

Behavior Model of Knowledge, Attitude, and Skills in Practicing Safety and Health in the Workplace among Higher Education Engineering Students

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Abstract

Safety and health practices are essential to avoid the risk of accidents in the work environment. They help mitigate unsafe behaviors, create a safe work environment, prevent accidents, and improve organizational performance. By prioritizing safety and health, organizations, including higher education institutions, can protect their employees, customers, and students and enhance overall productivity. Minimizing the risk of accidents and promoting safety practices requires a comprehensive understanding of the knowledge, attitude, and skills of professionals and workers. Several studies have explored these factors in different workplace settings. This study examines the level of knowledge, attitude, and skill in practicing safety and health in the workplace and its relationships among higher education engineering students. This study used a quantitative and correlational design. The researchers utilized a questionnaire survey instrument of 33 items on 248 respondents from a random sampling of final-year engineering students at Malaysian higher education institutions. The collected data were analyzed by using IBM SPSS Statistics software. The results showed that the knowledge, attitude, and skill level in safety and health practices are high and satisfactory. Significant positive relationships existed among the safety and health practices variables among higher education students. This study confirms the role of behavior models, knowledge, attitude, and skills in culturing safety and health practices in the workplace. This study will benefit those involved in improving safety and health practices in the laboratory of higher education institutions or real-work settings.

Keywords: Attitude, behavior model, knowledge, safety and health practice, skills.

Introduction

The Occupational Safety and Health Act (OSHA) plays a crucial role in ensuring the well-being of workers in Malaysia (Sadon, 2018; Subramaniam et al., 2016). Several studies have highlighted the importance of safety management practices and safety culture in promoting a safe work environment and improving safety compliance and performance. One study by

Subramaniam et al. (2016) examined the relationship between safety management practices and safety compliance in small and medium enterprises (SMEs). The safety management practices, such as management commitment, safety training, and safety rules and procedures, were significantly related to safety compliance. The study emphasized the role of voluntary employee behavior in promoting a safe work environment. It recommended that business owners provide safety training to educate employees about their crucial role in safety. The study also highlighted the mediating role of safety participation in the link between management commitment, safety training, and safety compliance.

Another study by Naji et al. (2021) focused on the impact of safety culture on safety performance, explicitly emphasizing the mediating role of psychosocial hazards. The study found that safety culture positively impacted employee safety performance by reducing psychosocial hazards. It emphasized the importance of considering psychosocial concerns in the workplace environment to enhance safety performance. The study also highlighted the mediating role of psychosocial hazards in the relationship between safety culture and safety performance. The findings suggested that a higher level of safety culture environment can reduce psychosocial hazards and improve employee performance towards safety concerns.

These studies highlight the significance of safety management practices and safety culture in promoting a safe work environment and improving safety compliance and performance. Employers in Malaysia should prioritize implementing effective safety management practices, including management commitment, safety training, and safety rules and procedures. Fostering a positive safety culture that addresses psychosocial hazards can enhance safety performance. By prioritizing safety and health in the workplace, employers can ensure the well-being of their employees and create a safer working environment (Arifin et al., 2021).

On 24 February 1994, the Safety and Health Act 1994 (OSHA 1994) was enforced and serves as a guideline for managing occupational safety and health (Department of Occupational Safety and Health, 2023). This enforcement aims to ensure the safety and health of employees exposed to safety risks and guaranteed health and protection for working employees, even promoting a suitable work environment as needed jobs (Negara, 2012). This act plays a crucial role in safeguarding the well-being of workers and promoting safe working environments across the country. The Act is of paramount importance as it not only safeguards the rights and well-being of workers but also has a significant impact on the overall economy, productivity, and the image of businesses and the nation. It is a fundamental piece of legislation that contributes to the safety and prosperity of the country.

The act is designed to protect the rights of workers by ensuring that employers provide a safe and healthy workplace. It outlines the responsibilities of employers to provide a work environment free from hazards that could cause injury, illness, or death. The OSHA 1994 also aims to reduce workplace accidents and occupational illnesses by setting standards and regulations that employers must adhere to. The law helps prevent injuries and diseases, improving the overall well-being of workers. The act encourages a culture of safety within organizations. Employers are required to implement safety policies, conduct risk assessments, and provide training to employees. The Act promotes a mindset where safety is a priority for everyone in the workplace.

Furthermore, the OSHA 1994 ensuring a safe and healthy work environment can have a positive economic impact. Fewer accidents and illnesses mean reduced medical costs, lower workers' compensation claims, and increased productivity, ultimately benefiting businesses and the national economy. Compliance with safety and health regulations is often a

requirement for international trade agreements. By having a comprehensive Safety and Health Act, Malaysia can participate in global markets and demonstrate its commitment to international labor standards. Employees who feel safe and healthy at work will likely increase their morale and productivity. The situation can lead to higher job satisfaction and a lower employer turnover rate.

Moreover, the Act functions as an establishment of legal requirements and penalties for non-compliance. The Act creates a framework for enforcement and encourages employers to take safety and health seriously. The OSHA 1994 also promotes the continuous improvement of safety and health measures through regular inspections, incident reporting, and updating regulations in response to emerging risks and technologies. Companies that prioritize the safety and health of their employees often have a better public image. A safe and healthy environment can attract customers, investors, and top talent who want to work for responsible and ethical organizations. A safer work environment reduces the burden on the healthcare system, as there are fewer workplace-related injuries and illnesses, which can lead to lower healthcare costs for the government and society.

Safety and health practices in the workplace are crucial for ensuring the well-being of employees and preventing accidents and injuries. Occupational safety and health are fundamental rights for all workers, providing a healthy and safe working environment. Employers are responsible for implementing safety measures and providing training to their employees to minimize workplace hazards and promote a safety culture. One crucial aspect of workplace safety is the role of sleep in cognitive performance and safety behavior. Research has shown that sleep deprivation can lead to cognitive failures, negatively affecting workplace safety (Brossoit et al., 2019). Employees who struggle to self-regulate are more susceptible to cognitive failures, which can increase the risk of workplace injuries and accidents. Therefore, promoting healthy sleep habits among employees is essential for maintaining a safe work environment.

Safety training is another essential practice in the workplace that can contribute to reducing work injuries. While some studies have suggested that safety training may lead to a higher reported injury rate, this is believed to be due to a positive reporting effect rather than a lack of safety actions (Waehrer & Miller, 2009). Safety training programs may incentivize firms to report injuries more accurately or encourage establishments to adopt palliative safety measures. Therefore, it is important to consider the reporting effects when evaluating the impact of safety training on work injury rates.

Safety and health practices in the workplace are crucial for ensuring the well-being of employees and preventing accidents and injuries. The practice includes implementing safety measures, promoting healthy sleep habits, and providing safety training to employees. By prioritizing workplace safety, employers can create a culture of safety and reduce the risk of workplace accidents and injuries.

Culturization of Safety and Health in the Workplace

Safety is an issue that is considered a positive routine. The importance and priority of safety depend on the individual developing a responsible attitude to the risks that may arise from personal safety, others, and the workplace environment. According to Campbell (2022) and Puad (2006), safety is protection against physical, psychological, occupational, and other risks associated with damage and unwanted incidents. Safety is defined as a state of being and a safe and accessible environment, including risk, injury, and knowledge to prevent accidents and the environment's quality free of accident risk (Bahari, 2006).

Organizations can implement several workplace cultural safety strategies based on the available references. Culturing safety in the workplace requires a multi-faceted approach. Organizations can create a safe and healthy work environment by fostering workplace spirituality, establishing a solid safety culture, demonstrating leadership commitment, promoting effective communication, and providing comprehensive training. Nurturing safety in the workplace requires a proactive and comprehensive approach that involves all levels of the organization, from leadership to employees (Hazuan et al., 2022).

One approach is fostering workplace spirituality related to employee engagement and safety (Saks, 2011). Workplace spirituality involves recognizing and addressing the spiritual needs of employees, such as finding meaning and purpose in their work. By promoting workplace spirituality, organizations can create a sense of meaningfulness, availability, and safety, which are important psychological conditions for employee engagement. In turn, it can contribute to a safer work environment. Another important factor in nurturing safety is establishing a strong safety culture. A review of studies on occupational safety culture in various workplaces, including hospitals, found that certain determinants contribute to a positive safety culture (Schöne & Rieger, 2020). These determinants include leadership commitment, employee involvement, communication, training, and the availability of resources. Organizations can focus on these factors to create a culture that prioritizes safety and encourages employees to participate in safety practices actively.

Leadership plays a crucial role in nurturing safety in the workplace. Leaders should demonstrate a commitment to safety by setting clear expectations, providing resources, and actively participating in safety initiatives. By leading by example, leaders can influence employees to prioritize safety and create a safety culture throughout the organization. Communication is another key aspect of nurturing safety. Open and transparent communication channels allow employees to report hazards, near misses, and safety concerns without fear of reprisal. Regular safety meetings, training sessions, and campaigns can also enhance communication and ensure that safety information is effectively disseminated to all employees. Training is essential for equipping employees with the knowledge and skills to identify and mitigate workplace hazards. Safety training should be comprehensive, covering topics such as hazard recognition, emergency procedures, and the proper use of personal protective equipment. Regular refresher training sessions can help reinforce safety practices and ensure employees stay updated with the latest safety protocols.

Health refers to protecting the body and mind from diseases caused by substances, processes, or procedures used in the workplace. The definition of safety refers to personal protection. There was no physical injury. Combining these two words is an essential matter that must be emphasized in the workplace. The enactment of the Safety and Health Act 1994 (OSHA 1994) gives one solution to workplace-related issues and factors in the occurrence of the accident.

Occupational safety and health issues are important issues that indirectly involve high-risk jobs in the manufacturing, construction, and industries that use machine tools and human resources in performing a process in the workplace. Supported by Negara (2012), information, guidance, knowledge, and caution when carrying out risky work. The issue of safety is more than just in the field of work. However, it also involves institutions of higher learning that offer a wide range of engineering and technical courses in which the area is increasingly used in the teaching and learning process, such as higher education institutions under the Malaysian Technical University Network (MTUN) have extensively used laboratories in

teaching and learning in the field of study (Sallehuddin, 2013). With the safety rules in place, students from these institutions can also reduce and avoid accidents in the laboratory.

According to Tiwari (2020), safety is focused on more than just doing practical work at any time. Accidents occur not only in the workplace but also in institutions of higher learning laboratories or schools. A laboratory is a place for students to do practical work, demonstrating skills learned during theory classes to practice. Various equipment and machines are involved throughout the teaching and learning process. Therefore, safety practices are essential and should be given priority when performing practical work in the laboratory. The frequency of accidents in the laboratory can be avoided if the student complies with the rules and applies safety measures, thus preparing students for the real environment of an industrial workplace (Puad & Desa, 2020; Rahman & Muniandi, 2010).

To promote health in the workplace, organizations can implement workplace wellness programs that focus on promoting employee well-being and healthy behaviors. These programs can include various components such as health screenings and education, fitness activities, and access to a healthy environment. These programs aim to improve employee health outcomes, reduce healthcare costs, and enhance overall well-being (Reif et al., 2020). Culturing health in the workplace involves implementing workplace wellness programs, creating a supportive work environment, addressing mental health concerns, promoting communication and feedback, and providing resources for employee well-being. Organizations can create a healthier and more productive workforce by prioritizing employee health.

A randomized controlled trial conducted by Reif et al. (2020) evaluated the effects of a workplace wellness program on employee health. Reif et al.'s study showed no significant effect of the program on biometrics or medical use. However, employees in the treatment group believed they had lower chances of poor biometric health, suggesting that they expected their participation in the wellness program to improve their health. It is important to note that there was a mismatch between employee perceptions and physical and administrative health measures.

In addition to wellness programs, organizations can create a supportive and healthy work environment. This can include providing ergonomic workstations, promoting work-life balance, and encouraging regular breaks and physical activity during the workday. Creating a culture that values and prioritizes employee health can improve overall well-being. Addressing mental health concerns in the workplace is also crucial for fostering a healthy and supportive environment. Organizations can offer resources and support for mental health, such as access to counseling services, promoting stress management techniques, and raising awareness about mental health issues. Regular communication and feedback channels can play a role in nurturing health in the workplace. Employers can provide information on health-related topics, share resources, and encourage open discussions about health and well-being. Feedback mechanisms allow employees to voice their concerns, suggestions, and needs regarding health and wellness initiatives (Zahid, 2015).

Behavioral Change Model

The awareness of the environmental problem and consequences will be better if the information and guidelines are provided earlier to the user before the user can adapt to the environment. A reasonable manner could be formed among users if users are alert to the surroundings as the first step of education in the workplace to avoid an accident. Many models are discussed, especially the model of knowledge, attitude, and skills. Figure 1 below

illustrates the Behavior Change Model of Knowledge, Attitude, and Skills in the workplace. The model, often referred to as the KAS model, is a simple framework used to understand and explain how individuals can change their behavior by acquiring new knowledge, developing positive attitudes, and gaining the necessary skills (Chan Lecturer, 2006; Chen et al., 2022). This model is particularly relevant in educational and training contexts where the goal is to equip individuals with the tools they need to adopt or improve new behaviors. If the ability is increased, attitudes based on good manners and self-responsibility towards the environment are developed, including skills among users in the workplace. This also could lead to self-alert among users towards the environment.



Figure 1: Behavior Change Model of Knowledge, Attitude, and Skills

Knowledge refers to the information and facts that individuals possess about a particular subject or behavior. Acquiring accurate and relevant knowledge is often the first step in initiating behavior change. People need to understand what a behavior entails, why it is important, and how it can benefit them. Meanwhile, attitude refers to the individual's feelings, beliefs, and evaluations about a particular behavior or subject. Attitude plays a crucial role in influencing behavior. Positive attitudes toward a behavior make it more likely that an individual will engage in that behavior. According to the model, skills represent the practical abilities and competencies required to perform a specific behavior. Even if students have knowledge and positive attitudes, they may still need the necessary skills to enact a behavior. Skills can be learned and developed through systematic and experiential practice and training.

The KAS model suggests that behavior change is most effective when individuals have a combination of these three elements: knowledge, attitudes, and skills. Knowledge helps individuals understand what they need to do and why. Attitudes create the motivation and emotional support for change. Skills provide the practical ability to carry out the desired behavior. In practice, behavior change interventions often incorporate strategies to address each component of the KAS model. For example, a smoking cessation program might include educational sessions to provide knowledge about the health risks of smoking, counseling to improve attitudes and motivation to quit, and practical training in coping strategies to develop the necessary skills for quitting.

It is essential to note that while the KAS model provides a useful framework, behavior change can be influenced by many other factors, including social norms, environmental factors, self-efficacy, and the availability of resources. Therefore, a comprehensive approach to behavior change often considers a broader range of determinants.

However, there is some argument over the human behavior change model among researchers. The model that has been introduced needs to be recognized and supported by

other researchers (Chen et al., 2022; Panahi et al., 2018; Vries et al., 2019; Sulat et al., 2018). The technique has become a favorite among researchers. It has frequently been used since it helps verify quickly and accept taking degrees on relationships over multiple variables in the research to identify the research questions and objectives with influence and relationships between the variables in the study. The hypothesis technique was accepted and used the most over time for the following years.

Even though the human behavior change model took simplicity, the model considers a relationship between knowledge, attitudes, and skills toward safety practice. With proper preparation of education in terms of knowledge among users, users acknowledge that the level of knowledge related to the attitudes on awareness of safety practices improves the level of skills of users in the workplace as a self-preparation to prevent an accident from occurring. Poor awareness and implementation of knowledge in the workplace relate to the responsibility of users toward attitude and the level of skills while working. Therefore, through the human behavior change model, the intention is to focus on the commitment and awareness of the user through reality is more complex. Thus, a more advanced behavior change model is needed as additional references and explanations to strengthen the research variables.

The behavior change models provide frameworks for understanding the factors that influence behavior change and can guide interventions to promote positive behavior change. It is important to note that different models may be more applicable to specific contexts or behaviors, and a combination of models may be used to address different aspects of behavior change.

Occupational Safety and Health in Higher Education Institutions

Accidents in higher learning institutions are rarely exposed in the mass media. Safety is an important issue that needs to be addressed by the various stakeholders, especially the management of the laboratory, the faculty, and the students themselves in the laboratory's practical work and testing. The safety rules in the laboratory must be disclosed in advance to prevent accidents. Abandonment of safety regulations and individual negligence in using laboratories can result in injury to self and others and property damage. According to Li et al. (2022) and Nasrallah et al. (2022) study, major of injuries occurring in the laboratory result from unsafe acts and practices by negligent individuals.

Occupational safety and health in higher education institutions is a critical concern to ensure the safety and well-being of both students and staff. These institutions, including universities, colleges, and research facilities, often involve various activities that may pose occupational hazards. Several studies have examined implementing occupational safety and health management systems in higher education laboratories (Lestari et al., 2019). The findings indicate that while compliance with the occupational safety and health policy and commitment aspect is relatively high, there are areas that require improvement, such as planning, implementation, evaluation, and management review (Lestari et al., 2019). Communication, participation, and consultation are essential elements that optimize the performance of occupational safety and health in laboratories. Failure to address occupational safety and health issues can lead to negative consequences, including financial losses, health effects, environmental pollution, and damage to the university's reputation.

The higher education industry, including universities and colleges, is known to be inherently stressful for employees. Ambiguity regarding access to occupational health services can contribute to workplace stress (Malomet & Harber, 2020). Therefore,

educational institutions must provide clear information and accessibility to occupational health and safety programs. A study assessing institutional websites found that larger institutions provide better information and more comprehensive programs than smaller institutions. The COVID-19 pandemic has also highlighted the need for increased attention to workplace health issues in higher education institutions (Malomet & Harber, 2020).

Also, the factor that causes accidents is caused by the attitudes taken and shown by themselves. The causes of the accident are due to individuals who do not understand their roles and responsibilities (Tiwari, 2020). According to Ozilgen (2011) and Ismail et al. (2018), the major contributor to the accidents was the student's attitude towards regulation in the laboratory. The mastery of laboratory safety skills in hand tools and machines and emergency equipment handling is also essential while working in the laboratory. Hassan (2009) states that failure to apply knowledge and skills can contribute to workplace accidents.

Occupational safety and health in higher education institutions require attention and implementation to ensure the well-being of employees and students. Compliance with occupational safety and health policies and the involvement of stakeholders, such as laboratory committees, are crucial for effective implementation (Lestari et al., 2019). Providing clear information and accessibility to occupational health and safety programs is essential in reducing workplace stress and addressing unique organizational stressors in educational institutions (Malomet & Harber, 2020). Additionally, incorporating occupational safety and health education into the curriculum of higher education institutions can enhance students' awareness and knowledge of occupational health and safety (Kanik et al., 2021). Thus assisting them in providing the required knowledge and skills for future jobs (Puad, 2016)

In order to minimize the risk of accidents, knowledge, attitudes, and skills in the safety practices in personal safety, the use of hand tools and machines, and the environment in the laboratory should be emphasized to students. Awareness of these safety practices needs to be cultured among students to become a regular part of their work in the laboratory. Students often overlook this aspect of safety. Safety is only highlighted if an accident occurs. The objectives of this study are to:

- (i) Identify the students' knowledge, attitude, and skills of safety practices in the laboratory.
- (ii) Investigate the relationship between students' knowledge, attitude, and skills toward safety practice in the laboratory.

Methodology

The study was conducted using a correlational design. This design is crucial to exploring and measuring the degree of association or relationship between two or more variables: knowledge, attitude, and skills toward safety practices. Researchers intended to understand whether and to what extent changes in one variable are associated with changes in another. Through a survey, the researchers used a quantitative questionnaire as an instrument. The advantage of using a survey form is that data can be collected in large groups, and research information can be obtained quickly and save time as well as resource costs (Sallehuddin, 2013).

The location study was conducted at Universiti Tun Hussein Onn Malaysia, located at Batu Pahat, Johore, Malaysia. The location was reliable and relevant to the study because it reflected the requirements and needs of the problems of the study. The total population was 683 students of the Faculty of Electrical and Electronics Engineering, Faculty of Mechanical Engineering and Manufacturing, and Faculty of Technical and Vocational Education at the

electrical laboratory in Universiti Tun Hussein Onn Malaysia. The sample in this study was 248 engineering respondents consisting of male and female students. The respondents were students in Year Four while doing practical work in an electrical laboratory. The sample was selected by using a simple random sampling method. The data obtained from the questionnaire were collected and analyzed by descriptive and inference using IBM SPSS Statistics. Alpha Cronbach's method was used to test the reliability and consistency of the modified and adapted instrument (Tahir & Mustafa, 2010).

The researchers collected data from respondents by using a survey form distributed to the chosen randomized sample. The data were analyzed using descriptive mean and standard deviation and inferential Pearson Correlation analysis. The researchers used three sections of instruments to measure students' knowledge, attitude, and skills toward safety practices. The researchers used an adapted instrument from Sallehuddin (2013) for students' knowledge, attitude, and skills on safety practices in the electrical laboratory. The instruments were validated by the expertise in the field of OSHA (Occupational Safety and Health), electrical field, and quantitative data collection from the Faculty of Electrical and Electronics Engineering and Faculty of Technical and Vocational Education of Universiti Tun Hussein Onn Malaysia before items were used to obtain study results. Based on the pilot study, the value of Alpha Cronbach for each instrument is as follows in Table 1.

Table 1
Reliability Statistics (N=45)

Component	N of items	Cronbach's alpha
Knowledge	13	.82
Attitude	9	.93
Skills	8	.86
Overall	30	.91

Results and Discussion

Table 2 illustrates the demography analysis of the respondents in this study. Respondents in this study were 248 students who used and studied in the electrical laboratory at Universiti Tun Hussein Onn Malaysia. From the data obtained, 148 respondents were 100 male and 100 female students. These findings show that male students dominate engineering and technical studies more than female students at Universiti Tun Hussein Onn Malaysia. Furthermore, most of the respondents were from electrical and mechanical engineering programs aligned with the strength and focus of the university's direction in the science and technology fields.

Table 2
Demography of Respondents (N = 248)

Demography	Frequency (f)	Percentage (%)
Gender		
Male	148	59.7
Female	100	40.3
Program		
Electrical Engineering	94	37.9
Mechanical Engineering	95	38.3
Technical and Vocational Education and Training (TVET)	59	23.8

Level of Knowledge, Attitude, and Skills in Practicing Safety and Health in the Workplace

Table 3 shows the respondents' questionnaire responses according to the item obtained on knowledge, attitude, and skills in practicing safety and health in the workplace. According to the item on the level of knowledge in practicing safety and health in the workplace, respondents strongly agree that wearing closed shoes during the lab with a mean score of 4.97. Respondents answering the questionnaires agree that the level of student knowledge of safety practices in the laboratory is essential and needs to be emphasized. According to the Department of Occupational Safety and Health (2023), individuals will be more sensitive to security issues and health by going through procedural experience correctly and safely. This is supported by Ismail et al. (2018) and Yusof (2014), which select appropriate clothing for laboratory users to avoid danger and indirectly make a job run efficiently.

As for the item on the level of attitudes in practicing safety and health in the workplace, it shows that those were involved in answering the questionnaire agreed to inform the lecturer if any equipment was damaged while working in the laboratory and to report to the lecturer in the event of a personal accident in the laboratory with a mean score of 4.97. Rahman and Muniandi (2010) state that students need to cultivate awareness of safety practices and the importance of security can be practiced in the following work workshop. According to Yusof (2014), safety practices should be given special priority to prevent accidents on equipment and machinery in the laboratory.

Based on the item on the level of skills in practicing safety and health in the workplaces, respondents who answered the questionnaire agree that students can use the equipment in the laboratory according to their function, with a mean score of 4.83. Yusof (2014) states that to reduce the risk of accidents at work, skills in the use of equipment and rules in the laboratory are necessary to emphasize to students. This study is supported by the findings of Rahman and Muniandi (2010). The study analysis shows the level of skills students' knowledge is high, covering aspects of using hand tools and machines.

Table 3
Level of Knowledge, Attitude, and Skills

Variable	Mean	Standard Deviation
Knowledge		
K1 Wear the safety dress code in the laboratory	4.93	.25
K2 Wear safety shoes in the laboratory	4.97	.18
K3 Wear covered shoes in the laboratory	4.37	.71
K4 Remove jewelry/accessories before work in the laboratory	4.47	.68
K5 Using protective equipment in the laboratory	4.87	.34
K6 No equipment from the laboratory out without permission from the lecturer	4.87	.43
K7 Return all laboratory equipment to its place after use	4.93	.25
K8 Use equipment for each job the right way	4.77	.56
K9 Alert with the position of first aid kits in the laboratory	4.40	.96
K10 Alert with the position of the fire extinguisher in the laboratory	4.60	.67
K11 Lighting in the laboratory is good	4.67	.66
K12 Ensure the laboratory has good ventilation space	4.63	.66
K13 Understand the instructions contained in the emergency plan	4.57	.62
Overall Knowledge	4.70	0.66
Attitude		
A1 Pay attention to the description by the lecturer before doing the work	4.87	.34
A2 Prioritize safety while working in the laboratory	4.93	.25
A3 Comply with safety regulations in the laboratory	4.90	.30
A4 Inform the lecturer if any equipment damage	4.97	.18
A5 Inform the lecturer if an accident happens in the laboratory	4.97	.18
A6 Inform the importance of the safety aspect of a friend	4.80	.48
A7 Put back the equipment that has been used to its place after use	4.93	.25
A8 Ensure tools are in condition and clean after use	4.90	.30
A9 Arrange used equipment by label	4.87	.34
Overall Attitude	4.90	0.39
Skills		
S1 Can use safety equipment in the laboratory	4.67	.479
S2 Using machines in the laboratory correctly	4.70	.466
S3 Use the alternative routes provided in the laboratory if there is an emergency that obstructs the main doorway	4.67	.479
S4 Use the equipment in the laboratory according to its function	4.83	.379
S5 Use high-risk equipment in the laboratory efficiently	4.67	.479
S6 Operating a machine with high precautions to prevent unwanted incidents	4.80	.407
S7 Operating the machine in the laboratory safely	4.80	.407
S8 Using the fire extinguisher in the correct way	4.57	.504
Overall Skills	4.71	0.48
Overall Components	4.76	.44

Relationship of Knowledge, Attitude, and Skills in Practicing Safety and Health in the Workplace

As for the relationship between student knowledge, student attitude, and student skill level toward safety practices in the laboratory, the results of the analysis data show that the three variables appear to have a significant relationship in Table 4. The highest coefficient of reference refers to the relationship between the student's level of knowledge and the student's skill level of 0.794, followed by the relationship between the student's attitude and the student's skill level with a coefficient of 0.541. However, the lowest coefficient of 0.511 refers to the relationship between students' level of knowledge and students' attitudes. This proves a link between student knowledge, student attitude, and student skills in safety practice at the Tun Hussein Onn University Malaysia electrical laboratory. All relationships are proven to be significant at a 95% confidence level.

Table 4
Relationship Among Knowledge, Attitude, and Skills

Component		Knowledge	Attitude	Skills
Knowledge	Pearson correlation	1	.51*	.79*
	Sig (2 tailed)		.000	.00
	N	248	248	248
Attitude	Pearson correlation	.51*	1	.54*
	Sig (2 tailed)	.000		.00
	N	248	248	248
Skills	Pearson correlation	.79*	.54*	1
	Sig (2 tailed)	.000	.00	
	N	248	248	248

* significant at alpha 0.05

There is a significant relationship of knowledge, attitude, and skills towards safety practices in the laboratory electricity Universiti Tun Hussein Onn Malaysia. The second objective has been identified using the Pearson Correlation analysis. Based on outcome analysis data, the study's findings indicate that the value of skewness and kurtosis towards practice security is average data. The analysis results indicate a positive relationship between student knowledge, attitude, and skills in safety practices in the laboratory. This study, supported by Tahir and Mustafa (2010), stated a significant relationship between aspects of knowledge and safety in the laboratory.

In a study conducted by Negara (2012) and followed by Tiwari (2020), the results of both studies found that apart from supplying and using enforcement, the use of safety equipment by employers, such as safety shoes, eye protection, safety helmets, and gloves should be implemented as it can protect employees from injury. Yusof (2014) supports this issue, where individuals must equip themselves with safety knowledge and practices and always adopt an orderly and safe work culture.

The same study by Arifin et al. (2021) was based on identifying workers' awareness of safety and health. The result shows that workers' awareness of safety and health aspects is satisfactory. However, the same study found that workers' compliance level toward safety instructions, regulations and measures, and occupational health is high. This is an example where employee awareness level of compliance could be higher.

In addition, Hazuan et al. (2022), in their study on safety management and occupational health in Hong Kong, found that security levels could be measured by looking at safety policies, safety committees, safety programs, training, accident investigations, emergency procedures and personal equipment protection found within an organization. Compliance or safety practices are implemented to avoid accidents, injuries, or damage during the practical process (Yusof, 2014). Workshop and laboratory security is a shared responsibility between the user and management, where every individual needs to adopt an orderly, disciplined work culture and be safe (Hazuan et al., 2022).

The study supported by Zahid (2015) and Yusof (2014) showed that students' knowledge of using equipment and methods to handle equipment in the workshop is higher. Skilled workers and mistakes in operating machinery cause accidents in the industrial sector (Sallehuddin, 2013). Students use tools and machines to do practical work at school, which will pose a risk if a move safety is not taken while doing activities in the workshop. Students use various machine tools in the workshop, which is a high risk of accidents (Tahir & Mustapha, 2010). Equipment used during practical work should always be kept in its original place to be organized and neat.

Therefore, safety practices need to be constantly monitored and identified by various parties, especially the students themselves, informing the students' quality and the aspect of employment that prioritizes safety as quality graduate preparation in the real world of work. This is because mastery of knowledge has to do with mastery of skills in individuals. So, student knowledge, attitude, and high student skills can prevent students from committing negligence that results in accidents and personal injury, and subsequent laboratory users reduce the risk of accidents.

According to the Behavior Change Model of Knowledge, Attitude, and Skills in the workplace, the KAS model, students can change their behavior by acquiring new knowledge, developing positive attitudes, and gaining the necessary skills. The inferential analysis of simple regression was conducted on the three variables to measure the relationship of the components in the model (Zainal et al., 2022). Figure 2 below shows the relationship between the three components of the model: knowledge, attitude, and skills.

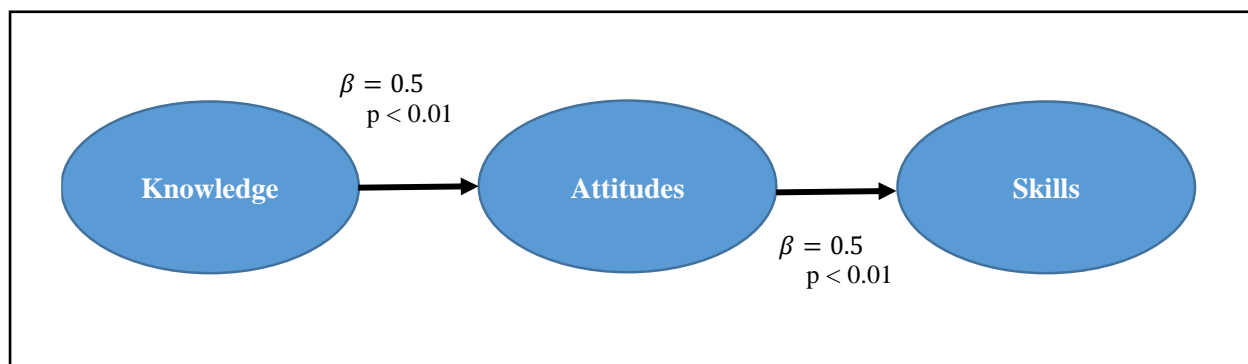


Figure 2: Relationship of Behavior Change Model of Knowledge, Attitude, and Skills

The findings show that the relationship exists and is significant to relate the student's knowledge, attitude, and skill components in practicing safety in the workplace, specifically in engineering laboratories in higher education institutions. The relationship affects and provides impact to another component of individuals. Therefore, it is crucial to ensure that

stakeholders have taken care of every component in implementing and culturing safety and health among students (Sadon, 2018; Subramaniam et al., 2016).

Conclusion and Implication

Based on the overall study, the results refer to the knowledge of students against safety practices in electrical laboratories at a high level, mainly student personal safety issues. However, a few students must focus on personal safety issues, such as removing jewelry or accessories, before starting work in the laboratory. Refers to items of student knowledge aspects for environmental safety issues should be given attention as the mean score indicates knowledge students for environmental issues are in a low position. The position of the first aid box and fire extinguishers needs to be explained to students to ensure that initial action can be taken by students if there is an accident in the lab. Monitoring needs to be done for high items to ensure safety practices are mastered and become a priority and routine for students in the laboratory.

Refers to the second aspect, students' attitude towards practice safety, which is at a high level. Three elements are involved in students' attitudes: responsibility, adherence, and practice are seen as very positive. Although there is a low mean score, the mean score on students' attitudes is still high. Items at a low level must be identified and improved to ensure the safety of students in the laboratory is guaranteed from the risk of accidents. Students' attitudes towards the elements responsible, indirectly forming a safe laboratory environment, further encourage students to abide by and practice the laboratory's rules well and clearly. Student attitudes are essential in forming students who are responsible, compliant, and practicing security that will be used continuously in the real world of work.

The third aspect stated by the researcher is the skills aspect of students on safety practices in the laboratory. Refers to outcome analysis of the findings of the study, the researchers concluded the results showed the students' skills to be on high. The three elements in the skills aspect are usage and equipment handling skills. Students analyze students' attitude study findings as machines in laboratories where these elements are healthy ma, with a low mean score. Items for usage elements and handling of equipment and machines showing low levels are necessary given attention. This involves the safety of users of equipment and machinery, especially students, in doing practical work in the laboratory. Party responsible, such as instructors and technicians, need to show how to use and operate equipment and machines clearly and accurately and ensure that students understand and master the use of and handling of equipment and machines in the laboratory. In addition, the element of knowledge and handling emergency aids such as fire extinguishers are also necessary to be emphasized by students as a precautionary measure and self-preparation in the event of a fire emergency in the laboratory. Therefore, student skills in safety practice are on a high to be applied and practiced to ensure student preparation for the real world of work and involve mastery of knowledge in the field of study.

For the last objective of the study, which is the second objective, the researcher looked at the relationship between student knowledge, student attitudes, and students' skills towards safety practices in the electrical laboratory of Universiti Tun Hussein Onn Malaysia across the three faculties involved in the study. The study results indicate a significant relationship between student knowledge, attitudes toward students, and student skills. All three aspects of student knowledge, student attitude, and student skills are interconnected and very important in ensuring that the safety of students in the laboratory is guaranteed and in creating a safe work environment based on aspects of mastery across the faculty. Practice

priority safety requires students to master knowledge and skills, showing students a positive attitude to apply their knowledge and skills of safety practices in the laboratory.

Referring to the study conducted, efforts to conduct exposure and instill safety practices among students in the laboratory should continue to be a culture of students ensuring safety emphasized to prevent and reduce the risk of accidents from happening. In addition, programs involving necessary safety training for each faculty member who uses the laboratory to produce teaching and learning in terms of mastery of knowledge, student perception, and mastery of skills and routine practice ensure self-avoidance of possible accidents. Besides, informal activities under institutions such as forums, competitions, telematics, or exhibitions involving safety practices should be mandatory for students to attend as additional info before students use laboratories within the institution. In addition, management needs to improve efforts to achieve 100% awareness of safety practices among students in the Universiti Tun Hussein Onn Malaysia laboratory. The effort can be made by tightening the laboratory rules while ensuring students take care of my behavior against personal safety, equipment, and the laboratory environment. Every student's safety practices must be made routine to prepare students to adapt to the atmosphere of a natural workplace environment in the workplace.

The scope of the study conducted needs to be further expanded by involving the use of electrical laboratories for diploma students as well as students. This can result in a more comprehensive and comprehensive study in implementing safety practices among students in the laboratory Electricity Universiti Tun Hussein Onn Malaysia. Future studies can also expand the study using a large sample, i.e., involving a study in each Malaysian Technical University Network (MTUN), which uses electrical laboratories, namely Universiti Malaysia Perlis (UNIMAP), Universiti Teknikal Malaysia Melaka (UTEM), and Universiti Malaysia Pahang (UMP). This is aimed at obtaining the results of accurate research findings on aspects of safety practices among students in electrical laboratories. Aspects of the study can also be further detailed in further study by looking at aspects of student commitment, aspects of student behavior, and aspects of efficiency of safety practices. These aspects are considered essential and can be considered an important element involving the user lab. Research on this study is necessary to continue from time to time to ensure the level of internal security practices among students is high and as a benchmark to institutions and parties involved to ensure the safety of students.

Motivation and Contribution of the Study

This study is motivated by the author's experience in an educational setting in dealing with Technical and Vocational Education-related facilities. Authors need to ensure students' safety and health in the laboratory and workshop environment during their learning sessions. Furthermore, authors are also inspired by their experience in the industry while dealing with occupational safety and health in the workplace. Valuable and plenty of experiences gained from working years in the manufacturing and government-enforcement agencies motivate the authors in initiating this study. This study will contribute to a better understanding and in-depth exploration of the knowledge and skills in Technical and Vocational Education and Training (TVET) as well as in the engineering education field that is related to occupational safety and health in the workplace.

References

- Arifin, K., Isa, W. M. Z. W., Zaini, Z. A. & Sahimi, A. S. (2021). Persepsi terhadap pelaksanaan pengurusan keselamatan dan kesihatan pekerjaan oleh kakitangan awam di Putrajaya, Malaysia. *Jurnal Sains Sosial dan Kemanusiaan*, 18(SI)(2), 198-212. <http://journalarticle.ukm.my/16955/>
- Bahari, I. (2006). *Pengurusan Keselamatan Dan Kesihatan Pekerjaan* (edisi kedua). Mc.Graw Hill.
- Brossoit, R., Crain, T., Leslie, J., Hammer, L., Truxillo, D., & Bodner, T. (2019). The effects of sleep on workplace cognitive failure and safety. *Journal of Occupational Health Psychology*, 24(4), 411-422. <https://doi.org/10.1037/ocp0000139>
- Campbell, L. O., Hillaire, B., Laguardia, E. D., Howard, C., & Kelchner, V. P. (2022). Exploring higher education students' perceptions of safety on campus. *Journal of Threat Assessment and Management*, 9(2), 67–79. <https://doi.org/10.1037/tam0000178>
- Chan Lecturer, M. F. (2006). Investigating nurses' knowledge, attitudes, and skills patterns towards clinical management system: Results of a cluster analysis. *Medical Informatics and the Internet in Medicine*, 31(3), 161-174, doi:10.1080/14639230600643608
- Chen, Y., Sun, Y., Liu, Z., & Hu, D. (2022). Study on nutritional knowledge, attitude and behavior of chinese school football players. *Children*, 9(12), 1910. <https://doi.org/10.3390/children9121910>
- Department of Occupational Safety and Health. (2023). Legislation. <https://www.dosh.gov.my/index.php/legislation/acts-legislation>
- Hazuan, N. N. N., Kasim, N., Noh, H. M. & Rahim, M. H. I. A. (2022). Kajian amalan keselamatan dan kesihatan pekerjaan berkesan (KKP) untuk pengurusan pekerja di industri pembinaan. *Research in Management of Technology and Business*, 3(1), 445-458. doi:10.30880/rmtb.2021.03.01.033
- Ismail, M. E., Harun, H., Abdul Razzaq, A.R., Irwan Mahazir, I., Abd Samad, N., Othman, H. (2018). Perceptions, knowledge and attitudes of students towards safety practice in culinary laboratories. *Jurnal Pendidikan Teknologi dan Kejuruan*, 24(1), 23-31. doi: 10.21831/jptk.v24i1.17672
- Kanik, R., Sezgin, M., Şenkal, Ö., & Şenkal, Ö. (2021). Occupational health and safety education at inclusive vocational schools in Turkey. *Sage Open*, 11(4), 215824402110672. <https://doi.org/10.1177/21582440211067239>
- Lestari, F., Bowolaksono, A., Yuniutami, S., Wulandari, T., & Andani, S. (2019). Evaluation of the implementation of occupational health, safety, and environment management systems in higher education laboratories. *Acs Chemical Health & Safety*, 26(4-5), 14-19. <https://doi.org/10.1016/j.jchas.2018.12.006>
- Li, Z., Wang, X., Gong, S., Sun, N. & Tong., R. (2022). Risk assessment of unsafe behavior in university laboratories using the HFACS-UL and a fuzzy Bayesian network. *Journal of Safety Research*, 82, 13-27. <https://doi.org/10.1016/j.jsr.2022.04.002>
- Malomet, M. & Harber, P. (2020). Website survey method for assessing higher education employee health and safety programs. *Journal of Occupational and Environmental Medicine*, 63(2), 119-125. <https://doi.org/10.1097/jom.0000000000002091>
- Naji, G. M. A., Isha, A. S. N., Mohyaldinn, M. E., Leka, S., Saleem, M., Rahman, S. M., ... & Alzoraiki, M. (2021). Impact of safety culture on safety performance; mediating role of psychosocial hazard: an integrated modelling approach. *International Journal of Environmental Research and Public Health*, 18(16), 8568. <https://doi.org/10.3390/ijerph18168568>

- Nasrallah, I. M, El Kak, A. K., Ismail, L. A., Nasr, R. R. & Bawab, W. T. (2022). Prevalence of accident occurrence among scientific laboratory workers of the public university in Lebanon and the impact of safety measures. *Safety and Health Work*, 13(2), 155-162. doi:10.1016/j.shaw.2022.02.001.
- Negara, R. C. J. (2012). Tahap Kesiapan Pelajar Kejuruteraan Politeknik Terhadap Keselamatan Di Dalam Bengkel. Universiti Tun Hussein Onn Malaysia (Tesis Sarjana). <https://api.semanticscholar.org/CorpusID:140926219>
- Ozilgen, S. (2011). Food safety education makes the difference: Food safety perceptions, knowledge, attitudes and practices among Turkish university students. *Journal für Verbraucherschutz und Lebensmittel sicherheit*, 6(1), 25-34.
- Panahi, R., Pishvaei, M., & Ghaderi, N. (2018). Multi-theory model of behavior change: an appropriate model for creating health behaviors. *Journal of Research and Health*, 8(6), 483–484. <https://doi.org/10.29252/jrh.8.6.483>
- Puad, M. H. M. & Desa, H. M. (2020). Dissecting perceptions of new graduates on work orientation and self-confidence in employability skills training program. *Universal Journal of Educational Research*. 8(1A), 70-75.
- Puad, M. H. M. (2006). Safety practices education among lecturers in Industrial Training Institutes (Safety practices education among lecturers in Industrial Training Institutes) (Master's degree thesis). <https://ptta.uthm.edu.my/?view=article&id=213&catid=14>
- Puad, M. H. M. (2016). Minimising Unemployment through Training Programs: Lesson Learnt from the Perspective of Educators, Employers and Graduates. *Borderless Open Access Education*. 206-220 (eds). Aini Ideris, Renuganth Varatharajoo, Fairuz Izzudin Romli, Ab. Rahim Bakar, Eugene Fransua Arokiasamy. Universiti Putra Malaysia Press.
- Rahman, A. R. M. & Muniandi, E. L. (2010). Amalan Peraturan Keselamatan Bengkel Dalam Kalangan Pelajar Di Sebuah Institut Kemahiran Mara. Universiti Teknologi Malaysia. <http://eprints.utm.my/id/eprint/10856/>
- Reif, J., Chan, D., Jones, D., Payne, L., & Molitor, D. (2020). Effects of a workplace wellness program on employee health, health beliefs, and medical use. *Jama Internal Medicine*, 180(7), 952. <https://doi.org/10.1001/jamainternmed.2020.1321>
- Sadon, N. F. (2018). Mentransformasikan hubungan industri di Malaysia: Keberkesanan pengurusan keselamatan dan kesihatan pekerjaan (Transformation of industrial relations in Malaysia: The effectiveness on management of occupational safety and health). *Trends in Undergraduate Research*, 1(1), h50-54. <https://doi.org/10.33736/tur.1185.2018>
- Saks, A. (2011). Workplace spirituality and employee engagement. *Journal of Management Spirituality & Religion*, 8(4), 317–340. <https://doi.org/10.1080/14766086.2011.630170>
- Sallehuddin, N. F. (2013). Kesedaran Terhadap Amalan Keselamatan Dalam Kalangan Pelajar Di Makmal Kejuruteraan UTHM. Universiti Tun Hussein Onn Malaysia (Tesis Sarjana). <https://api.semanticscholar.org/CorpusID:108085786>
- Schöne, L. & Rieger, M. (2020). Determinants of occupational safety culture in hospitals and other workplaces - Results from an integrative literature review. *International Journal of Environmental Research and Public Health*, 17(18), 6588. <https://doi.org/10.3390/ijerph17186588>
- Subramaniam, C., Shamsudin, F. M., Zin, L. M., Ramalu, S. S., & Hassan, Z. (2016). Safety management practices and safety compliance in small medium enterprises. *Asia-*

- Pacific Journal of Business Administration, 8(3), 226-244.
<https://doi.org/10.1108/apjba-02-2016-0029>
- Sulat, J., Prabandari, Y., Sanusi, R., Hapsari, E., & Santoso, B. (2018). The validity of health belief model variables in predicting behavioral change. *Health Education*, 118(6), 499–512. <https://doi.org/10.1108/he-05-2018-0027>
- Tahir, L. & Mustafa, N. Q. (2010). Faktor-Faktor Yang Mempengaruhi Keberkesanan Pendidikan Khas Teknik Dan Vokasional Untuk Golongan Orang Kurang Upaya Di Tiga Buah Politeknik. https://core.ac.uk/display/11786232?utm_source=pdf&utm_medium=banner&utm_campaign=pdf-decoration-v1
- Tiwari, G. (2020). Safety research: Learnings from new methods and large data sets. *International Journal of Injury Control and Safety Promotion*, 27(4), 401-402, doi:10.1080/17457300.2020.1838183
- Vries, H. d., Luna-Perejon, F., Amaya, C., Civit, A., Schneider, F., Bamidis, P. D., ... & Li, Y. (2019). Opening the black box: explaining the process of basing a health recommender system on the i-change behavioral change model. *IEEE Access*, 7, 176525-176540. <https://doi.org/10.1109/access.2019.2957696>
- Waehrer, G. & Miller, T. (2009). Does safety training reduce work injury in the United States? *The Ergonomics Open Journal*, 2(1), 26-39. <https://doi.org/10.2174/1875934300902010026>
- Yusof, M. K. A. (2014). Amalan Keselamatan Bengkel dalam Kalangan Pelajar Kolej Vokasional Temerloh. Universiti Tun Hussein Onn (Tesis Sarjana). <http://eprints.uthm.edu.my/1546/>
- Zahid, N. (2015). Amalan Keselamatan dan Kesihatan Pekerja: Pusat Perubatan Universiti Malaya (Bachelor degree thesis). <https://etd.uum.edu.my/5261/1/s806372.pdf>
- Zainal, N. C., Puad, M. H. M. & Sani, N. F. M. (2022). Moderating effect of self-efficacy in the relationship between knowledge, attitude and environment behavior of cybersecurity awareness. *Asian Social Science*, 18(1), 55-64. doi:10.5539/ass.v18n1p55