items.

Data analysis was performed using IBM SPSS Statistics. Descriptive analysis was used to describe the research variables. Assumption testing included normality and multicollinearity tests. The Shapiro-Wilk test was used to verify normality because the sample size was less than 50 respondents. Multicollinearity was assessed based on tolerance values and Variance Inflation Factor (VIF), as well as correlations between independent variables. Furthermore, multiple linear regression analysis was conducted to test the effect of learning discipline and understanding of K3 on the learning outcomes of lathe machining practice. The partial effect of each independent variable was tested using the t-test, while the simultaneous effect of both independent variables was tested using the F-test. The coefficient of determination (R^2) was used to determine the proportion of variation in learning outcomes that can be explained by the regression model. The significance level used was $\alpha = 0.05$. The regression model used is formulated as $Y = a + b_1X_1 + b_2X_2 + e$, where Y is the learning outcome of lathe machining practice, X_1 is learning discipline, X_2 is understanding of K3, a is a constant, b_1 and b_2 are regression coefficients, and e is error.

3. RESULTS AND DISCUSSION

3.1 Respondent Characteristics and Research Variables

The study involved 32 students who participated in lathe machining practice at Turen Vocational High School. The study examined three variables: learning discipline (X1), understanding of Occupational Safety and Health (K3) (X2), and learning outcomes of lathe machining practice (Y). Learning discipline and understanding of K3 were measured using a questionnaire, while learning outcome data were obtained through school documentation.

3.2 Instrument Reliability Test

The research instrument consisted of 40 items, with 20 items measuring learning discipline and 20 items measuring understanding of K3. Negative items were reverse-scored before the total score was calculated. The reliability analysis of the learning discipline instrument yielded a Cronbach's Alpha value of 0.967 for the 20 items. This value indicates very high internal consistency.

3.3 Normality Test

The Shapiro-Wilk test was used to test the normality of the research variables because the study involved 32 respondents. The test results showed a significance value of less than 0.001 for learning discipline (X1), 0.005 for understanding of K3 (X2), and 0.292 for learning outcomes (Y). Based on these results, the dependent variable Y has a significance value greater than 0.05, while X1 and X2 have significance values less than 0.05. These results are reported transparently as statistical characteristics of the research data. The normality of each variable should not be interpreted separately from the regression assumptions, particularly the distribution of the regression residuals.

3.4 Multiple Linear Regression Analysis

Multiple linear regression was used to test the effect of learning discipline and understanding of K3 on learning outcomes of lathe machining practice. The regression model produced an R value of 0.326, R Square of 0.106, and Adjusted R Square of 0.044. The standard error of the estimate was 2.36874. The R-square value indicates that the two independent variables explain 10.6% of the variation in students' lathe machining learning outcomes. Meanwhile, 89.4% is related to other factors outside the research model.

3.5 Partial Influence of Learning Discipline

The partial regression test results show that learning discipline has a significance value of 0.075. Because this value is greater than 0.05, learning discipline does not have a statistically significant effect on students' lathe machining practice learning outcomes. This finding differs from the research by Bayhaqi et al. (2025), which reported a significant influence of learning discipline on student achievement. These differences may be related to differences in educational context, respondent characteristics, learning activities, sample size, and the types of learning outcomes assessed. The findings of this study also differ from those of studies that identify learning discipline as a crucial factor in vocational education. Ratnaya (2023), for example, specifically examined learning discipline in vocational high school students majoring in engineering. These differences in results indicate that the contribution of discipline to learning outcomes can vary depending on the characteristics of the learning environment and the competencies being assessed. In lathe machining practice, learning outcomes are not solely related to discipline. Students must also demonstrate technical competence, measurement accuracy, understanding of engineering drawings, machine operation skills, practical experience, and the ability to produce workpieces according to specified standards. Therefore, although discipline remains important in practical learning, in this study sample, discipline was not a significant predictor of learning outcomes.

3.6 The Influence of Partial Understanding of K3

The partial regression test results show that understanding of K3 has a significance value of 0.074. Because this value is greater than 0.05, understanding of K3 does not have a statistically significant effect on students' lathe machining learning outcomes. These findings do not imply that OHS is unimportant in vocational education. Anwar et al. (2024) identified various occupational safety risks in machining workshops, including risks related to lathe operation, welding, material handling, hand tool use, and machine guarding. Yusuf et al. (2025) also reported that OHS understanding and knowledge of OHS regulations were related to the safety behavior of students participating in workshop practical activities. The findings of this study differ from those of Fuadi et al. (2025), who examined occupational safety and health and learning outcomes in lathe machining engineering for vocational high school

students. These differences in results may be due to differences in sample characteristics, measurement instruments, learning environments, assessment procedures, and other contextual factors. Sihombing et al. (2025) also examined occupational health and safety (OHS) knowledge and workshop facilities in relation to learning outcomes in lathe machining techniques. These findings demonstrate the importance of occupational health and safety knowledge and workshop facility conditions in practical vocational learning. This supports the view that learning outcomes in machining practices may involve multiple interacting factors, not just a single predictor.

3.7 The Simultaneous Influence of Learning Discipline and K3 Understanding

The simultaneous test results produced an F value of 1.718 with a significance value of 0.197. Because the significance value is greater than 0.05, learning discipline and understanding of K3 do not have a significant simultaneous effect on the learning outcomes of lathe machining practices. An R-square value of 0.106 indicates that the model explains 10.6% of the variation in learning outcomes, while 89.4% is attributed to factors outside the model. Therefore, the R-square value reflects the model's explanatory power and cannot be interpreted as evidence of a statistically significant effect. The model's low explanatory power suggests that other factors likely contribute more significantly to students' practical learning outcomes. These factors may include technical competence, prior practical experience, learning motivation, teacher guidance, workshop facilities, technical drawing comprehension, measurement skills, machine operation skills, and learning methods. Research on vocational machining learning also shows that learning media and learning approaches can contribute to practical learning outcomes (Radhitya et al., 2025).

3.8 Multicollinearity Test

The correlation analysis results showed a very high Pearson correlation between learning discipline and K3 understanding, at $r = 0.962$. The regression analysis also produced a Variance Inflation Factor (VIF) value of 13.429. These results indicate high multicollinearity between the two independent variables. The very high correlation indicates that learning discipline and K3 understanding have significant overlap in the analyzed sample. Therefore, individual regression coefficients should be interpreted with caution, as multicollinearity can affect the stability and interpretation of regression coefficients. Overall, the results of this study indicate that learning discipline and understanding of K3 together are not sufficient to explain differences in learning outcomes in lathe machining practices in the analyzed samples. This finding also indicates that the results of previous studies cannot always be generalized to all vocational education contexts. This study provides empirical evidence in the specific context of SMK Turen and suggests that additional factors need to be considered in explaining learning outcomes in lathe machining practices.

4. CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that learning discipline and understanding of Occupational Safety and Health (K3) do not show a statistically significant influence on the learning outcomes of lathe machining practices of SMK Turen students in the analyzed sample. Partial tests show that learning discipline has a significance value of 0.075, while understanding of K3 has a significance value of 0.074. Both values are greater than 0.05, so each variable does not have a significant partial influence on learning outcomes. The simultaneous test produced an F value of 1.718 with a significance value of 0.197. Because the significance value is greater than 0.05, learning discipline and understanding of K3 do not have a significant simultaneous influence on learning outcomes. The regression model produced an R value of 0.326 and an R Square of 0.106, which indicates that the two independent variables explain 10.6% of the variation in students' lathe machining practice learning outcomes, while the other 89.4% is related to factors outside the model.

The analysis also showed a very high correlation between learning discipline and understanding of K3 ($r = 0.962$), accompanied by a VIF value of 13.429, indicating high multicollinearity between the independent variables. Therefore, the individual regression coefficients need to be interpreted with caution due to the high degree of overlap between the two predictors. Practically, the results of this study indicate that improving learning outcomes in lathe machining practice should not only rely on learning discipline and understanding of K3. Teachers and vocational schools also need to consider technical competence, practical experience, workshop facilities, learning motivation, teaching methods, teacher supervision, and other factors that can directly support practical performance. The main limitations of this study are the relatively small sample size, namely 32 students from one vocational school, and the presence of high multicollinearity between the two independent variables. Further research is recommended to

involve larger and more representative samples, consider additional relevant predictors, and use measurement and analysis approaches that can reduce the influence of multicollinearity.

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