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The Relationship of Knowledge and Attitude to Occupational Health and Safety Behavior in Machining Workshop

Andrian Wisnu Dewangga[1], Riswan Dwi Djatmiko[1], Aulia Majid[1]
[1]Universitas Negeri Yogyakarta, Indonesia

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ABSTRACT

This research aims to determine the relationship between knowledge and attitudes towards Occupational Health and Safety (OHS) behavior in the Vocational School workshop. This research is descriptive research with a quantitative approach. The research population was Machining Engineering students and the sample was determined using purposive sampling technique. The data collection technique uses a closed questionnaire. Data were processed using descriptive analysis techniques and regression analysis. The results of the research show that (1) there is a significant relationship between knowledge and OHS behavior of class which is significant, OHS knowledge and attitudes together towards the OHS behavior of class X students majoring in Mechanical Engineering at Vocational School. This conclusion provides factors influencing students' OHS behavior. The implications of this research are providing OHS knowledge to improve student behavior in OHS.

Corresponding Author:

Andrian Wisnu Dewangga
Department of Mechanical Engineering Education, Faculty of Engineering
Universitas Negeri Yogyakarta
55281 Sleman, Yogyakarta, Indonesia
Email: andrianwisnu@uny.ac.id

INTRODUCTION

Occupational Health and Safety (OHS) in machining workshops plays a crucial role in ensuring a safe working environment for students and instructors, particularly in practical training activities such as Limited Field Assignments. However, a major issue persists regarding students' understanding and compliance with OHS procedures (Maciej Serda et al., 2023). Observations indicate that workplace safety has not received adequate attention from all parties, thereby increasing the risk of accidents during practical sessions (Tinao et al., 2018). One of the primary contributing factors to this issue is the lack of knowledge and a positive attitude toward OHS, which directly affects students' behavior in applying safety principles in machining workshops. Therefore, serious efforts are needed to enhance students' understanding of the importance of OHS and its long-term benefits (Şenkal et al., 2021). Implementing OHS-focused learning is not only a necessity for regulatory compliance but also a crucial investment in shaping safe and professional work habits among students before they enter the industrial workforce.

The possible impact of accidents which tend to involve productive workers with low competence can have serious consequences for the Indonesian economy (Karimi & Taghaddos, 2019). This is primarily due to the potential for a significant decline in productivity, which in turn could be detrimental to overall economic growth. In addition, accidents among the productive workforce can cause additional burdens on the health and insurance systems, which have the potential to reduce people's purchasing power and disrupt economic stability. (Trinh et al., 2020). Therefore, the need to increase awareness and implementation of OHS is becoming increasingly urgent to protect human potential as a valuable economic resource, while ensuring the sustainability and prosperity of the economy. (Lari, 2024).

Vocational School as an educational unit cannot be separated from problems in educating work-ready students. Through observations that have been made, there are still many vocational school students who have not implemented OHS regulations because they find strong reasons for behaving in OHS correctly in workshops (Warphana & Sukardi, 2019) . Occupational health and safety activities are to reduce unexpected events in the workplace (Viswanathan et al., 2024). This incident generally does not involve an element of intention or planning, and it is hoped that vocational schools can strengthen the OHS program as an integral part of the curriculum to provide a deeper understanding to students (YILMAZ, 2022). Increasing student awareness and compliance with OHS regulations can be pursued through a more holistic and structured educational approach, so as to create a safe learning environment and support the development of good OHS skills and behavior. (Afolabi et al., 2016).

Knowledge is an important element in forming a person's actions because behavior based on knowledge is more lasting than behavior that is not based on knowledge. (Shakeel et al., 2023). According to Bloom's theory, there are 5 levels in the cognitive domain, namely knowing, understanding, application, analysis, synthesis and evaluation. From this theory, knowledge will be related to the ability to think and determine hypotheses so that students are able to think about abstract things. (Sadrina et al., 2021). Students have also been trained to think systematically, namely thinking in terms of the concept of something that might happen, not just what has happened (Mutakinati et al., 2018).

Attitude is a person's reaction or response that is still closed to a stimulation or object (Corcoran, 2023). Attitude refers to a person's mental or emotional state towards an object, event, or person. Attitudes towards OHS play an important role in creating a safe and productive work environment (Odonkor & Sallar, 2024). A positive attitude towards OHS reflects good judgment, a feeling of security, and a belief in the importance of complying with OHS procedures. Individuals with positive attitudes tend to be more proactive in following safety rules, using personal protective equipment properly, and participating in OHS training programs. Conversely, a negative or indifferent attitude towards OHS can lead to negligence, decreased vigilance, and increased risk of work accidents (Lari, 2024). Developing a positive attitude towards OHS is not only crucial for individual safety, but also has a positive impact on overall workplace productivity and prosperity (Tan et al., 2023). Through an educational approach, awareness promotion, and supportive policies, organizations can establish a strong OSH culture, create a safe work environment, and support organizational members.

Responsible behavior towards OHS reflects an individual's commitment to establishing and maintaining a safe and healthy work environment (Rinawati, 2018). Workers are not only expected to comply with every safety procedure established by the company, but also to use personal protective equipment appropriately in accordance with applicable norms (Prasad & Ray, 2024). High awareness of potential risks in the work environment is the key to maintaining sustainable safety (Konijn et al., 2018). It is important for individuals to proactively identify and report potential hazards to superiors or HSE staff. By making safety a top priority, workers not only protect themselves from possible risks, but also play an active role in creating and maintaining a safe, healthy and sustainable work environment for all involved (Purwanto et al., 2015). With collaboration and shared awareness, companies can establish a positive safety culture and improve workplace health.

This research identifies the critical role of Occupational Health and Safety (OHS) in the machinery workshop environment, emphasizing the necessity of a comprehensive understanding of how knowledge and attitudes influence safety behavior. Despite existing studies on OHS implementation, there remains a gap in understanding the direct relationship between these three factors—knowledge, attitude, and behavior—and how they shape safety practices among students and workers in machining workshops. Without this understanding, efforts to improve safety culture may lack effectiveness and fail to produce long-term behavioral changes. Therefore, this study aims to analyze the extent to which knowledge and attitudes contribute to OHS behavior, providing empirical evidence on their influence. The findings are expected to offer valuable insights for curriculum development, teacher training, safety campaigns, and policy formulation in engineering education and the machine shop work environment. By addressing this research gap, this study has the potential to enhance safety awareness, reduce workplace accidents, and foster a strong safety culture that benefits both students and workers in the engineering field.

METHOD

This research is descriptive research with a quantitative methodology approach. The research population consists of Machining Engineering students from multiple classes. The research follows a structured procedure to ensure systematic data collection and analysis. The research procedures involve problem identification through observations in machining workshops, literature review to establish a theoretical basis, sample selection using appropriate sampling techniques, instrument development through the design of a closed-ended questionnaire (Likert scale) and observation checklist (Yes/No format), and validity and reliability testing using the expert judgment method followed by pilot testing. The research instrument includes a questionnaire with a Likert scale (Strongly Agree = 4, Agree = 3, Disagree = 2, Strongly Disagree = 1) to measure students' knowledge and attitudes toward OHS, and an observation checklist with a binary scale (Yes = 1, No = 0) to assess compliance with safety practices in the workshop. Data collection is conducted through questionnaire distribution and structured observations in machining workshops. The collected data is analyzed using descriptive statistics and correlation analysis to examine the relationship between knowledge, attitudes, and OHS behavior. The final stage of this research involves drawing conclusions and providing recommendations, focusing on the implications of the findings for curriculum development, teacher training, safety campaigns, and policies to enhance OHS practices in machining workshops.

Table 1. Instrument Validity Results

Variable	Number of items	number of valid items
Knowledge OHS	40	40
Attitude OHS	30	30
Behavior OHS	30	30

A valid study means that there is a correspondence between the data collected and the actual data observed in the research object (Martono et al., 2010). This means that the research results should align with reality or the observed phenomenon, making them reliable for drawing conclusions or making accurate generalizations about the studied object. In other words, research validity indicates the extent to which the study can be trusted to provide an accurate depiction of the phenomenon being examined.

a study is considered reliable if the data remains consistent over different periods. Reliable research is one that produces consistent and dependable results when conducted repeatedly. This theory explains that if an instrument has been deemed valid based on expert judgment, then it can also be assured that the instrument is reliable.

Table 2. Variables, Indicators, and Instrument Statement Items

Variable	Indicator	Statement Items	Total
K3 Knowledge	Importance of K3	1-3	3
	Benefits of K3	4-6	3
	Objectives of K3	7-10	4
	Hazard Identification	11-14	3
	Use of PPE	15-17	3
	First Aid Understanding	18-20	3
	Identification of Mechanical Hazards	21-23	3
	Understanding of Ergonomic Factors	24-26	3
	Identification of Physical Hazards	27-30	3
	Use of PPE	31-35	3
	First Aid Procedures	36-40	3
K3 Attitude	Belief in K3 - Basic K3	1-3	3
	Belief in K3 - Hazard	4-8	5
	Belief in K3 - Personal Protective Equipment (PPE)	9-11	3
	Readiness to Face Hazards in the Workshop - Fire	12-15	4
	Readiness to Face Hazards in the Workshop - Machine Damage	16-20	5
	Opinion on K3 Statements - Electrical Safety	21-23	3
	Opinion on K3 Statements - Ergonomics	24-26	3
	Opinion on K3 Statements - Mechanical Hazards	27-30	3
K3 Behavior	Stimulus for Understanding K3 Theory - Unsafe Conditions	1-6	6
	Stimulus for Understanding K3 Theory - Unsafe Actions	7-12	5
	Stimulus for Understanding K3 Theory - Personal Protective Equipment (PPE)	13-15	3
	Stimulus for Understanding K3 Theory - Workshop Regulations	16-19	4
	Coordination	19-21	3
	Physical	22-24	3
	Mechanical Hazards	25-27	3
	Ergonomic Hazards	27-28	2
	Behavioral Response	28-30	2

Table 3 presents the classification of research variables based on specific score ranges. The categorization is determined using a mathematical formula that incorporates the mean (Mi) and standard deviation (Sdi) to define different levels of measurement. The classification ranges from Very Low to Very High, providing a structured interpretation of the data. This approach helps in assessing the extent of a variable's presence within the study and ensures a more accurate analysis of research findings.

Table 3. Variable Categorization

Category	**Formula**
Very Low	X < Mi-1.Sdi
Low	Mi - 1. Sdi ≤ X < Mi
High	Mi ≤ X < Mi + S.di
Very High	Mi + 1 .Sdi ≤ X

Information
X = score obtained
Mi = Ideal Mean
SDi = Ideal Standard Deviation

Hypothesis testing is carried out using regression analysis techniques with prerequisite tests of normality test, linearity test, multicollinearity test and heteroscedasticity test.

RESULTS AND DISCUSSION

RESULT

1. Overview of Occupational Health and Safety (OHS) Knowledge

This study involved students as respondents to evaluate their knowledge of Occupational Health and Safety (OHS). The analysis results indicate that the majority of students (78%) have a low level of knowledge, while 22% fall into the high category. No students were classified as having very low or very high knowledge levels.

The distribution of students' knowledge levels regarding OHS is presented in Figure 1.

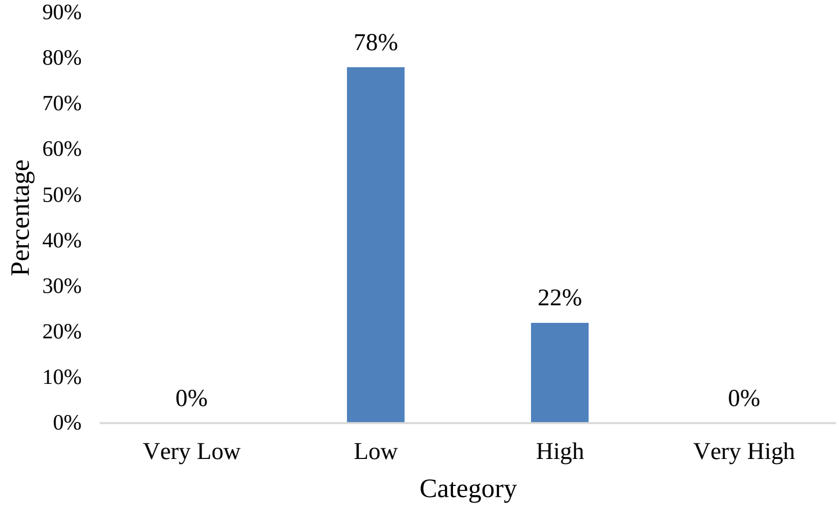

Figure 1. Histogram of Categorization of OHS Knowledge Variables

2. Overview of Occupational Health and Safety (OHS) Attitude

This study involved a group of students who participated in an assessment of their Occupational Health and Safety (OHS) attitudes. The assessment aimed to categorize the students' attitudes toward OHS practices based on their responses. The results indicate that 78% of the students exhibited a low level of OHS attitudes, while a smaller portion, 22%, demonstrated a high level of OHS attitudes. Notably, no students were classified in the very low or very high categories. This suggests that the majority of the students tend to show lower engagement with OHS practices, while a minority show a relatively higher level of OHS awareness and application. The distribution highlights the range of attitudes toward OHS within the student group, without any extreme values falling outside the low and high categories.

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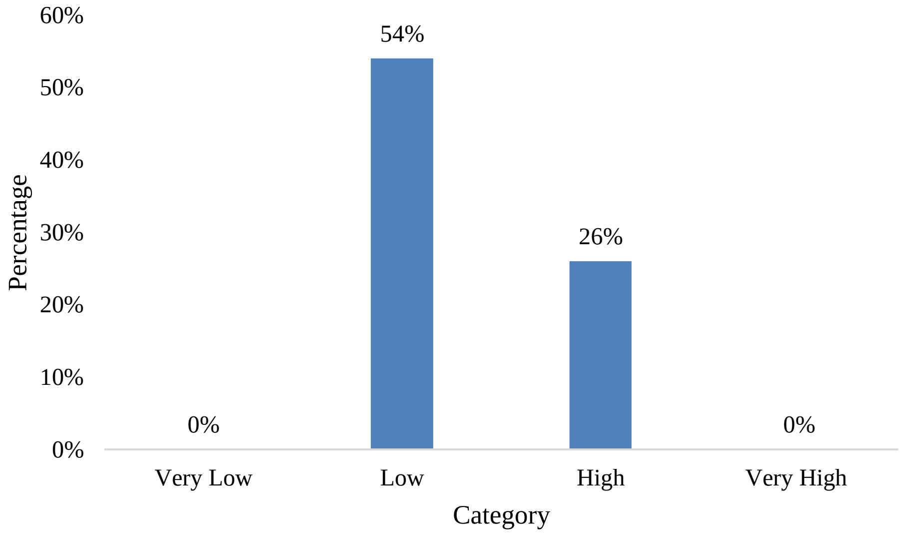

Figure 2. Histogram of Categorization of OHS Attitude Variables

3. Overview of Occupational Health and Safety (OHS) Behavior

This study presents an analysis of the distribution of responses regarding the practice of Occupational Health and Safety (OHS) behavior among 50 students. The responses are categorized into two groups: "Practicing OHS Behavior" and "Not Practicing OHS Behavior." The aim is to examine how students engage with OHS practices across various instrument criteria. The following sections will provide a detailed description of the students' responses for each instrument criterion in figure 3.

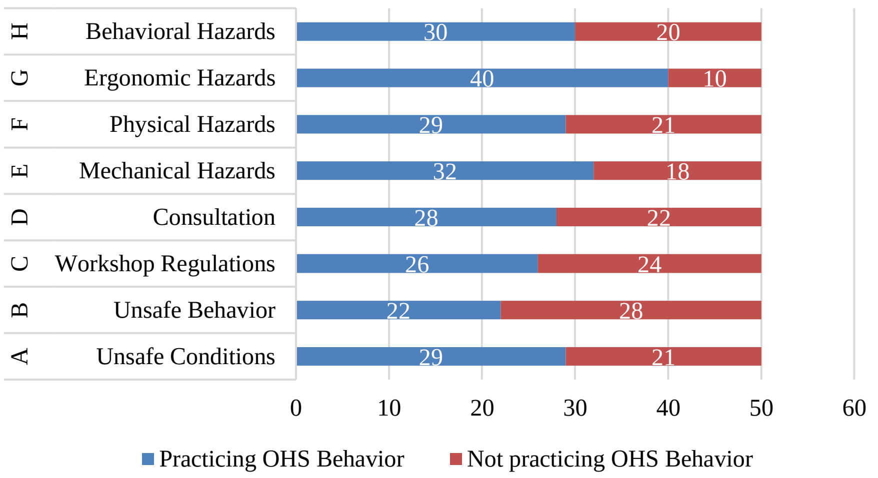

Figure 3. Number of Students who Practicing and Not Practicing OHS Behavior for Each Criteria

In terms of the overall practice of OHS behavior, 52% of the total responses indicate that participants are practicing OHS behavior, while 48% are not practicing OHS behavior. This demonstrates a fairly balanced distribution across all instrument criteria, with some areas showing a higher percentage of participants practicing OHS behavior than others. percentage of participants practicing OHS behavior ispresented in Figure 4.

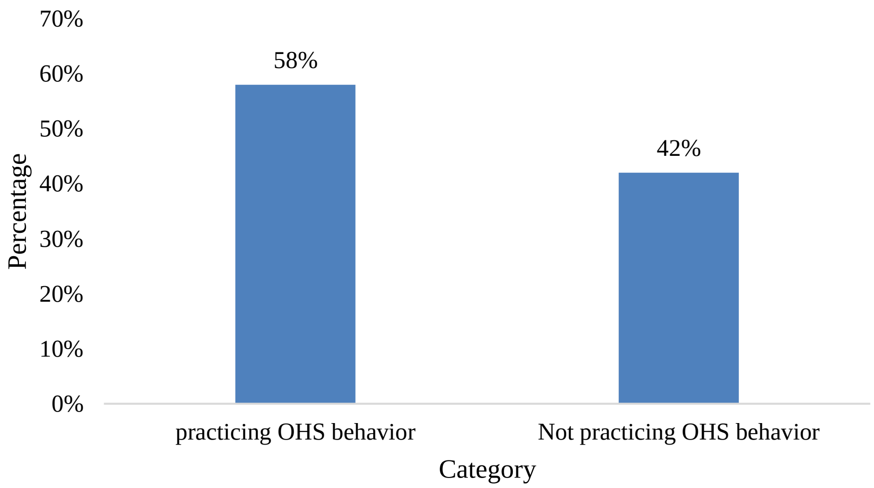

Figure 4. Percentage of Students who Practicing and Not Practicing OHS Behavior

4. Statistical Analysis and Hypothesis Testing

4.1 Normality test

The normality test conducted using the Kolmogorov-Smirnov method confirmed that the data is normally distributed (Asymp. Sig = 0.864, $p > 0.05$). Thus, the data is suitable for further parametric analysis.

Table 6. Normality Test Results

Asymp. Sig	Significant level	Information
0.864	0.05	Normal

4.2 Linearity Test

The linearity test was conducted to examine the linear relationship between the independent and dependent variables in this study. Based on the results of the linearity test, there is a linear relationship between OHS knowledge and OHS behavior, as well as between OHS attitude and OHS behavior, with $F_{calculated}$ values smaller than the F_{table} value of 3.18 at a 0.05 significance level. This indicates that the relationships between the variables are linear.

Table 7. Linearity Test Results

Variable	$F_{calculated}$	F_{table}(Sig. 0.05)	Information
OHS Knowledge	0.872	3.18	Linier
OHS attitude	0.852	3.18	Linier

4.3 Multicolinearity Test

The multicolinearity test showed no multicollinearity issues, as indicated by a tolerance value (0.953) greater than 0.1 and a VIF value (1.05) less than 10. This means that regression analysis can proceed without concerns of multicollinearity.

Table 8. Multicollinearity Test Results

Data Name	Score
Tolerance Value	0.953
VIF value	1.05
N	50

Based on the data in the table, it can be concluded that there are no multicolinearity issues, and therefore, the regression test can proceed

4.4 Hypothesis Testing

4.4.1 Hypothesis 1: Relationship between OHS Knowledge and OHS Behavior

Hypothesis I was tested to examine the effect of OHS knowledge on OHS behavior using simple linear regression analysis. The regression analysis results revealed a positive but weak correlation between OHS knowledge and OHS behavior ($r = 0.289$, $R^2 = 0.083$). This indicates that OHS knowledge explains only 8.3% of the variance in OHS behavior, with the remaining 91.7% influenced by other factors. The significance test showed that the relationship was statistically significant ($t = 2.089$, $p < 0.05$).

Table 9. Regression X1-Y

Number	Data Name	Score
1	R	0.289
2	R2	0.083
3	Constant Coefficient	6.242
4	OHS Knowledge Coefficient	0.066
5	Tcount	2.089
6	Significance	0.042

The regression equation $Y = 6.242 + 0.066X1$ indicates that for each unit increase in OHS knowledge, OHS behavior increases by 0.066 units.

4.4.2 Hypothesis 2: Relationship between OHS Attitude and OHS Behavior

Hypothesis II was tested to examine the effect of OHS attitude on OHS behavior using simple linear regression analysis. The regression analysis revealed a very weak correlation between OHS attitude and OHS behavior ($r = 0.122$, $R^2 = 0.0148$), indicating that OHS attitude accounts for only 1.48% of the variance in OHS behavior. The significance test ($t = 1.289$, $p > 0.05$) indicated that this relationship was not statistically significant.

Table 10 . X2-Y Linear Regression Results

No.	Data Name	Score
1	R	0.122
2	R2	0.0148
3	Constant Coefficient	10.575
4	OHS Attitude Coefficient	0.051
5	Tcount	1.289
6	Significance	0.398

The regression equation $Y = 10.575 + 0.051X2$ suggests that OHS attitude has minimal direct influence on OHS behavior.

4.4.3 Hypothesis 3: Combined Influence of OHS Knowledge and OHS Attitude on OHS Behavior

Hypothesis III was tested to examine the combined effect of OHS knowledge and OHS attitude on OHS behavior using multiple regression analysis. The multiple regression analysis revealed a weak combined effect of OHS knowledge and OHS attitude on OHS behavior ($R = 0.22$, $R^2 = 0.05$). This indicates that both independent variables together explain only 4.7% of the variance in OHS behavior. The significance test ($F = 1.12$, $p > 0.05$) confirmed that this combined effect was not statistically significant.

Table 11. Linear Regression Results X1X2-Y

Number	Data Name	Score
1	R	0.22
2	R2	0.05
3	Constant Coefficient	7.38
4	OHS Knowledge Coefficient	0.05
5	OHS Attitude Coefficient	0.01
6	Fcount	1.12
7	Significance	0.34

The regression equation $Y = 7.38 + 0.05X1 + 0.01X2$ indicates that both OHS knowledge and OHS attitude together have a very small effect on OHS behavior.

DISCUSSION

The findings of this study indicate a complex relationship between knowledge, attitude, and behavior regarding Occupational Health and Safety (OHS) among students. While OHS knowledge has a statistically significant effect, its impact on student behavior is limited. Simple linear regression analysis revealed a weak positive correlation between OHS knowledge and OHS behavior ($r = 0.289$, $R^2 = 0.083$), meaning that OHS knowledge only explains 8.3% of the variance in behavior, while the remaining 91.7% is influenced by other factors. The significance test further confirmed that this relationship was statistically significant ($t = 2.089$, $p < 0.05$). This suggests that while knowledge of OHS is important, it alone is insufficient to ensure consistent adherence to OHS practices.

The relationship between OHS attitudes and OHS behavior showed a very weak correlation ($r = 0.122$, $R^2 = 0.0148$), indicating that attitudes account for only 1.48% of the variance in behavior. The significance test ($t = 1.289$, $p > 0.05$) revealed that this relationship was not statistically significant. This implies that although students' attitudes toward OHS may have some influence, attitudes alone are not enough to significantly change their OHS behavior. Other factors, such as a deeper understanding of OHS, social influences, or practical experience in real-world situations, may play a more significant role in shaping effective OHS behavior.

The combined analysis of both OHS knowledge and OHS attitudes on OHS behavior indicated that together, they explain only 4.7% of the variance in behavior, with the relationship also not being statistically significant ($F = 1.12$, $p > 0.05$). This result suggests that while both knowledge and attitude are important, their combined influence on OHS behavior remains limited. It implies the need for additional factors, such as a safety culture within the institution, practical experience in the field, and experiential learning, to drive more substantial behavioral change in applying OHS practices in the workplace.

Errors in hypothesis testing could be influenced by several factors. Subject-related factors, such as potential dishonesty in questionnaire responses, misunderstandings of the questions, or psychological conditions affecting responses, may have distorted the findings. Moreover, the sample size of only 50 Mechanical Engineering students might not be fully representative of the broader student population, potentially introducing sampling errors. Therefore, future studies should aim to include a larger, more diverse sample to improve the accuracy and generalizability of the results.

Additionally, other unaccounted variables, such as the safety culture within educational institutions or students' real-world work experiences, may have a greater influence on OHS behavior. Future research should explore these factors to gain a more comprehensive understanding of what influences OHS behavior. Moreover, this study found a gap in existing literature specifically focusing on the dominant variables influencing OHS behavior among Mechanical Engineering students in Vocational Schools, which could serve as a valuable area for further research.

In conclusion, future training programs should integrate experiential learning approaches, hazard simulations, and mentorship programs to ensure that students not only understand OHS principles but also apply them effectively in real-world settings. Strengthening the safety culture within educational institutions through continuous monitoring and reinforcement could improve the real-world application of both OHS knowledge and attitudes, creating a safer environment for students and workers in the future.

CONCLUSION

This study demonstrates that OHS knowledge contributes to students' safety behavior in workshop environments. The findings show that while OHS knowledge plays a role in shaping safety behavior, its influence is limited. Conversely, OHS attitudes alone did not significantly impact students' behavior, suggesting that attitudes are not enough to drive safe practices in the workshop environment. The combined effect of OHS knowledge and attitudes was also weak and statistically insignificant, emphasizing the need for additional factors beyond knowledge and attitude to influence OHS behavior.

These results highlight the importance of adopting a more holistic approach to safety training programs. While OHS knowledge is essential, it must be complemented by practical application, hands-on experience, and a strong safety culture within the institution. Interactive learning methods, such as hazard simulations, experiential learning, and mentorship, can help students apply their theoretical knowledge to real-world safety behavior. Future research should explore additional variables, such as safety leadership, peer influence, and institutional safety policies, which may have a more significant impact on OHS behavior. Expanding the sample size and employing more robust sampling techniques in future studies could improve the generalizability and accuracy of the findings.

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