Measure of Awareness on Occupational Health and Safety Vulnerability in Technical and Vocational Education and Training Institutions

Zakir Hussain[1]*, M.A. Burhanuddin[2], A.G. Khanapi[3]

[1] Faculty of Information and Communication Technology, Technical University of MalaysiaJalan Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia
[2]Faculty of Information and Communication Technology, Technical University of MalaysiaJalan Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia
[3] Faculty of Information and Communication Technology, Technical University of MalaysiaJalan Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia
[1]p031710003@student.utem.edu.my

Article History: Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 20 April 2021

Abstract Technical and Vocational Education and Training (TVET) is the future of tomorrow's workforce in the era of the Industrial Revolution 4.0. The ability of TVET institutions to prepare their graduates for future employment is paramount. Graduates who are adequately prepared to adapt to the workplace scenario is very much sought after. Job descriptions may differ slightly from their education and training, but strong fundamentals greatly improve a TVET graduate's employability. Part of this employability is the ability to commit to safety and health processes and procedures in the workplace. A survey using an instrument with a meritorious confirmatory factorial analysis was conducted. The items of the survey try to obtain feedback on awareness among the TVET population. The survey was disseminated using an online survey form. Feedbacks were analyzed using statistical packages to determine the respondents' replies. Utilizing the Pareto analysis, significant items based on respondents' feedback were identified. From the analysis, two hypotheses were formulated, which were then tested using independent samples test to obtain the significant value of the test. From the Pareto analysis, only 40% of the respondents were knowledgeable to assist if there were any safety and health concerns. Further analysis proved that gender did not influence having the knowledge to assist in any safety and health concerns. Additionally, having an industrial experience did not influence having the knowledge to assist in any safety and health concerns. The study on the awareness of occupational health and safety in TVET institutions is still a scarce research topic. By taking into consideration this research study, practical implications focusing on various stakeholders of educational systems; accreditation agencies and government bodies, TVET institutions, and civil society can be further explored and developed. TVET institutions play a pivotal role in providing a competent workforce to industries. The ability to provide experience in handling safety and health concerns within the curriculum can improve TVET graduates' competency and marketability. However, being a developing country, further research needs to be conducted on safety and health for TVET institutions.

Keywords Technical vocational education and training (TVET), Education, Occupational health and safety, Hazards

1. Introduction

Technical and Vocational education is considered as an integral part of the social and economic setting that has consistently progressed in conjunction with the major transformations in the educational environment [1]. The school education system, teaching techniques, and particularly vocational education institutes have essentially required the transformation to mitigate new challenges [2]. Thus, the teaching and learning process in these vocational training institutes have undergone many changes especially with the introduction of various mechanical and technical activities have consequently exposed TVETs to previously unfamiliar hazardous situations and dangers in the workplace. Therefore, occupational health and safety (OHS) is a natural transition for TVETs to progress towards to ensure that the (teaching and) learning experience is a smooth and effective one. Cultivating health OHS culture in TVETs through the progressive improvement of social and professional skills, gradual increases in the general awareness regarding OHS among staff and students can play a significant role in OHS development at TVETs.

The performance of an organization is highly reliant on its personnel. In other words, the quality of the organization's people is reflected by the standards of the services provided by them. In the technical vocational education and training (TVET) institutions such as polytechnics, the attributes of their graduates are greatly influenced by the quality of their lecturers [3]. Instructors in TVET organizations such as vocational colleges are associated with certain hazards. The workplace must meet all safety conditions for safety and health protection. It is imperative that proper OHS techniques and rules are formulated and practiced improving safety conditions between instructors and students, namely in workshops and laboratories. Hazards and threats at the workplace could pose dangers to TVET denizens, if not properly mitigated. OHS factors affecting access roads (to and from the workplace), working equipment, materials, working and procedures, workplace arrangement and organization should not be further exacerbated by other factors i.e., chemical factors, physical factors, biological factors, social factors, and factors influencing the psychological workload [4]. Factors that could potentially cause environmental

and/or workplace harm include physical, chemical, and biological factors which unequivocally cause health disorders and/or illnesses. The stress caused by less than optimum living conditions can also adversely affect people, both physiologically and psychologically. Behavior and attitude patterns need to be addressed via proper educative and legislative approaches [5].

Hossain, Moazzem Hossain, Tarannum, & Chowdhury, (2015) asserts that other factors play a significant role in the quality and credibility of the organization. Indirectly, infrastructure and physical environment are also main contributing factors which form part of the educational system. A sustainable education system must have a safe infrastructure as part of a pre-requisite for a safe working environment. In the literature review, they affirm that research done on occupational health and safety (OHS) in academic institutions is inadequate. The limited research that has been done related to OHS primarily focused on safety issues in a laboratory and the deficient implementation and practice of proper scientific procedures. Limited research can have serious consequences on the quality of the working environment.

TVET institutes of higher learning play a vital role in the future development of any country. They provide the country with skilled and semi-skilled workers in the industries. As the opportunity for white-collar jobs dwindle with the advent of IR4.0; TVET institutions of higher learning have become the training of choice. TVET education provides the necessary skills for graduates in the job market, particularly in the skilled and semi-skilled sector.

The aim of this study is to examine the level of awareness of safety and health in the workplace within a TVET institution, namely polytechnics. It will establish the familiarity of the population in the present situation to the implementation of safety and health within their workplace.

2. Literature review

TVET Technical and Vocational Education and Training

The term TVET is defined as Technical and Vocational Education and Training. As per the name, it is concerned with the education along with skills to serve the world. TVET is a program that drives the learners to the process of productive development regarding social mores and to facilitate them in attaining practical skills, generally considered significant for the nation development. It is a scheduled training program including learning experiences which starts with the analysis of possible career opportunities, supports multiple skills (basic, academic and life), enables to achieve high educational standards, develops leadership qualities for industry along with encouraging education continuity [7]. Audu, Rufai, (2013) deemed TVET as an effective tool to promote socioeconomic progression.

TVET serves as a major force for the evolution of every nation. It has been recognized as a tool for viable and potent economy as well as it plays a key role in promoting society and national progress [2]. It is considered as a national tool to empower the nations for viable source of revenue and socioeconomic development. The general conference conducted by ILO (International Labour Organization) and UNESCO (The United Nation Educational, Scientific and Cultural Organization) in 2001, recommended TVET as an effective tool for the twenty-first century. The recommendation was with respect to introduce an educational system involving the technologies and related sciences studies; expertise in practical skills, along with analysis of possible opportunities/occupations in various socioeconomic sectors [8].

TVET in Malaysia

In Malaysia, technical and vocational education started soon after the institutionalization of trade schools in Kuala Lumpur in 1926. Its objective was to provide trade education to the young generation of Malaysia to meet the international standards of trade and industry [9]. These schools offer basic training for machinery repair, building construction, electric wiring, carpentry for a three-year diploma. The government has always demonstrated special concern for technical and vocational education in Malaysia from the first Malaysia plan until the Eleventh Malaysia plan 2015-2020. It has to be taken into account that TVET institutions were not only limited to vocational schools. Since Malaysia achieved independence, other TVET institutions have also been established such as Polytechnics, MARA (Majis Amanah Rakyat, People's Trust Council) Vocational Institutes, Industrial training institutes, National Youth Development Corps (NYDC) [10].

Occupational Health and Safety

Occupational health hazards typically refer to materials and processes that have the potential to adversely affect the workforce. Hence, analyzing, controlling and inducing the identification of possible hazards must be the initial step in order to ensure occupational safety (and consequent health of the workforce). Occupational health and protection are the key elements to attaining a stable, virtuous working environment through strong preventative

measures. At present, OHS related studies are immensely encouraged by the stakeholders (TVET) and experts from different industries to support and managing a safe and comfortable workplace during hazardous situations and jobs. Also, technical and vocational education and training institutions (TVET) incorporate the learning methods of OHS training activities with hands-on industry-related tasks for the sake of safety, protection, and awareness of technical and non-technical workers at educational institutions and industries.

It is essential to ensure that safety knowledge is prevalent in TVET institutions, thus increasing the awareness among population concerning safety and health [3]. Assessing the level of awareness among the population will give a better understanding of the quality of safety and health. A report by Walters et al., (2005) indicated that lack of safety awareness caused activities requiring inclusive safety procedures to fall short from those defined by legislation. Parupalli et al., (2017) emphasized that employees need to be made aware of the safety rules and procedures, ensuring [3] that the level of awareness in the workplace be more productive and comprehensive. TVET institutions should strive to develop ideal practices in the awareness and promotion of health and safety and therefore, adopt rules and policies to ensure their implementation [3].

da Silva & Amaral, (2019) concluded that there were three types of indicators; where one of them was related to awareness. According to da Silva et al, the institutions should follow the necessary international protocols regarding health and safety by raising the awareness levels within institutions. Training and education can elevate standards of awareness, as well as how best to avoid hazardous situations, rather than entirely depending upon personal protective equipment (PPE) [13]. The participation of the employees in health and safety education will significantly elevate their level of awareness with a better understanding regarding the potential hazards in the workplace [14]. Therefore, employees with better knowledge regarding health and safety will possess the ability to improve the safety conditions in the workplace. Sabitu, Iliyasu, & Dauda, (2009) reported that workers' understanding of OHS came from the complete understanding and knowledge of hazards as well as dangerous situations.

Hu, Lee, Shiao, & Guo, (1998) asserted that the most reliable predictor of occupational health and safety practices was awareness. Workers who were more concerned with occupational health and safety were more likely to be aware of health and safety regulations. Awareness of occupational health and safety is one of the most significant factors for the implementation of health and safety regulations. Measures that enhance the awareness of occupational health and safety for workplaces are necessary in order to promote the employees' safety and health.

Due to the fact that TVET institutions are commonly comprised of several departments and faculties; this implies serious challenges to the efficient and effective management of health and safety protocols. The actual hazards to occupational safety are unforeseen events and risks in the workplace, such as (but not limited to) accidents and injuries caused by mismanagement. TVET institutions are required to maintain a balance between the legislative impositions and work procedures within the workplace [4]; while also educating students about health and safety measurements, and identifying the hazardous circumstances besides simply following the safety rules [3].

Industrial Revolution 4.0

The Industry 4.0 is an approach of controlling the process of production through time by adjusting/integrating production. This approach is used on three interlinked elements: 1) economic interaction and digitization towards economic networks from simple techniques to complex techniques with, 2) digitalization of services and products, 3) innovative market models. The application of artificial intelligence is one of the unique Industry features of 4.0 revolutions [11]. The use of robots to replace human is example of its application [17].

Occupational Health and Safety Awareness

Occupational health and safety awareness is defined as an individual's understanding and knowledge of safety hazards, responsibilities, OHS rights and the way to perform workplace tasks safely (e.g., through the use of protective equipment). Health and safety awareness can be gained through training and/or work experience. The knowledge of OHS responsibilities and rights can greatly enhance worker's health and safety while also reducing the possibility of injury risk.

Occupational Health and Safety Vulnerability

Vulnerability refers to conditions where employees are exposed to risks and hazards along with insufficient protection from risks and hazards (OHS rights, policies, procedures and awareness of responsibilities).

It is evident in health behavior research that awareness is the primary motivator in health-promoting behaviors [18]–[22]. Therefore, workers will be personally motivated and feel anxious towards their own personal safety by educating themselves with adequate knowledge of health and safety at the workplace. Instructing them with the correct procedures before the commencement of a task will lead them to adopt the right behavior. Moreover, discussing safety and health legislation rights and responsibilities from time to time will increase more awareness in workers and likewise in supervisors as well [23]. Awareness among workers regarding health and safety involved in the workplace will encourage them to adopt appropriate safety behavior.

The fundamental pillars of the initiative on occupational health and safety on the workplace are awareness and literacy. The findings of the earlier research studies showed that there are constraints on the stakeholders while they are dealing with safety and health hazards [24], [25]. The stakeholders must allow everyone to explore issues regarding health and safety in their TVET community [26]. This helps to promote awareness among the students regarding hazardous incidents which they may face in order for proper precautionary measures to be taken.

It is observed that students are usually unfamiliar with the potential dangers associated with the task that was assigned to them while performing the task. They may also lack the courage to raise their voice to ensure that there are (existing) health and safety measures to prevent them from suffering any mishaps while they are performing their tasks [27]. It is thus the responsibility of administrative executives to take care of the students and protect them from any danger [28]. Students should be aware of any dangers that they may face and how to overcome these dangers [24].

Students and in extension, (future) workers who are aware of safety and health issues, will improve hazards recognition [29]. This awareness will better prepare them for safety and health emergencies should such a situation arise. Awareness can be created by providing safety and health training, which should include first aid training. Apart from this, providing training, drills on how to conduct first aid applications is also helpful [30]. This will ensure students and/or workers aware of their behavior; as behavior is a relevant experiential factor for occupational safety and health [31]. Behavioral awareness reduces bias when risks are not beyond the students' or workers' control, but where it can still be managed.

3. Research Question

1. Does having knowledge to assist in any safety and health concerns at the workplace depend on gender?
2. Does having knowledge to assist in any safety and health concerns at the workplace depend on prior industrial experience?

4. Hypothesis

H_0: Having the knowledge to assist in any safety and health concerns at the workplace does not depend on gender.

H_1: Having the knowledge to assist in any safety and health concerns at the workplace depends very much on gender.

H_2: Having the knowledge to assist in any safety and health concerns at the workplace does not depend on prior industrial experience.

H_3: Having the knowledge to assist in any safety and health concerns at the workplace depends very much on prior industrial experience.

5. Research Methodology

Occupational safety and health are extensively researched in developed countries. However, research is still lacking in developing countries [6], [32]. Therefore, systematic research from peer-reviewed literature was conducted to identify possible instruments that can be adopted for this research study. If no instruments were to be found, then the appropriate instrument would have to be developed.

Taking into consideration that this research study required participants to attain representative answers via a quantitative method, a literature search was conducted using primarily SCOPUS. The search was chiefly focused on articles measuring awareness according to the conceptual framework. The search was restricted to years 2010 until 2019.

From the search, one particular instrument was shortlisted and eventually adopted. The instrument was developed by Smith et al., (2015), which was later employed by the Institute for Work and Health, Ontario, Canada. The instrument was thoroughly developed with a substantial factorial validity [33]. The final instrument consisted of 27 items. The items were divided into workplace hazards, policies, and procedures in the workplace, occupational health and safety awareness, participation in occupational health and safety. Subsequently, for the purpose of this research study, the online questionnaire that was finally developed was administered using Google Forms.

The items measuring awareness are displayed in Table 1.

Table 1: Factorial validity awareness item measure of OHS vulnerability

		Factor Loading
A1	I am clear about my rights and responsibilities in relation to workplace health and safety	0.87
A2	I am clear about my employers' rights and responsibilities in relation to workplace health and safety	0.82
A3	I know how to perform my job in a safe manner	0.66
A4	If I became aware of a health or safety hazard at my workplace, I know who (at my workplace) I would report it to	0.54
A5	I have the knowledge to assist in responding to any health and safety concerns at my workplace	0.67
A6	I know what the necessary precautions are that I should take while doing my job	0.72

The items are latent and cannot be measured directly. Thus, a Likert of one to five, with one (1) being “strongly agree” and five (5) being “totally disagree” was used to measure the responses. The questionnaire was disseminated using Google Forms. No expectations of the number of responses were determined.

6. Survey Data and Findings

6.1. Respondents

The goal of the survey conducted was to obtain a representative sample of the TVET institution to ascertain overall safety and health in awareness within their workplace. 116 responses were collected from the survey. The demographic information collected from the survey is displayed below. The survey conducted showed that the respondents are 50.86% male and 49.14% female. This demonstrates that there was an almost equal representation of both genders in the sample.

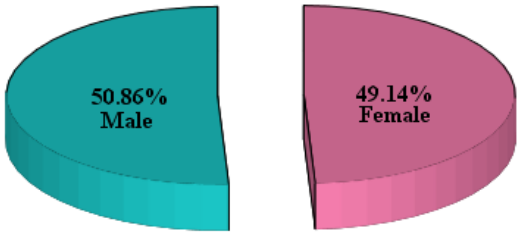

Figure 1: Distribution of survey based on gender

56.9% of the respondents have had prior industrial experience while the remaining 43.1% did not have any previous industrial experience.

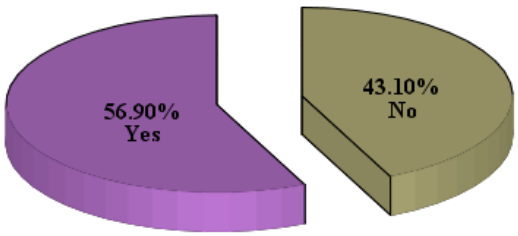

Figure 2: Distribution of survey with industrial experience

The percentage of females with previous industrial experience (49.14%) is comparable to the number of males with prior industrial experience (50.86%).

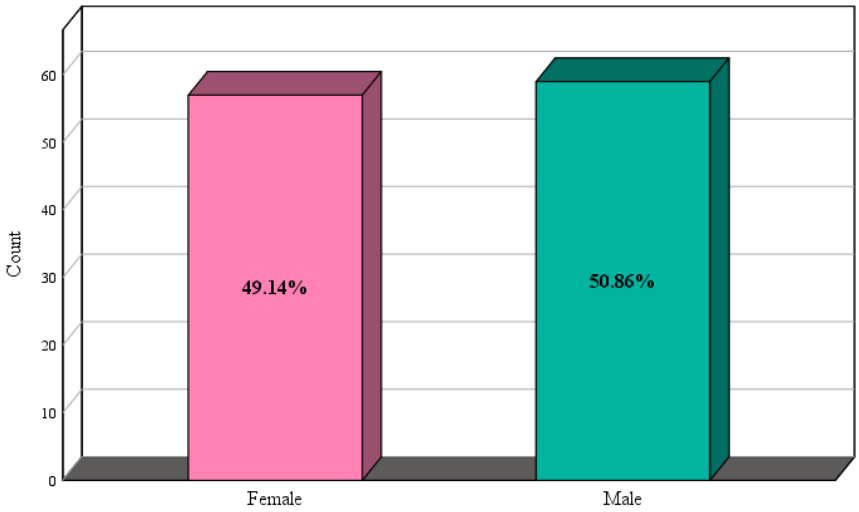

Figure 3: Distribution of Gender with Industrial Experience

However, running the Chi-Square test proved that gender is not indicative to those who possessed previous industrial experience as the Pearson value is more than 0.05.

Table 2. Chi-Square Tests on Gender with Industrial Experience

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.831[a]	1	.362		
Continuity Correction[b]	.524	1	.469		
Likelihood Ratio	.832	1	.362		
Fisher's Exact Test				.454	.235
N of Valid Cases	116				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 24.57.

b. Computed only for a 2x2 table

There was no association between gender and previous industrial experience. This was indicated by a Phi value of .085, which is more than 0.05. Thus, industrial experience is not indicative by gender.

Table 3: Significance Effect of Gender with Industrial Experience

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.085	.362
	Cramer's V	.085	.362
N of Valid Cases		116	

Results regarding the awareness of the respondent's safety and health at the workplace are shown in Table 4. The average mean value of the data is mainly within the range of 2 where the respondents agreed with the statements given.

Table 4: Average mean and standard deviation of respondents' awareness towards safety and health in the workplace

Items	**Mean**	**Std. Deviation**
I am clear about my rights and responsibilities in relation to workplace health and safety.	2.15	1.151

I am clear about my employers' rights and responsibilities in relation to workplace health and safety.	2.19	1.182
I know how to perform my job in a safe manner	2.13	1.181
If I became aware of a health or safety hazard at my workplace, I know who (at my workplace) I would report it to.	2.27	1.214
I have the knowledge to assist in responding to any health and safety concerns at my workplace.	2.51	1.127
I know what the necessary precautions are that I should take while doing my job.	2.18	1.156

The initial analysis of the demographics indicate that gender did not indicate any previous industrial ex perience. The subsequent statistical description assesses the respondents' awareness concerning safety and health at their workplace. Utilizing SPSS multi-response analysis, the following figure displays respondents' Likert scale of "strongly agree" (5) feedback.

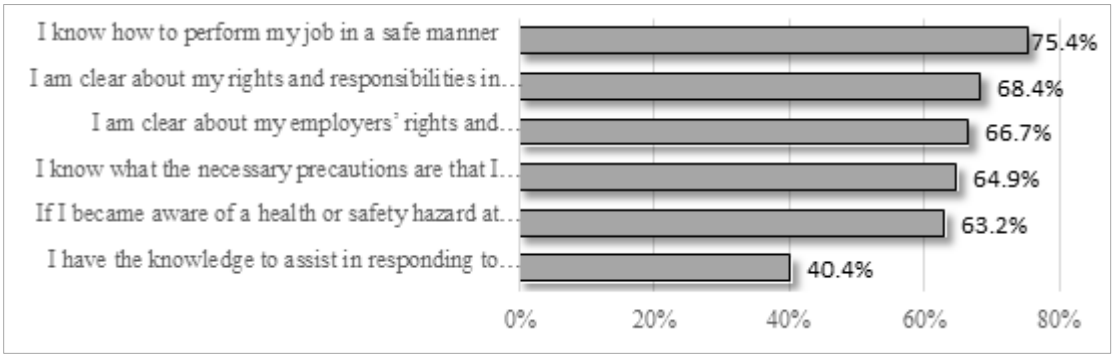

Figure 4: Pareto Chart of Awareness with "Strongly Agree" Response

75.4% of respondents knew how to perform their jobs safely. 68.4% were clear about their rights and responsibilities at the workplace while 66.7% were clear about their employer's responsibilities. 64.9% knew the necessary precautions to take while doing their job. 63.2% knew whom to report to if there were any safety or health hazards at the workplace. However, only 40.4% agreed that they had the knowledge in assisting to any safety concerns.

Since only 40.4% of respondents agreed that they had the knowledge to assist in responding to safety and health concerns at the workplace, it can be deduced that only 40.4% can confidently lend assistance should a safety and health concern occur at the workplace. A closer look at the percentage yielded the following figures.

From the analysis, it was observed that 19.8% "strongly agree" that they had the knowledge to assist in any safety and health concerns at the workplace while 32.8% "agree" that they had the knowledge to assist in any safety and health concerns. As for the rest of the respondents, 28.4% were neutral, 12.1% disagreed and 6.0% strongly disagreed.

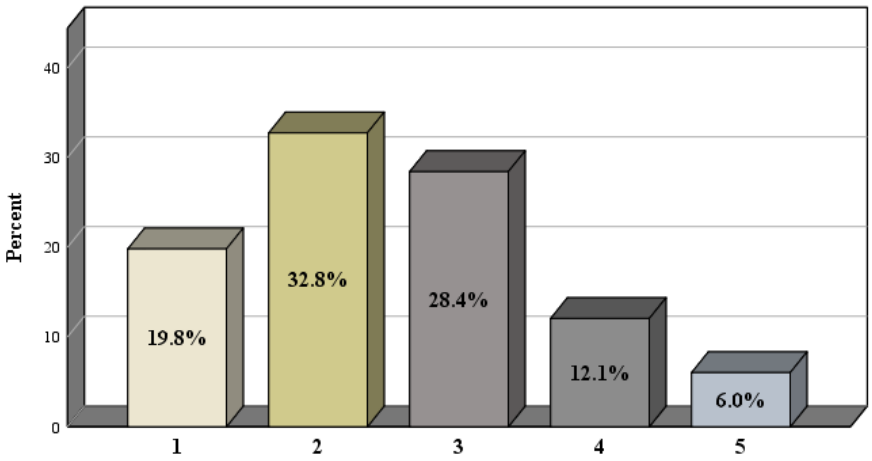

Figure 5: Breakdown Analysis of Respondents' Feedback

6.3. Gender

Based on respondents' gender, further analysis of their responses yielded the following hypotheses.

H_0: Having the knowledge to assist in any safety and health concerns at the workplace does not depend on gender.

H_1: Having the knowledge to assist in any safety and health concerns at the workplace depends very much on gender.

Table 5: Independent sample test based on Gender

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
I have the knowledge to assist in responding to any health and safety concerns at my workplace.	Equal variances assumed	3.950	.049	-4.008	113	.000	-.792	.198	-1.183	-.400
	Equal variances not assumed			-3.998	103.866	.000	-.792	.198	-1.184	-.399

The significant value [34] from the independent samples test is 0.049, which is less than the a value of 0.05. Thus, we can reject H_0, where gender did not have an effect on having the knowledge to assist in any safety and health concerns in the workplace. This implies that there was insufficient evidence to conclude that gender had an effect on having the knowledge to assist in any safety and health concerns at the workplace. Therefore, the alternative hypothesis, H_1 can be accepted.

6.4. Industrial Experience

Based on respondents' (previous) industrial experience further analysis of their responses yielded the foll owing hypotheses.

H_2: Having the knowledge to assist in any safety and health concerns at the workplace does not depend on prior industrial experience.

H_3: Having the knowledge to assist in any safety and health concerns at the workplace depends very much on prior industrial experience.

Table 6. Independent sample test based on Industrial Experience

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
I have the knowledge to assist in responding to any health and safety concerns at my workplace.	Equal variances assumed	1.487	.225	.524	113	.602	.112	.213	-.311	.534
	Equal variances not assumed			.534	109.921	.594	.112	.209	-.302	.526

The significant value [34] from the independent samples test is 0.225, which is more than the a value of 0.05. Thus, we can accept H_2 where previous industrial experience did not have an effect on having the knowledge to assist in any safety and health concerns at the workplace. This implies that there was insufficient evidence to conclude that (having prior) industrial experience had an effect on having the knowledge to assist in any safety and health concerns at the workplace. Therefore, we reject the alternative hypothesis, H_3.

7. Discussion of Findings

The main aim of this study was to ascertain the level of awareness of health and safety in the workplace within TVET institutions. This was attained by computing the responses of the respondents to various elements of the level of awareness of health and safety in TVET institutions. The findings indicate that respondents were mostly aware of health and safety practices in TVET institutions. The findings of this study were also consistent with research carried out by Baizura Zubir & Fazidah Saad, (2016).

In addition to this, the results also shed light on whether gender played a role in having the knowledge to address any health and safety concerns at the workplace i.e., the study revealed that the level of health and safety awareness depended for the most part on gender. Chatigny, Riel, & Nadon, (2012) also corroborated that gender had an influence on awareness and knowledge of occupational health and safety at the workplace.

This study also revealed that knowledge of occupational health and safety depended on workers' (previous) industrial experience. This was further endorsed by a study conducted by Fargnoli, Minicis, & Gravio, (2010) who confirmed that knowledge to assist in any hazard mostly depends on having industrial experience.

Several issues were extrapolated from the undertaking of this study i.e., health and safety are serious issues and is something that should involve every level of the organization, from top management right to the very bottom rung of the organization to ensure that there be proper mitigation of hazards as well as the safety, health and well-being of every member of the organization which will only bring benefits to the organization in the long-term. It has to be noted that although steps can and will be taken in ensuring that the workplace environment is safe, hazards cannot be thoroughly eliminated due to the dynamic nature of the workplace and its denizens. Accidents can happen anywhere and at any time. Therefore, proper occupational health and safety awareness and education is imminent in ensuring that the workplace remains a safe and healthy environment.

Regrettably, the US State Department has categorized Malaysia as a country where human rights and workers' rights are not crucial [3]. This only means that the occupational health and safety movement in Malaysia is still in relative infancy and thus has great room for growth and expansion. What better way to start with TVET institutions, given that they are essentially preparatory learning institutes for the future workforce, so that the health and safety culture can be ingrained even before they have stepped into actual working environments.

8. Conclusion

This research aimed to investigate the level of awareness of safety and health at the workplace within a TVET institution such as a polytechnic college. Based on Figure 4, the findings indicate that only 40% of the respondents felt that they did not have the confidence to assist should there be any safety and health concerns. It can be surmised that there seems to be a need to improve safety and health awareness, particularly on how to give first aid in critical situations. First aid training, as part of safety and health initiatives, will aid in improving behavior. Having "hands-on" first-aid training will help bolster confidence thereby improving behaviors, which will in turn improve the overall health and safety culture of the organization.

However, the study that was conducted has limitations as it was conducted at three TVET institutions within the state of Sarawak. This only means that it can be extended further to other TVET institutions all over Malaysia, not only where there is a higher number of TVET institutions but may include a different class of higher education institutions such as technical universities. Since this is something akin to a pilot study here in Malaysia, the instrument utilized is of a more generic nature. Future studies could have a more specific set of questions directed at a targeted set of respondents whereby targeting a specific type of TVET institution or a specific group of TVET students from a certain background, for example.

The issues raised by this study carries several practical implications for various stakeholders of a (TVET) educational system i.e., accreditation agencies and government bodies, TVET institutions and society as a whole. The importance of health and safety at the workplace cannot be given greater emphasis or importance especially in view of the fact that TVET institutions play a key role in building a nation's (future) workforce. The potential for establishing a safer, healthier, better occupational health and safety culture lies at the foundation of its workforce, in this case it is the TVET institution.

Although this has been tested in a developing nation i.e., Malaysia, with some limitations, the overall findings of the study can be applied to other developing nations as well. The study can also be part of a comprehensive on-going occupational health and safety program, where a pre-test and a post-test can be conducted. Respondents can be tested before the commencement of a safety and health awareness program. After the program has been

conducted, a post-test can be administered. Not only can the effectiveness of the program be evaluated, but the respondents' level of awareness, understanding and confidence can also be estimated. The long-term benefits for both organization and workers are incalculable. These tests can be streamlined to suit each organization's specific occupational health and safety needs in accordance with the specific industry that they are in. Therefore, it will only get easier to ascertain provisions for safety training, promotion of safety advocacy, and enforcement of proper workplace safety regulations. The potential for laying a strong occupational health and safety foundation is endless.

Acknowledgements

The authors would like to thank BIOCORE Research Group, Center for Advanced Computing Technology (C-ACT), Fakulti Teknologi Maklumat dan Komunikasi (FTMK), Centre for Research and Innovation Management, Universiti Teknikal Malaysia Melaka and Ministry of Higher Education Malaysia for providing the facilities and support for this research.

Our Affiliation

MA Burhanuddin, burhanuddin@utem.edu.my, Director of UTeM International Centre, Faculty of Information & Communication Technology, Universiti Teknikal Malaysia Melaka, Durian Tunggal, Melaka

References

A. F. A. Halim, A. R. Bakar, R. Hamzah, A. M. Rashid, U. Tun, and H. Onn, "Employability Skills of Technical and Vocational Students With Hearing Impairements: Employers' Perspectives," *J. Tech. Educ. Train.*, vol. 5, no. 2, pp. 65–74, 2013.

B. A. R. Audu, Rufai, "Technical Vocational Education: As a Veritable Tool for Eradicating Youth Unemployment.," *IOSR J. Humanit. Soc. Sci.*, vol. 8, no. 2, pp. 10–17, 2013.

C. Z. Sarah Ismail, K. Arifin, K. Aiyub, and K. Aiyub Taylor, "A Contemporary Business Journal Promoting OSHA at Higher Institutions: Assessment of Level of Safety Awareness among Laboratory Users," *Bus. Rev.*, vol. 2, no. 2, pp. 155–164, 2015.

D. Walters, T. Nichols, J. Connor, A. C. Tasiran, and S. Cam, "The Role and effectiveness of Safety Representatives in Influencing Workplace Health and Safety," *Heal. Saf. Exec.*, vol. 2, no. 1, pp. 1–179, 2005.

E. A. Kamis, A. Alwi, B. L. Ismail, N. Zakaria, and F. A. N. Yunus, "Integration of green skills in sustainable development in technical and vocational education," *Int. J. Eng. Res. Appl.*, vol. 7, no. 12, pp. 8–12, 2017.

F. M. A. Hossain, M. Moazzem Hossain, S. Tarannum, and T. H. Chowdhury, "Factors affecting OHS practices in private universities: An empirical study from Bangladesh," *Saf. Sci.*, vol. 72, pp. 371–378, 2015.

G. S. A. Ward, "Career and Technical Education in United States Prisons: What Have We Learned?," *J. Correct. Educ.*, vol. 60, no. September, pp. 191–200, 2009.

H. O. A. Nelson, "A viable vocational technical education curriculum : A tool for economic and technology development in Nigeria," *Sch. J. Educ.*, vol. 2, no. February, pp. 22–26, 2013.

I. A. Hollander and N. Y. Mar, "International Handbook of Education for the Changing World of Work," *Int. Handb. Educ. Chang. World Work*, pp. 41–42, 2009.

J. N. H. Jabarullah and H. Iqbal Hussain, "The effectiveness of problem-based learning in technical and vocational education in Malaysia," *Educ. Train.*, vol. 61, no. 5, pp. 552–567, 2019.

K. S. R. Parupalli *et al.*, "FACTORS AFFECTING IMPLEMENTATION OF HEALTH AND SAFETY PRACTICES IN WORK PLACE: A CASE STUDY OF TEMEKE MUNICIPALITY," 2017.

L. S. L. C. da Silva and F. G. Amaral, "Critical factors of success and barriers to the implementation of occupational health and safety management systems: A systematic review of literature," *Safety Science*, vol. 117. Elsevier, pp. 123–132, 01-Aug-2019.

M. C. N. Anil Kumar, M. Sakthivel, R. K. Elangovan, and M. Arularasu, "Analysis of material handling safety in construction sites and countermeasures for effective enhancement," *Sci. World J.*, vol. 2015, 2015.

N. K. Y. Kao, C. Spitzmueller, K. Cigularov, and C. L. Thomas, "Linking safety knowledge to safety behaviours: a moderated mediation of supervisor and worker safety attitudes," *Eur. J. Work Organ. Psychol.*, vol. 28, no. 2, pp. 206–220, 2019.

O. K. Sabitu, Z. Iliyasu, and M. M. Dauda, "AWARENESS OF OCCUPATIONAL HAZARDS AND UTILIZATION OF SAFETY MEASURES AMONG WELDERS IN KADUNA METROPOLIS, NORTHERN NIGERIA," *Ann. ofAfrican Med.*, vol. 8, no. 1, pp. 46–51, 2009.

P. S. C. Hu, C. C. Lee, J. S. C. Shiao, and Y. L. Guo, "Employers' awareness and compliance with

occupational health and safety regulations in Taiwan," *Occup. Med. (Chic. Ill).*, vol. 48, no. 1, pp. 17–22, 1998.

Q. A. D. Minghat and R. M. Yasin, "A sustainable framework for Technical and Vocational education in Malaysia," *Procedia - Soc. Behav. Sci.*, vol. 9, pp. 1233–1237, 2010.

R. M. Conner and P. Norman, "Health behaviour: Current issues and challenges," *Psychology and Health*, vol. 32, no. 8. pp. 895–906, 2017.

S. Institute of Occupational Safety and Health, "Promoting a Positive culture: A guide to health and safety culture," 2017.

T. M. P. Kelly and M. Barker, "Why is changing health-related behaviour so difficult?," *Public Health*, 2016.

U. R. Davis, R. Campbell, Z. Hildon, L. Hobbs, and S. Michie, "Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review," *Health Psychol. Rev.*, 2015.

V. B. Gardner, "A review and analysis of the use of 'habit' in understanding, predicting and influencing health-related behaviour," *Health Psychol. Rev.*, 2015.

W. [23] "Expert Advisory Panel on Occupational Health and Safety," *2018*, no. December, p. 81, 2010.

X. A. Tanner and B. Doberstein, "Emergency preparedness amongst university students," *Int. J. Disaster Risk Reduct.*, vol. 13, pp. 409–413, 2015.

Y. T. C. Wu, C. H. Chen, N. W. Yi, P. C. Lu, S. C. Yu, and C. P. Wang, "Hazard management dealt by safety professionals in colleges: The impact of individual factors," *Int. J. Environ. Res. Public Health*, vol. 13, no. 12, 2016.

Z. W. Villegas-Ch, X. Palacios-Pacheco, and S. Luján-Mora, "Application of a smart city model to a traditional university campus with a big data architecture: A sustainable smart campus," *Sustain.*, vol. 11, no. 10, 2019.

AA. M. Nykänen, K. Salmela-Aro, A. Tolvanen, and J. Vuori, "Safety self-efficacy and internal locus of control as mediators of safety motivation – Randomized controlled trial (RCT)study," *Saf. Sci.*, vol. 117, no. April, pp. 330–338, 2019.

BB. P. T. Mwangi, "ASSESSMENT OF THE LEVEL OF COMPLIANCE WITH OCCUPATIONAL SAFETY AND HEALTH ACT 2007 IN PUBLIC TVET INSTITUTIONS IN NAIROBI COUNTY , MASTER OF SCIENCE (Occupational Safety and Health) JOMO KENYATTA UNIVERSITY OF," 2016.

CC. T. Laukkanen, "Construction work and education: Occupational health and safety reviewed," *Constr. Manag. Econ.*, vol. 17, no. 1, pp. 53–62, 1999.

DD. N. S. Hudin, N. S. Hudin, A. A. Jamaludin, and S. Muzakhir, "Educators' preparedness towards children safety and health in Malaysian preschools and kindergartens," *Int. J. Innov. Creat. Chang.*, vol. 10, no. 8, pp. 187–205, 2019.

EE. H. Lingard, "The effect of first aid training on Australian construction workers' occupational health and safety motivation and risk control behavior.," *J. Safety Res.*, vol. 33, no. 2, pp. 209–230, 2002.

FF. D. L. Goetsch, "Occupational Safety and Health for Technologists, Engineers, and Managers, Global Edition," Pearson Education Limited, 2014.

GG. P. M. Smith *et al.*, "The development of a conceptual model and self-reported measure of occupational health and safety vulnerability," *Accid. Anal. Prev.*, vol. 82, pp. 234–243, 2015.

HH. S. Tappura, A. M. Teperi, A. L. Kurki, and J. Kivistö-Rahnasto, "The management of occupational health and safety in vocational education and training," *Adv. Intell. Syst. Comput.*, vol. 785, pp. 452–461, 2019.

II. W. F. W. M. Baizura Zubir and M. R. J. Fazidah Saad, "Safety and Health Awareness among Staff and Students in Workshop and Laboratory of an Engineering Technology University Campus," *Int. J. Eng. Res. Technol.*, vol. 5, no. 3, pp. 285–288, 2016.

JJ. C. Chatigny, J. Riel, and L. Nadon, "Health and safety of students in vocational training in Quebec: A gender issue?," *Work*, vol. 41, no. SUPPL.1, pp. 4653–4660, 2012.

KK. M. Fargnoli, M. De Minicis, and G. Di Gravio, "Occupational health and safety improvement throughout knowledge management Knowledge Management integration in Occupational Health and Safety systems in the construction industry," no. January, 2010.