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Understanding Occupational Health and Safety Regulations and the Influence on Students' Behavior in Practical Workshops

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Abstract

Understanding occupational health and safety (OHS) is essential for engineering students, especially in high-risk environments such as mechanical workshops, where unsafe practices can lead to accidents and injuries. Although Regulation Number 5 of 2018 from the Indonesian Ministry of Manpower mandates OHS implementation in all workplaces, students' knowledge and behavior still fall short of the expected safety standards. This study aimed to measure students' understanding of OHS, their basic knowledge of OHS law, and their behavior during workshop practicum activities. A cross-sectional research design was used, involving 203 students in State Polytechnic in Badung District, Indonesia. Data were collected through direct observation, surveys, and interviews. OHS understanding and legal knowledge were assessed using a test questionnaire, while OHS behavior was evaluated using a Likert-scale-based questionnaire. Data were analyzed using structural equation modeling at a 95% confidence level. The results indicated that combined OHS understanding and legal knowledge influence OHS behavior by 25.1%, with legal knowledge alone contributing only 1.8%, suggesting that knowledge of the law cannot shape behavior independently. Other contributing factors, such as engaging teaching methods and continuous monitoring, are needed.

Keywords: basic knowledge, behavior, comprehension level, occupational health and safety, occupational health and safety law

Introduction

Occupational health and safety (OHS) regulations serve as the legal foundation for workplace safety in Indonesia, as outlined in the Indonesian Minister of Manpower Regulation No. 5 of 2018.¹ This regulation mandates that both state-owned and private companies implement OHS standards to ensure workers' protection. As future professionals, students are expected to understand these regulations before entering the workforce. OHS encompasses both occupational safety and health, forming a critical aspect of labor protection and human rights.

In industrial settings, an OHS culture—characterized by strict adherence to safety protocols and continuous implementation of OHS standards—is essential for minimizing workplace risks. Additionally, advancements in technology can enhance safety measures when integrated effectively into OHS practices. OHS is a basic right of every worker whose scope has expanded to include it.^{2,3} OHS is also a policy used by companies and governments to reduce the risk of work-related accidents and thereby avoid hazards in the workplace.^{4,5} However, one of the greatest challenges faced by industries is a lack of adequately prepared individuals who possess not only OHS knowledge but also the behavioral discipline to apply it effectively.

In other words, OHS policies are designed to reduce workplace accidents, ensuring that workers internalize and practice safety measures remains a significant concern. Since prospective workers are still in college, it is crucial to instill OHS behavior early on through practical experiences such as workshop training, internships, and practicums. Despite these opportunities, many students struggle to develop proper OHS habits, highlighting the gap between theoretical knowledge and practical application. Addressing this issue requires an in-depth investigation into students' understanding of OHS, legal knowledge, and behavior in workshop environments to identify key factors influencing safety compliance and professional preparedness.

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Failure to follow OHS procedures can result in practicum-related work accidents. These work accidents occur primarily due to a lack of understanding of OHS procedures, a lack of discipline in carrying out work procedures, and other factors.⁶⁻⁸ A lack of safe and healthy behavior at work can be a major factor in work accidents.^{9,10} At school or college, work accidents can occur during practicums or when students do internships in workshops.^{11,12} Until now, there have rarely been any measurements of OHS behaviors among mechanical engineering students practicing in laboratories or workshops. For this reason, it is necessary to make various real efforts to improve the quality of human resources, especially among students.

The real effort is through education. Education that strives to encourage the OHS culture is applied education delivered in polytechnics. According to Higher Education Law No. 12 of 2012,¹³ a polytechnic is a tertiary institution that provides vocational education in various fields of science and/or technology, and if it meets the requirements, the polytechnic can also provide professional education. This law indicates that its position as a tertiary institution is part of the national education system, which aims to prepare students to become members of society who have competent, responsible professional abilities. The hope is that graduates will be able to apply and develop a professional culture at work, and polytechnic education focuses on preparing students to apply specific skills.

Students must understand how OHS operates and appreciate how standard OHS regulations can become a habit or work culture. It is necessary to have a good understanding of OHS and the laws or regulations of OHS itself to make OHS a work culture.^{14,15} It is necessary to explore the level of students' understanding of OHS, especially when they do a practicum in the laboratory, as an illustration of their future employment prospects when they graduate. Previous studies revealed that educational programs still pay less attention to OHS both in the classroom and in the laboratory or workshop.^{16,17} Knowledge management regarding OHS in organizations, schools, and universities still lacks.^{18,19} Studies on OHS in the laboratory have not emphasized prevention factors but rather, the impact of a lack of understanding of OHS.^{20,21} Therefore, it is deemed necessary to conduct research to measure the level of understanding of OHS and OHS behaviors in students who will later become practitioners in global companies or industries.

Several previous studies have examined OHS knowledge in educational settings, and most have focused on either the general impact of accidents, rather than their root causes in behavior and understanding, or OHS management in organizations, rather than the development of OHS behavior during training at the student level.²²⁻²⁵ Moreover, studies covering this scope often lack quantitative or behavioral measurement of OHS practices among students during practical activities in laboratories or workshops.

This study filled the research gap by specifically assessing students' understanding of OHS laws and standards, evaluating safety behaviors during practicum and internship sessions, and exploring the relationship between knowledge, behavior, and institutional support for building an OHS culture. By focusing on student-level behavior in applied learning environments, this study provided empirical evidence and practical insights largely overlooked in the existing literature. This study can be an input for policymakers in the field of education to improve students' OHS behavior during practicums or internships, also for educational curriculum makers and lecturers to revise the practicum module to further improve the basic understanding of OHS law and provide a significant contribution to building safe and healthy behaviors during practice or when working in the industry in the future. Building this OHS behavior will also have an impact on the global industry, as it can reduce the number of work accidents and increase productivity.

Method

This cross-sectional study was conducted from August to December 2023. A cross-sectional design was chosen because it can measure research variables while students are completing a practicum without losing samples, as in a longitudinal design. The population in this study consisted of sixth- and eighth-semester students in the Department of Mechanical Engineering of State Polytechnic in Badung District, Bali Province, Indonesia. The population size was 203 students. The sample calculation used a saturated sampling technique,²⁶ so all populations were used as samples in this study. The samples came from 10 classes—8 classes in semester 6, totaling 172 students, and 2 classes in semester 8, totaling 31 students. This saturated sampling was chosen because the existing population was not too large, everyone could be reached, bias could be avoided, and the validity of the research results could be improved.

The inclusion criteria were (a) mechanical engineering students, (b) in semester 6 or 8, and (c) willing to be research participants until completion. Meanwhile, for the exclusion criteria, subjects who were (a) dropped out of college when the research was conducted and (b) suffered from illnesses that interfered with the research based on reports from the subjects or accompanying laboratory staff. For the dropout criteria were subjects withdrew from the sample for various

reasons, so missing data were not taken into account in the analysis.

Research instruments for measuring the level of understanding of OHS and basic knowledge of OHS law were used in tests. OHS behavior in the workshops was measured using Likert-type questionnaires on a scale of 1–5. The framework of the questionnaire and basic knowledge test of OHS was modified from the previous studies' test and questionnaire.^{27,28} The percentage values of this Likert scale were as follows very poor 0–20%, poor 21–40%, good enough 41–60%, good 61–80%, and very good 81–100%. Based on the total score of the questionnaire measurement results, the measurement of the level of OHS behavior was based on a normal curve reference, which was divided into five intervals. Each interval was given an attribute as very poor ($M_i - 3.0 \text{ SD}_i \leq X \leq M_i - 1.5 \text{ SD}_i$), poor ($M_i - 1.5 \text{ SD}_i \leq X \leq M_i - 0.5 \text{ SD}_i$), good enough ($M_i - 0.5 \text{ SD}_i \leq X \leq M_i + 0.5 \text{ SD}_i$), good ($M_i + 0.5 \text{ SD}_i \leq X \leq M_i + 1.5 \text{ SD}_i$), and excellent ($M_i + 1.5 \text{ SD}_i \leq X \leq M_i + 3.0 \text{ SD}_i$), whereas M_i means ideal mean, X means score value, and SD_i means ideal standard deviation. The valid criteria for each question were ≥ 0.5 .

The level of understanding of OHS was defined as the level of understanding of the concept, principles, and implementation of OHS in the work environment. The level of understanding of OHS was measured using a questionnaire test with indicators of basic understanding of OHS, knowledge of risks and hazards, compliance with OHS regulations, implementation of OHS, and OHS culture. The OHS behavior in the workshop was defined as the behavior of students in implementing OHS in the workshop, such as using personal protective equipment, following safe work procedures, maintaining cleanliness and tidiness, operating tools properly, being aware of potential hazards, and obeying signs and warnings. The level of understanding of OHS and OHS behavior in the workshop was measured using a Google Form questionnaire. Meanwhile, interviews were conducted to determine whether students had adequate knowledge, carried out the OHS steps correctly, and had completed all parts of the questionnaire correctly. The interview was conducted based on interview guidelines that had been prepared previously based on the research objectives. Meanwhile, observations were conducted to assess the actual behavior of students when they were carrying out practical activities and whether they were following OHS procedures or not. These observations were conducted using a checklist with yes or no answers.

Data analysis used quantitative descriptive and structural equation modeling (SEM) analysis with a significance level of 95% or alpha 5%. Quantitative descriptive analysis was used to evaluate sample characteristics, and SEM was used to find relationships between variables. SEM analysis was used because it can measure all variables simultaneously and can take into account the effects of latent variables on the indicator variables.²⁹ Another advantage of SEM is that it provides measurement and structural models in one analysis. However, multiple regression is not designed to handle latent variables directly.³⁰

Results

This study involved 203 students from the Department of Mechanical Engineering of State Polytechnic in Badung District, Bali Province, consisting of 6th and 8th semester students. Most respondents were from the 6th semester, totaling 172 students (84.7%), while 8th semester students numbered 31 (15.3%). Most students (132 students, 65.0%) were aged 20 years, and the rest 33 students (16.3%), 29 students (14.3%), and 9 students (4.4%) were aged 19 years, 21 years, and 22 years, respectively. This distribution indicated that most students are in the active practicum phase and within a productive age range, which was highly relevant to this study.

There was a dominant number of male students, 198 individuals (97.5%), while female students totaled only 5 (2.5%). This imbalance reflects a common trend in mechanical engineering programs, which tend to attract more male students. Regarding compliance with the use of personal protective equipment (PPE), 135 students (66.5%) reported routinely using PPE during practicum activities, while the remaining 68 students (33.5%) were inconsistent or rarely used it. This figure indicated that there was still a gap between knowledge and actual OHS practices.

The results of the SEM analysis for instrument reliability using Cronbach's alpha were an OHS understanding level of 0.972, a basic understanding of OHS law of 0.966, and an OHS behavior of 0.966, while calculated construct validity using average variance extracted (AVE) results were an OHS understanding level of 0.655, a basic understanding of OHS law of 0.792, and OHS behavior of 0.655. The Cronbach's alpha value in all variables was above 0.7. The value of the OHS understanding level variable was 0.966, the OHS behavior variable was 0.966, and the basic understanding of OHS law was 0.972. These results showed that this study's instrument could be used because it produced valid and reliable results. The AVE value was also met in all three variables because it was above 0.5.

Occupational Health and Safety Understanding Level

The OHS understanding level was measured using questionnaires. Of the 20 questions, 19 were valid and and 1 question (question number 19) was invalid (dropped), so the questionnaire on OHS understanding questions totaled 19. The results of measuring OHS understanding in respondents were the frequency of correct answers, 2,512 (62.5%), and the frequency of wrong answers, 1,345 (37.5%). Therefore, the correct answer from the total score of respondents was found to be 62.5%. The percentage value of students' level of understanding OHS was be in the good category, but there is still room for improvement.

Table 1. Validity of Occupational Health and Safety Comprehension Level Question Items

Question Items	Topic	Validity Value (Outer Loading)	Valid/Invalid	Information
TPK3-1	OHS abbreviation	0.61	Valid	applied
TPK3-2	Definition of OHS	0.51	Valid	applied
TPK3-3	Occupational Health	0.61	Valid	applied
TPK3-4	The purpose of OHS	0.61	Valid	applied
TPK3-5	Work Safety	0.60	Valid	applied
TPK3-6	Occupational Safety Objectives	0.58	Valid	applied
TPK3-7	Factors Affecting OHS	0.63	Valid	applied
TPK3-8	OHS Management	0.53	Valid	applied
TPK3-9	Personal Protective Equipment	0.56	Valid	applied
TPK3-10	Work Accident	0.56	Valid	applied
TPK3-11	Company Productivity	0.55	Valid	applied
TPK3-12	Elements of Production	0.55	Valid	applied
TPK3-13	Occupational Disease	0.63	Valid	applied
TPK3-14	OHS Management System	0.46	Valid	applied
TPK3-15	The Purpose of OHS Management	0.63	Valid	applied
TPK3-16	Measuring instrument	0.56	Valid	applied
TPK3-17	Flammable Substances	0.55	Valid	applied
TPK3-18	Unsafe Behavior	0.51	Valid	applied
TPK3-19	Work Environment	0.45	Invalid	drop
TPK3-20	OHS Training	0.52	Valid	applied

Notes: TPK3 = number of occupational health and safety understanding questions, OHS = occupational health and safety, valid criteria: outer loading ≥ 0.5

Basic Understanding of Occupational Health and Safety Law

The basic understanding of OHS law was measured using questionnaires. Of the 10 questions, one (question number 10) was invalid, so the questionnaire on understanding OHS law amounted to 9 items. The results of measuring the understanding of OHS law in respondents were the frequency of correct answers, 1,026 (56.2%), and the frequency of wrong answers, 801 (43.8%). Those who answered correctly from the total score of respondents amounted to 56.2%. The percentage value of the level of understanding of the law on OHS was in the sufficient category, but there is still room for improvement.

Table 2. Validity of Question Items on the Basic Understanding of Occupational Health and Safety Law

Question Items	Topic	Validity Value (Outer Loading)	Valid/Invalid	Information
PDH-1	Constitution	0.66	Valid	applied
PDH-2	OHS Regulations	0.66	Valid	applied
PDH-3	Occupational Health Law	0.63	Valid	applied
PDH-4	Labor Laws	0.64	Valid	applied
PDH-5	Labor Protection Act	0.66	Valid	applied
PDH-6	OHS implementation	0.65	Valid	applied
PDH-7	Purpose of the OHS Act	0.65	Valid	applied
PDH-8	OHS legal basis	0.62	Valid	applied
PDH-9	PPE Regulations	0.64	Valid	applied
PDH-10	Sanction	0.27	Invalid	drop

Note: PDH = number of question items on basic understanding of Occupational Health and Safety Law, OHS = occupational health and safety, valid criteria: outer loading ≥ 0.5

Occupational Health and Safety Behavior Level

The level of OHS behavior was measured using a questionnaire in the form of a five-item Likert scale. Of the 16 questions, 3 (question number 2, 10, and 12) were invalid, so the questionnaire about OHS behavior in students amounted to 13 items. This measurement of the OHS behavior level was based on the reference of the normal curve divided into five intervals. The ideal mean was $1/2$ (ideal maximum score+minimum score) = 609, and the SDi was $1/6$ (ideal maximum score–minimum score) = 135.33. Predicate classification on OHS behavior is presented in Table 4.

Table 3. Validity of Occupational Health and Safety Behavior Question Items

Question Items	Topic	Validity Value (Outer Loading)	Valid/Invalid	Information
PRK-1	Pay attention to OHS	0.62	Valid	applied
PRK-2	OHS knowledge	0.34	Invalid	drop
PRK-3	Maintain health	0.62	Valid	applied
PRK-4	Practical Procedures	0.55	Valid	applied
PRK-5	Using PPE	0.54	Valid	applied
PRK-6	Work accident	0.59	Valid	applied
PRK-7	Sick condition	0.65	Valid	applied
PRK-8	Attention to work accidents	0.59	Valid	applied
PRK-9	Work posture	0.59	Valid	applied
PRK-10	Maintaining equipment	0.49	Invalid	drop
PRK-11	Tidy up equipment	0.53	Valid	applied
PRK-12	Cleanliness	0.42	Invalid	drop
PRK-13	Clothes	0.64	Valid	applied
PRK-14	Emergency measures	0.61	Valid	applied
PRK-15	work break	0.66	Valid	applied
PRK-16	Healthy food	0.59	Valid	applied

Notes: PRK = number of occupational health and safety behavior questions, OHS = occupational health and safety, PPE = personal protective equipment, valid criteria: outer loading ≥ 0.5

Table 4. Predicate Classification on Occupational Health and Safety Behavior

Score Range	Classification/Predicate
$10.556 < X \leq 13.195$	Excellent
$8.797 < X \leq 10.556$	Good
$7.037 < X \leq 8.797$	Good enough
$5.278 < X \leq 7.037$	Poor
$2.639 \leq X < 5.278$	Very poor

The total score on respondents' OHS behavior was 7.487. By referring to Table 4, the score at the OHS behavior level is, therefore, categorized as good enough, but this category of behavior still urgently needs to be improved. The classification of predicates, as in Table 4, is based on the acquisition of the scores from the questionnaire completed by the students. There were 5 Likert scale levels on the questionnaire. Level 1 was very poor, 2 was poor, 3 was quite good, 4 was good, and 5 was very good.

Based on the number of questionnaire items multiplied by the Likert scale, the lowest total score was 2.639, which was very low, and the highest total was 13.195, which was very good. With a total score of 7,487 from the students' questionnaire responses, this study fell within the good enough range, between 7.037 and 8.797. These results were quite good for students, but there is still room for improvement in how students behave when forming OHS habits during lectures and practice.

Classroom instruction, laboratory, or workshop practicum activities must be used to build this improvement in OHS behavior. Classroom instruction includes instructors teaching students and administering tests based on OHS questions. This takes the form of tasks in the lab or workshop, such as reading safety instructions, learning how to use tools, putting on personal protective equipment, and keeping equipment neat and clean. In addition, lecturers and other staff need to supervise students to ensure that they can act correctly according to OHS principles.

The image of the relationship model between variables at the level of understanding of OHS, basic knowledge of OHS law, and OHS behavior in students was analyzed using SEM and Smart PLS 4 software (free version). Before analyzing the relationship between the variables, reliability and construct validity tests were conducted. The reliability analysis results using Cronbach's alpha were OHS understanding level = 0.972, basic understanding of OHS law = 0.983, and OHS behavior = 0.972. The result of the AVE construct validity tests was 0.668 for OHS understanding level, 0.877 for basic understanding of OHS law, and 0.754 for OHS behavior.

Cronbach's alpha value was above 0.7, and the AVE value was above 0.5, which indicated that all the constructs had good validity and reliability. Evaluation of the structural model was carried out using the R-squared test. The results of the R-squared test were OHS behavior of 0.251 and OHS understanding level of 0.018. These results indicated that the relationship model was moderate/sufficient and weak. The results of analyzing the relationship between variables using Smart PLS 4 obtained the results shown in Figure 2.

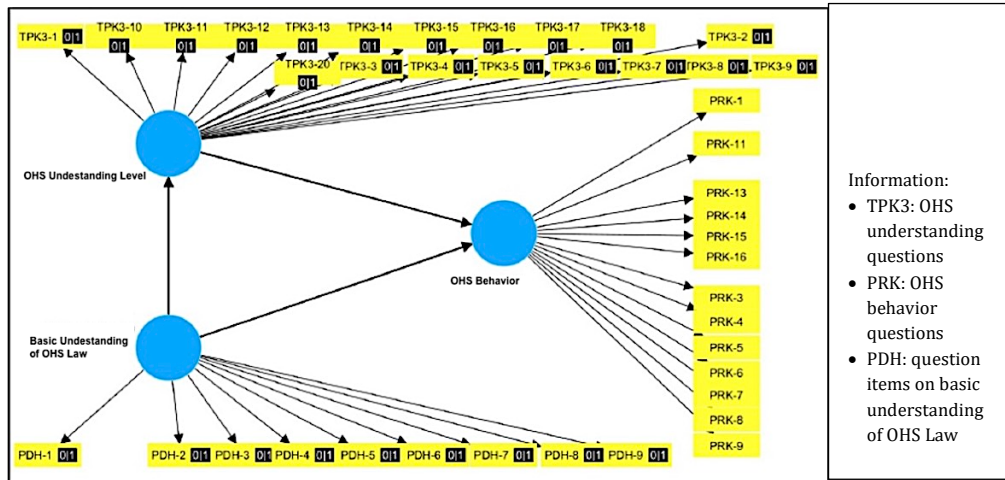


Figure 1. Model of Relationships Between Variables Using SEM Analysis with Smart PLS 4

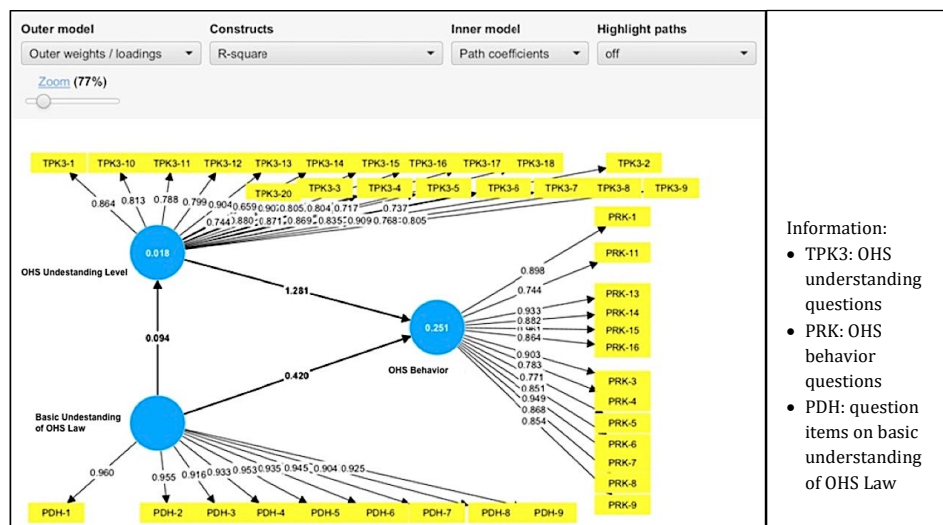


Figure 2. Results of the SEM Analysis Using Smart PLS 4

Based on the results of the SEM analysis, the OHS understanding level and basic understanding of OHS law were found to have influenced the OHS behavior of students by 25.1%, while basic understanding of OHS law was only able to contribute to the OHS understanding level by 1.8%. An advanced analysis of respondents was conducted to test the knowledge and behavior differences between sixth- and eighth-semester students. The analysis was calculated using an independent t-test.

The results revealed that no significant difference between the sixth- and eighth-semester students in OHS understanding level (p-value = 0.122; 95% CI: -2.596–21.735) and OHS behavior (p-value = 0.619; 95% CI: -3.144–1.879) was found. These results showed no activities that could increase the OHS understanding and behavior level of students, either in learning activities or practical activities in the seventh semester. For this reason, higher education observers must attend to improving and monitoring the understanding and behavior of the OHS of students in the final semester. This can be done through OHS workshop activities or OHS seminars with pretests and posttests, and needs to be done in preparation for students to enter the industrial world when they graduate.

Discussion

After testing the validity and reliability of the three measurement instruments in this study, the results were declared valid and reliable. These three instruments were a questionnaire on the OHS knowledge level, a basic understanding of OHS law, and the OHS behavior. Therefore, this research instrument can be declared suitable for measuring the research variables. Research instruments must be valid and reliable so that they can be used to measure or predict the measurements of research variables.^{31,32}

The OHS understanding level of this study's respondents was 62.5%, which was in the good category but still needs to be improved. The basic understanding of OHS law was 56.2%, which was in the sufficient category, but needs to be improved. Meanwhile, the OHS behavior was quite good, but it still needs to be improved. The OHS understanding level and the basic understanding of OHS law affected the OHS behavior of students by 25.1%. These results are certainly not so good for students in the final semester, when students are already prepared to work in the industry. For this reason, effort is needed to improve OHS behavior by increasing knowledge of OHS and OHS law in courses in the first semester. Students, particularly those at vocational colleges, require OHS training. If knowledge about OHS is increased and students exhibit good OHS behavior, the number of work accidents in laboratories and workshops should decrease. These students are ready to enter the workforce, and of course, the number of work accidents in the industry will also decrease. These findings indicated that improving students' understanding of and behavior in OHS is very important. This improvement can be stronger if OHS materials are included in the design of the education curriculum because the results will be evaluated continuously.^{33,34} Activities can take the form of training, tutorials in class, or posters that are easy to understand and placed strategically and accessibly.

The level of understanding of OHS is very important in the world of work, so that workers at work can act safely and avoid unsafe behavior.^{35,36} Unsafe behavior will increase the likelihood of work accidents.^{28,37,38} A basic understanding of OHS law will be needed to increase motivation not to violate existing provisions. People tend to be careless and make mistakes, so if they are not given basic rules for practicing OHS, there will often be violations that result in work accidents.^{1,39}

Based on the findings of the structural equation modeling (SEM) study, it was found that the level of OHS comprehension and the basic grasp of OHS law had a 25.1% influence on the OHS behavior of students. In the meantime, the fundamental comprehension of occupational health and safety law was only able to contribute to a level of OHS comprehension that was 1.8%. These results showed that legal knowledge alone is not enough to build OHS behavior; therefore, other underlying factors are needed. In the context of education and teaching, these other factors can be more appropriate teaching methods, behavioral examples from lecturers and peers, more binding regulations, and continuous monitoring and evaluation. The results of this study are in line with previous studies stating that there is a relationship between understanding OHS and OHS behavior at work.^{23,40}

The practical implications of this article can be seen in the context of meeting the educational needs for continuous learning and knowledge enhancement/lifelong learning in the field of OHS. Improving the understanding and behavior of OHS on campus requires cooperation by all parties, including students, lecturers, and other staff. With a combination of education, policy, active participation, and technology, an OHS culture on campus can be built well. Steps that can be implemented include education and training in the form of OHS workshops and seminars, integration into the curriculum by including OHS material in certain courses in the early semesters, provision of OHS information and tools, and strengthening OHS policies and procedures in campus regulations.

Increasing the understanding and behavior of OHS in students will produce graduates who will work more professionally in the future because they will be able to apply safe, comfortable, healthy, and productive work principles. Good OHS insight will also help reduce accidents on campus and in the industry where they will work later. Besides that, educational programs for OHS have been developed in several institutions, but only a few have shown high levels of success.^{24,34}

This study has some limitations. It was conducted in one polytechnic, which will limit the generalizability of the conclusions; therefore, it needs to be tested in other polytechnics. In addition, there is potential bias in the questionnaire and interview data if the subject is not completely honest in providing answers to questions in the questionnaire or interview. The results of this study also obtained a small relationship value (R-squared) for both OHS behavior and knowledge; therefore, future studies are needed to conduct interventions on OHS behavior and knowledge in students so that a greater relationship value can be obtained later.

Conclusion

The students' understanding of OHS and OHS law is good in general, but can be improved since the knowledge will affect the behavior. This study highlights the need to improve the understanding and behavior of OHS in the campus environment by combining education, policies, active participation, technology, and OHS culture. This improvement can be made by delivering education and training in the form of OHS workshops and seminars, integrating OHS into the curriculum by including OHS material in certain courses in the early semester, providing OHS information and tools, providing examples of OHS steps—both theoretical and practical, in related courses—and strengthening OHS policies and procedures in campus regulations.

Abbreviations

OHS: Occupational Health and Safety; SEM = Structural Equation Modeling; AVE = Average Variance Extracted.

Ethics Approval and Consent to Participate

Ethical approval was achieved from the Ethical Committee on Social Studies and Humanities- National Research and Innovation Agency with the certification of ethical review clearance number 398/KE.01/SK/05/2023.

Competing Interest

The authors declare no competing interests in this study.

Availability of Data and Materials

The primary author can provide all data and materials from this study.

Authors' Contribution

MY designed and was responsible for the conduct of the study. IKGJS made the analysis and provided suggestions. NWMSD, NWS, and IMS wrote, proofread, and reviewed the manuscript. All authors read and approved the final manuscript.

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