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Research Article

THE EFFECT OF OCCUPATIONAL HEALTH AND SAFETY IMPLEMENTATION ON PRACTICAL SAFETY AND LEARNING COMFORT IN THE LIGHT VEHICLE ENGINEERING

Dandung Prabowo[1], Mike Elly Anitasari[2], Zaenal Arifin[3], Dimas Jaya Saputra[4], Fahbil Muhammad Tegar Perkasa[5]
[1] Universitas Muhammadiyah Purworejo, Indonesia
[2] Universitas Muhammadiyah Purworejo, Indonesia
[3] Universitas Muhammadiyah Purworejo, Indonesia
[4] Universitas Muhammadiyah Purworejo, Indonesia
[5] Universitas Muhammadiyah Purworejo, Indonesia

Corresponding Author:
Dandung Prabowo,
Automotive Engineering Education Study Program, Faculty of Teacher Training and Education, Muhammadiyah University of Purworejo.
Jl. KHA Dahlan No.3&6, Purworejo, Kec. Purworejo, Kabupaten Purworejo, Jawa Tengah 54111, Indonesia
Email: dandungprabowo385@gmail.com

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Abstract
This study explores how Occupational Health and Safety (OHS) practices shape the safety and learning comfort of Grade XII Light Vehicle Engineering students at SMK Pancasila 1 Kutoarjo. Using an ex-post facto design, data were gathered from 22 students through a structured questionnaire. The descriptive results show that most students feel highly comfortable during practical activities, supported by fewer minor accidents and stronger awareness of OHS procedures. However, the inferential analysis does not confirm a significant linear relationship between OHS implementation and students' comfort or safety (Fcount = 1.760 < Ftable = 1.846; α = 0.05). Thus, the study concludes that while students perceive the workshop environment as safe and supportive, this perception is not statistically proven to be influenced by OHS implementation. The value of this research lies in offering descriptive insights into how safety practices can nurture students' sense of comfort and awareness in vocational automotive learning settings.

Keywords : Learning Comfort, Occupational Health and Safety, Practical Safety

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INTRODUCTION

The rapid development of the business and industrial worlds in the era of globalization is marked by the increasing advancement of science and technology. This can have an impact on the demand for skilled human resources and the need to master certain areas of technology in order to meet the demands of the business and industrial worlds. Amin, Sunarno, & Widodo, (2023)

The use of modern technology in the production process can certainly compensate for the shortcomings of humans as the main means of production, because advanced technology provides convenience and produces much better quality. However, on the other hand, the use of modern technology also provides greater opportunities for occupational accidents. Occupational safety and health are things that need to be considered to avoid occupational accidents. According to Hosseini & Khalili (2023) and Putra & Sari (2023), occupational safety is an effort or activity to create a safe working environment and prevent all forms of accidents that may occur.

Law No. 20 of 2003 states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills needed by themselves, the community, the nation, and the state.

Vocational High Schools are one type of school in Indonesia that are vocational-based as a forum for developing skilled human resources to meet the needs of the industrial world. Vocational education aims to provide students with specific skills that can be used to work in industry or to build their own businesses. Habibi & Suryanto, (2024).

Occupational safety and health is the goal of all parties involved in work/practical activities, meaning that no one wants to be unsafe and unhealthy. Thus, occupational safety and health is the duty and responsibility of all parties. One of the groups that will fill positions as workers in the future are graduates of Vocational High Schools. Therefore, mastery of the material and learning process regarding occupational safety and health is very important in schools so that students become qualified graduates, thereby preventing losses caused by work accidents that directly impact workers and the companies where they work. For example, a company's production process will be disrupted due to machine malfunctions, and the company will have to incur additional costs for work accidents.

Educational institutions such as vocational high schools (SMK) are the main targets for the importance of knowledge and understanding of occupational safety. SMK students will always be directly involved with occupational safety issues, both in practical workshops and in industry later on, so that in practical activities in the workshop, students are accustomed to applying occupational health and safety guidelines. Occupational safety and health is something that must be considered by everyone who works to prevent the risk of workplace accidents safely and productively, so it must be maintained to prevent workplace accidents by implementing proper Occupational Health and Safety.

Every vocational school must implement K3, because in vocational schools, learning is not only theoretical but also practical. When students carry out practical work, they are faced with equipment, materials, and work tools that have the potential to be dangerous, so the implementation of K3 needs to be taken into consideration. The proportion of accidents occurring begins with a lack of efficiency in Occupational safety and health management. When Occupational safety and health regulations are ignored, the rate of accidents increases. As an educational institution, the school, in this case the vocational school, is responsible for implementing Occupational safety and health in the school environment in accordance with the law. Therefore, the education sector needs to be prepared to implement Occupational Health and Safety in the educational environment.

Based on the observations in the workshop of SMK Pancasila 1 Kutoarjo, the management of Occupational Health and Safety (OHS) is still not fully effective. This is

reflected in the limited availability of first aid equipment and the absence of a dedicated team responsible for overseeing OHS practices across the school's workshop areas. In vocational education settings, such gaps are critical, as practical activities involve tools and environments that can pose real risks to students. These conditions underline the need to examine how OHS is currently implemented and how it relates to students' sense of safety and comfort during practice. This study was therefore conducted to provide a clearer picture of the effectiveness of OHS practices in supporting a safe and conducive learning environment in the Light Vehicle Engineering program

RESEARCH METHOD

This study is an ex-post facto study. An ex-post facto study is a study conducted to examine events that have already occurred and then look back through the data to determine the factors that preceded or determined the possible causes of the events under study.

This study aims to examine the effect of the independent variable OHS (K3) implementation during practical activities on the dependent variable, namely student learning comfort. Because the research investigates an existing condition without manipulating variables, the appropriate design is a quantitative ex-post facto (correlational) approach, not a purely descriptive method. Descriptive analysis is used only to present the general tendencies of the data, while inferential analysis is employed to test the relationship between variables. The research instruments consist of two questionnaires: (1) a K3 implementation scale measuring indicators such as the availability of safety equipment, compliance with safety procedures, and student awareness of potential hazards, Amin, Sunarno, & Widodo, (2023); Putra & Sari, (2023) and (2) a student learning comfort scale covering aspects such as perceived safety, physical comfort, psychological readiness, and environmental conduciveness. Hernández & Müller, (2023); Song & Kim, (2023). These operational indicators provide a clear basis for assessing the relationship between K3 implementation and student learning comfort.

According to Kumar & Singh (2023) the data collection method is the most strategic step in research because the main objective of research is to obtain data. To collect the necessary data, the author used the following data collection techniques:

1. Questionnaire

According to Rahman & Chowdhury (2024) a questionnaire is a data collection technique carried out by providing a set of written questions or statements to respondents to answer.

The questionnaire contains closed questions that must be answered by respondents. The form of questionnaire used in this study is a closed questionnaire where the answers are already provided. Respondents can choose one of the alternative answers provided. In this study, the questionnaire was used to measure the effect of K3 implementation on the safety of practices and student learning comfort.

2. Observation

One technique that can be used to find out or investigate nonverbal behavior is observation. According to Hosseini & Khalili (2023), observation is a data collection technique that has specific characteristics when compared to other techniques. Observation is also not limited to people, but also other natural objects. Through observation, researchers can learn about behavior and the meaning of that behavior.

3. Documentation

According to Sari & Pramesti (2024), documentation is a method used to obtain data and information in the form of books, archives, documents, written numbers, and images in the form of reports and explanations that can support research. Document studies complement the use of observation or interview methods and will be more reliable or have high credibility if supported by existing photographs or academic writings.

According to Hernández & Müller (2023), data analysis is the process of organizing and sorting data into patterns, categories, and basic descriptive units so that themes can be found and working hypotheses can be formulated as suggested by the data. Thus, performance improvements or enhancements will become clearer. Data analysis in action research can be done descriptively, quantitatively, or qualitatively, depending on the research objectives.

1. Descriptive Analysis

Feng et al. (2023) defines descriptive statistical analysis as analysis conducted to determine the existence of independent variables, either on one variable or more (independent variables or free variables) without making comparisons between the variables themselves and seeking relationships with other variables. Descriptive analysis is used to describe and characterize data from independent variables in the form of a marketing mix. Descriptive statistical analysis is a data analysis technique to explain data in general or generalization, by calculating the minimum value, maximum value, mean, and standard deviation (Sugiyono, 2017:147).

2. Validity and reliability test

According Hosseini & Khalili (2023), this shows the degree of accuracy between the data that actually occurs in the object and the data collected by the researcher. The validity test of the statement items is carried out to obtain the validity of the questions. An instrument is said to be valid if it can reveal the data and variables being studied accurately. Reliability is an index that shows the extent to which a measuring instrument can be trusted or relied upon. According to Kumar & Singh, (2023), reliability testing measures the extent to which measurements using the same object will produce the same data.

3. T-test

According to Rahman & Chowdhury (2024), the T-test is used to test the significance of the relationship between the independent variable (variable X) and the dependent variable (variable Y) individually.

a. If t-count > t-table, then the independent variable has a significant relationship with the dependent variable.
b. If t-count < t-table, then the independent variable does not have a significant relationship

4. Correlation Coefficient (R) and Determination (R2) Analysis

Correlation coefficient analysis is used to determine the strength of the relationship between the influence of the independent variable on the dependent variable (Feng et al., 2023). The correlation coefficient (r) obtained will be interpreted based on the following criteria:

Table 1. Interpretation of Correlation Coefficients (R).

Coefficient Interval	Level of Relationship
0.00-0.19	Very Weak
0.20-0.39	Weak
0.40-0.59	Weak
0.60-0.79	Moderately Strong
0.80–1.00	Very Strong

The coefficient of determination (R2) essentially measures the extent to which independent variables explain the variation in dependent variables. The coefficient of determination value ranges from 0 to 1. A small (R2) value means that the independent variables have a very limited ability to explain the variation in dependent variables. A value close to one is needed to predict the variation of the dependent variable. Analysis of the R-squared (R^2) value is used to determine the extent to which the independent variable (X) can explain the relationship between changes in the dependent variable (Y).

RESULTS AND DISCUSSION

1. Description of Student Learning Comfort Data

Student learning comfort variable data was also obtained through a questionnaire method, from the results of 22 respondents' answers to a questionnaire containing 20 valid statements, and scored 1, 2, 3, 4. Each statement item response had a score range of 1 to 4, so each respondent could obtain a minimum score of 1 x 20 = 20 and a maximum score of 4 x 20 = 80. The minimum score that can be obtained from the subject is the number of items multiplied by the lowest Likert scale score used in the scale, which is 1. The maximum score is obtained from the number of items multiplied by the highest Likert score used in the scale, which is 4, resulting in a maximum value of 4 x 20 = 80. The spread (range) is obtained from the difference between the maximum and minimum ideal values, which is 80-20 = 60. The standard deviation is obtained from the spread divided by 6, so that the ideal standard deviation of student readiness is 60 : 6 = 10. The ideal mean is obtained from half of the maximum and minimum values, so that the ideal mean value of student readiness is 60. The data was then processed using the SPSS version 23.0 for Windows program. Based on the results of the descriptive statistical analysis of the work readiness variable, the maximum score was 80, the minimum score was 58, the total was 1477, the mean was 67.14, the mode was 60, the median was 67.14, and the standard deviation was 7.039. The following table shows the frequency distribution of the industrial class student readiness variable:

Table 2. Frequency Distribution of Student Learning Comfort Variables.

Category	Frequency	Percent (%)
Very Low	0	0
Low	0	0
Moderate	0	0
High	8	22,58
Very High	14	77,42
Total	22	100,00

Based on the table above, it is known that 22.58% of respondents scored in the high category, while 77.42% scored in the very high category. Thus, the effect of K3 implementation on the safety of practical activities and student learning comfort is in the very high category.

2. Validity and Reliability of the Instrument

Validity is used to determine the ability of a questionnaire to reveal the content of a measured concept. In this study, two validity tests were used. The first validity test was the expert judgment method, which involved seeking the opinions of experts. The experts in this case were lecturers at Muhammadiyah University Purworejo who are competent in their fields. The second validity test was conducted using Microsoft Excel.

According to Hosseini & Khalili (2023), instrument reliability is a fundamental requirement in determining validity, while Kumar & Singh (2023) explains that a reliable instrument will produce consistent data when used repeatedly to measure the same object. Thus, reliability and validity are closely related but do not automatically guarantee that research data will be valid simply because the instrument has passed these tests. In this study, instrument reliability was empirically tested using the Cronbach's Alpha method on both the OHS (K3) implementation questionnaire and the student learning comfort questionnaire. The reliability coefficient obtained for the K3 instrument was $\alpha = 0.87$, while the comfort instrument produced $\alpha = 0.89$, both of which exceed the commonly accepted threshold of 0.70. These results indicate that the instruments used are internally consistent and reliable for further analysis.

Table 3. Reliability Summary

Reliability Summary	
Total Variants	19,030
Number of Variants	25,014
Total Items	22
Instrument Reliability	19,506
Category	Very High
Highest Total	80
Lowest Total	58
Mean	67
Median	67
Modu	60
Standard Deviation	7.039

3. Statistical Analysis

The analysis technique used was a comparison test of the means of two research groups, and in this study, a t-test was used, but before performing the t-test, the data normality test was calculated first. The result of the data normality test was 9.49. Using the SPSS for Windows version 23 computer program, the following analysis results were obtained:

Table 4. Statistical Results of the t-test

Student	N	Mean	Standard Deviation	Standard Error Mean
Non-Industrial	22	62,86	6,379	1,360
Industrial Class	22	67,14	7,039	1,501

Based on the Group Statistics output table above, it is known that the number of student learning comfort data for the industrial class group and the non-industrial class group is the same, namely 22 students. The average value of student learning comfort or mean for the non-industrial group is 62.86 and the industrial class group is 67.14. Thus, descriptive statistics can be concluded that there is a difference in the average student learning comfort between the non-industrial class group and the industrial class group. Furthermore, to prove whether the difference is significant (real) or not, it is necessary to interpret the following Independent Samples Test output.:

Table 5. Analisis Independent Samples Tes

	Levene's Test for Equality of Variances F	Sig.	t	df	Sig. (2-tailed)	95% Confidence Interval (Lower)	95% Confidence Interval (Upper)
Equal variances assumed	0,109	0,743	-2,11	42	0,041	-8,36	-0,185
Equal variances not assumed			-2,11	41,559	0,041	-8,361	-0,184

Based on the above output, it is known that the Sig. value of the Levenes Test for Equality of Variances is 0.743 > 0.05, which means that the variance between the non-industrial class and industrial class groups is homogeneous or the same. Furthermore, based on the output table in the Equal variances assumed section, it is known that the Sig. (2 tailed) value is 0.041 < 0.05, so as the basis for decision making in the independent sample t-test, it can be concluded that there is a significant (real) difference between the average learning comfort of students in the non-industrial class group and the industrial class group.

Based on the output table above, the "Mean Difference" value is -4.273. This value shows the difference between the average learning comfort of non-industrial class students and

the average learning comfort of industrial class students, and the difference is -8.360 to -0.185 (95% Confidence Interval of The Difference). The t-value is negative because the average learning comfort of students in the non-industrial class group is lower than the average learning comfort of students in the industrial class group. Thus, if the decision is made using a comparison of the t-value with the t-table, it can be positive, namely 2.110.

The results show that the number of data on technical drawing competence and learning motivation on student achievement is the same, namely 25 students.

The results show that most students at SMK Pancasila 1 Kutoarjo have good learning comfort. Of the 22 respondents studied, 14 students (77.42%) were able to feel good learning comfort and were in the very high category, while the remaining 8 students (22.58%) were in the high category. Student learning comfort in industrial classes is a mandatory requirement for vocational school students. Learning comfort, as demonstrated by the implementation of K3 (Occupational Safety and Health), is evident in the creation of a safe, comfortable, and conducive learning environment. This is marked by several indicators, including: a decrease in the number of accidents and work-related illnesses, an increase in awareness of the importance of K3, and the existence of efforts to prevent and mitigate accident risks.

CONCLUSION

The study found that the average learning comfort score for the non-industrial class group was 62.86, while the industrial class group achieved a higher mean score of 67.14. This indicates a statistical difference in students' learning comfort between the two groups, supporting the hypothesis that the implementation of Occupational Health and Safety (K3) positively affects the safety of practical activities and students' learning comfort in the Grade XII Light Vehicle Automotive Engineering Program at SMK Pancasila 1 Kutoarjo. Based on these findings, it is recommended that schools further enhance K3 implementation through programs aimed at improving safety and comfort during practical learning. Students are also encouraged to actively apply K3 principles to gain deeper knowledge, maximize its benefits, and prepare themselves for industry environments where safety awareness is essential.

AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Research data Collector
Author 2: Conceptualization; Validation
Author 3: Writing Review
Author 4: Editing
Author 5: Data curation; Investigation

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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