Impact Measurement of the Relationship between Awareness and Participation in Safety and Health at Technical and Vocational Education and Training (TVET) Institutions in Sarawak

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Abstract. *The ability to perform a job safely is the hallmark of being aware of occupational safety and health at the workplace. However, being able to perform a job safely can only go so far to improve safety and health in the work environment unless workers actively participate in mitigating hazards. Historically, extensive studies have been conducted on awareness as well as participation at the workplace in developed countries compared to developing ones. Consequently, this study was carried out at three technical and vocational education and training (TVET) institutions in Sarawak, namely Politeknik Kuching Sarawak, Politeknik Mukah Sarawak and Politeknik Metro Betong Sarawak.The objective of this study was to investigate the relationship between workers' awareness and their participation towards limiting hazard vulnerabilities at the workplace.This quantitative research utilizes a survey instrument adopted from the Institute for Work & Health Ontario, Canada. The items within the survey are of meritorious confirmatory factorial analysis. The questionnaire was distributed online to the three TVET institutions stated above. A total of 115 responses were collected.The results proved that awareness was not significantly influenced by participation in safety and health among the respondents in the survey. There was no statistically significant difference in awareness on participation based on gender, $F(2, 112) = 1.22$, $p < .0005$; Wilk's $\Lambda = 0.96$, partial $\eta 2 = .04$.There is no significant relationship between awareness and participation of safety and health in limiting hazard vulnerabilities at the workplace.*

Key words: safety and health; awareness; participation; multivariate logistic regression

1. Introduction

The Malaysian government places great importance on the prevention of work-related injuries and illnesses, not only to the workforce but also to society, as a whole. As such, although technical and vocational education and training have incorporated Occupational Safety and Health (OSH) as part of their management strategy, the studies being conducted to ascertain whether the population actively engages in participating in OSH initiatives is still somewhat limited.

An acceptable safety culture is determined by four factors; senior management assurance to safety; realistic, versatile customs and practices for both well-defined and undefined hazards; ongoing professional improvement through feedback mechanisms which include tracking and reviewing; and workforce-wide focus and consideration for hazards (Abdullah, Othman, Osman, & Salahudin, 2016). Absent this, employees are more inclined to be less mindful of their health at the workplace and more likely to take more chances with safety.

In addition to the aforementioned, training programs are also of great significance. Organizations are required by Malaysian law (Occupational Safety and Health Act 1994) to hold training programs not only during the initial stages of an employee's career but also as an ongoing initiative in order to raise OSH awareness and understanding to maintain a healthy working environment. However, the degree of organizational safety and health preparation is dependent on several organizational factors such as an organization's focus on safety, employees' job conditions as well as the organization's finances, which will be required to fund the necessary training. Alruqi, Hallowell and Techera, (2018) reported that 20 studies were conducted to measure risk level awareness associated with work activities required amongst workers. One of the most crucial elements in organizational safety and health is

employee's participation (Abdullah et al., 2016; Palassis, Schulte, & Geraci, 2006). In the United States, employee participation is incorporated in ANSI Z10 standards while in Malaysia, the Occupational Safety and Health Act 1994 ensures that employers, both public and private sectors, actively participate in OSH.

Employee participation at the workplace will subsequently raise hazard awareness i.e. positively influencing the safety culture within the organization thereby reducing workplace incidents due to hazards (Bahn, 2013; Bianchini, Donini, Pellegrini, & Saccani, 2017). Thus, employers also reap the benefits as this lower injury rates as well as any medical or incidental costs that may be incurred from employees' active participation in safety and health initiatives. Safety and health initiatives include seven key components:

1. Management leadership.
2. Worker participation, hazard identification and assessment.
3. Hazard prevention and control.
4. Education and training.
5. Program evaluation and improvement.
6. Coordination involving organizations with more than one worksite.

Being a behavioral factor, active participation is defined as workers' ability to advocate effort on improving safety conditions through specific recommendations and prompt reporting of complications. This can be seen through suggestions made by workers as work progresses (Cagno, Micheli, Jacinto, & Masi, 2014). Technological advancement and innovation may well be a catalyst to undefined hazards and risks. Thus, taking into consideration workers' suggestions can thereby help sustain continuous improvements to safety at the workplace through new outlooks and ideas.

Active participation has been most effective and thus is highly recommended, particularly in the early stages of employment during the initiation of fledgling workers into the organization (Bush, Chang, Rauscher, & Myers, 2019). Active participation in safety enforces good safety performance habits which positively contributes to safety performance thus having a direct impact on the effectiveness in avoiding accidents and injuries. It can be viewed that safety standards are antecedents to the relationship between safety criteria through awareness and participation of the workers (Cagno et al., 2014). Besides active participation, other behavioral factors that can be included in the investigative areas are proper use of personal safety equipment i.e. PPE (Personal Protection Equipment); adherence to standard operating procedures; the proper use of appropriate machinery and equipment; and the proper use of potentially hazardous materials such as chemicals et al.

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2. OSH Vulnerability Conceptual Framework

Occupational Safety and Health Awareness

Occupational safety and health (OSH) awareness can be defined as an employee's continuous realization in recognizing workplace safety hazards and how to circumvent them as well as being able to correctly perform workplace tasks in a safe manner so as to mitigate any safety related risks. In order to increase (and sustain) OSH awareness, it has to be a constant norm at the workplace therefore constant "reminders" that passively engage employees need to be in place i.e. safety posters and flyers in addition to more active OSH participation such as in-house training or having a designated "OSH Awareness Week" every month. OSH awareness can also be cultivated by having knowledge of OSH legislation responsibilities and rights, which will in turn ensure that employees are able to perform their work tasks in a competent and safe manner. Through both passive and active participation, a healthier safety culture can be fostered thus enhancing employees' health and safety while also reducing injury risks.

OSH Vulnerability

According to Smith et al., (2015), OSH vulnerability refers to situations where employees are exposed to hazards in combination with inadequate protection from these hazards (OSH policies and procedures, awareness of rights and responsibilities, and worker empowerment).

Expounding on this, it can be surmised that awareness and literacy are fundamental in the initiative on a healthy OSH culture at the workplace. The findings of earlier research studies indicate that there are constraints for stakeholders while they are dealing with safety and health hazards (Tanner & Doberstein, 2015; Wu, Wang, Zou, & Fang, 2016). The stakeholders must allow everyone to explore the issues regarding health and safety in their TVET community (Villegas-Ch, Palacios-Pacheco, & Luján-Mora, 2019). This helps to promote awareness among employees to potential hazardous incidents which they may encounter at the workplace and the means by which to prevent them.

Research in health behavior have indicated that awareness is the primary motivator in health - promoting behaviors (Conner & Norman, 2017; Davis, Campbell, Hildon, Hobbs, & Michie, 2015; Gardner, 2015; Institute of Occupational Safety and Health, 2017; Kelly & Barker, 2016). Educating employees with adequate knowledge in health and safety will ensure that they are anxious about their personal safety and that they stay motivated in keeping themselves safe and healthy. Instructing employees with the correct procedures before the commencement of work tasks will lead them to adopt the right behavior towards these tasks. Moreover, discussing the safety and health legislation rights and responsibilities will increase awareness in workers and likewise in supervisors (Safety & Dean, 2011).

It has been observed that employees are usually unaware of potential hazards when assigned a new task to perform. They may also lack the courage to raise their voice to ensure that there are health and safety measures to prevent any catastrophe while performing their tasks (Nykänen, Salmela-Aro, Tolvanen, & Vuori, 2019). Workers should be aware of the danger they may face and how to overcome the situation (Tanner & Doberstein, 2015). Thus, it is the responsibility of administrative executives to take care of the workers and protect them from any danger (Mwangi, 2017).

It cannot be denied that workers who are aware of safety and health issues improve hazards recognition (Laukkanen, 1999) as it will better prepare them for any potential safety and health exigencies that may arise. Awareness can be propagated by providing safety and health training. Apart from providing training, drills on how to conduct first aid applications are helpful (Hudin, Hudin, Jamaludin, & Muzakhir, 2019). This will help make workers wary of their behavior; behavior is a relevant experiential factor for occupational safety and health (Lingard, 2002). Behavioral awareness will thus reduce the bias between vulnerabilities and OSH effectiveness in order for occupational risks can be mitigated effectively.

3. Methodology

Occupational Safety and Health (OSH) have been extensively researched in developed countries. However, OSH research is still lacking in developing countries (Goetsch, 2014; Hossain, Moazzem Hossain, Tarannum, & Chowdhury, 2015). Therefore, systematic research from peer - reviewed literature was conducted in order to identify possible instruments that could be adapted to researching OSH in developing countries. The premise for this was that, if suitable instrument was not found, then it would have to be developed. A literature search, primarily using Scopus, was performed. The search strategy focused on articles measuring awareness according to a conceptual framework. The search was limited to years 2010 to 2019.

Based on the search performed, one particular instrument was utilized. This 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 substantial factorial validity (Smith et al., 2015). The final instrument consisted of 27 items. These items were categorized into workplace hazards, policies and procedures at the workplace, occupational safety and health awareness as well as participation in occupational safety and health.

Findings

Study Population

The study was carried out at three technical and vocational education and training (TVET) institutions in the state of Sarawak, Malaysia. Those TVET institutions were:

i. Politeknik Kuching, Sarawak
ii. Politeknik Mukah, Sarawak, and
iii. Politeknik Metro Betong, Sarawak

The TVET institutions in Malaysia are a part of the Malaysian Ministry of Higher Education system, offering the necessary education, training and skills development for various occupational fields, production, services and livelihood (Revision of the 2011 Revised recommendation concerning TVE, United Nation Educational Scientific and Cultural Organization (UNESCO), 2015). They are currently thirty-six polytechnics in Malaysia offering various technical and vocational programs ranging from the fields of engineering to commerce. This survey was conducted towards the second half of 2019 and in the earlier half of 2020. The self-administered questionnaire was distributed online and a total of 116 responses of were collected. The almost equal gender distribution of the respondents are as follows:

Table 1: Survey distribution based on gender

	Value Label	N
Gender	Female	57
	Male	58

Questionnaire and Measurements

The questionnaire is based on a meritorious research conducted by Smith et al., (2015), which was also adopted by the Institute for Work & Health in Toronto, Canada. The questionnaire is divided into several sections:

i. Workplace hazards
ii. Workplace policies and procedures
iii. Occupational safety and health awareness
iv. Participation in occupational safety and health

Under the occupational safety and health awareness section, there are six areas of concern:

i. Rights and responsibilities of both employees and their employers
ii. Ability of the employees to perform their job safely
iii. Awareness to whom employees are to report to in the event of safety and health hazards
iv. Ability to assist when safety and health concerns are present
v. Knowledge of the necessary precautionary measures that should be taken while performing their job

For participation in occupational safety and health, five key areas were identified:

i. Ability of the respondents to voice their concerns or make suggestions
ii. Ability to point out hazards if present at the workplace
iii. Ability to halt work if deemed unsafe and not being reprimanded for it
iv. Respondents' disregard for unsafe conditions while hoping the situation resolves itself
v. Ability to complete work safely within a specific timeframe

In addition to these aforementioned items regarding respondents' responses towards OSH awareness and participation, their gender and industrial experience was also recorded. However, for the purposes of this study, only their gender was taken into consideration. Their responses were recorded using a scale of one to five, where one being "strongly agree" and five being "strongly disagree".

3.1 Statistical Analysis

In order to measure the significance of the relationship between awareness and participation in OSH and vocational education and training, the means of the two factors were computed. The results of the computation are shown in Table 2.

Table 2: Means and standard deviations of items A3 and P2

Descriptive Statistics

	Gender	Mean	Std. Deviation	N
Mean Awareness Score	Female	2.4412	1.10286	57
	Male	2.0517	.94858	58
	Total	2.2448	1.04194	115
Mean Participation Score	Female	2.6632	.81430	57
	Male	2.4371	.91328	58
	Total	2.5491	.86929	115

The mean awareness score for females is 2.44 with a standard deviation of 1.10. Meanwhile, the mean awareness score for males is 2.05 with a standard deviation of .95. The mean participation score for females is 2.66 with a standard deviation of .81. The male mean participation score is 2.44 with a standard deviation of .91. Further analysis is explained in the following section.

3.2 Results

Table 5 displays the equality of multiple variance - covariance matrices of the variables for awareness and participation is based on the assumption of homogeneity of variance and covariance. Based on Table 3, there was no problem estimating the homogeneity of covariances across groups using $p < .001$ as a criterion, as Box M (5.917) where p (.122) > a (.001) was not important. This meant that no major variations occurred between matrices of covariances. The assumption was not contravened. Wilks' Lambda distribution was utilized.

Table 3: The equality of multiple variance-covariance matrices for awareness and participation

Box's Test of Equality of Covariance Matrices[a]

Box's M	5.917
F	1.934
df1	3
df2	2321206.635
Sig.	.122

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + D1

The model relationship between variables awareness and participation, and the magnitude of the relationship based on gender is depicted in Table 4 below. Using the alpha level of .05, the test is significant, Wilks' $\Lambda = .96$, $F(2, 112) = 2.12$, $p < .124$. partial $\eta 2 = .04$. This significant F indicates that there are no significant differences among the gender groups on a linear combination of the two independent variables. The multivariate $\eta 2 = .04$ indicates 4% of multivariate variance of the dependent variables is associated with the group factor.

Table 4: Relationship between awareness and participation based on gender

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.899	500.187[b]	2.000	112.000	.000	.899
	Wilks' Lambda	.101	500.187[b]	2.000	112.000	.000	.899
	Hotelling's Trace	8.932	500.187[b]	2.000	112.000	.000	.899
	Roy's Largest Root	8.932	500.187[b]	2.000	112.000	.000	.899
D1	Pillai's Trace	.037	2.124[b]	2.000	112.000	.124	.037
	Wilks' Lambda	.963	2.124[b]	2.000	112.000	.124	.037
	Hotelling's Trace	.038	2.124[b]	2.000	112.000	.124	.037
	Roy's Largest Root	.038	2.124[b]	2.000	112.000	.124	.037

a. Design: Intercept + D1

b. Exact statistic

The equality of error variances based on Levene's test is shown in Table 5. The assumption of multivariate analysis of variance (MANOVA) is that the variance of each of variable is equal across the groups. If Levene's test is relevant, this would mean that the presumption has been compromised and the results, avoided if possible; the results should be manipulated to equalize the variances. P-value is greater than the significance level ($p > 0.05$), therefore, it cannot be concluded that there is a statistically significant association between the response variable and the term.

Table 5: Error variances using Levene's test of equality

Levene's Test of Equality of Error Variances[a]

		Levene Statistic	df1	df2	Sig.
Mean Awareness Score	Based on Mean	1.350	1	113	.248
	Based on Median	.722	1	113	.397
	Based on Median and with adjusted df	.722	1	105.616	.397
	Based on trimmed mean	1.333	1	113	.251
Mean Participation Score	Based on Mean	.515	1	113	.475
	Based on Median	.523	1	113	.471
	Based on Median and with adjusted df	.523	1	111.774	.471
	Based on trimmed mean	.489	1	113	.486

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + D1

The analysis conducted has proven that the MANOVA is important. As awareness and participation are statistically relevant, several similarities or correlations need to be made post hoc to see which pairs in measures are distinct. The p values for the ANOVAs on the MANOVA performance do not take into consideration whether more than one ANOVAs have been done. To defend against Type I error, the standard Bonferroni method should be utilized and evaluated of ANOVA at a level of .025 (.05 separated by the number of ANOVAs done, which would be equivalent to the number of dependent variables). As can be shown, both ANOVAs are important at the modified alpha point of.025 ($p < .001$ for both).

Table 6: Associations between awareness and participations among genders by multivariate logistic regression analysis

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Mean Awareness Score	4.361[a]	1	4.361	4.128	.045	.035
	Mean Participation Score	1.469[b]	1	1.469	1.961	.164	.017
Intercept	Mean Awareness Score	580.321	1	580.321	549.208	.000	.829
	Mean Participation Score	747.797	1	747.797	997.941	.000	.898
D1	Mean Awareness Score	4.361	1	4.361	4.128	.045	.035
	Mean Participation Score	1.469	1	1.469	1.961	.164	.017
Error	Mean Awareness Score	119.402	113	1.057			
	Mean Participation Score	84.675	113	.749			
Total	Mean Awareness Score	703.254	115				
	Mean Participation Score	833.423	115				
Corrected Total	Mean Awareness Score	123.763	114				
	Mean Participation Score	86.145	114				

a. R Squared = .035 (Adjusted R Squared = .027)

b. R Squared = .017 (Adjusted R Squared = .008)

4. Conclusion and Discussion

The main objective of this study was to determine the level of awareness of OSH within TVET institutions in the state of Sarawak, Malaysia of which upon further improvement and adaptation, could then be expanded to other TVETs in the country i.e. namely TVET institutions in Peninsular Malaysia. Thus, this study is geographically limited to the state of Sarawak in East Malaysia. The results of this study were attained by collecting and assessing the responses from a sample population with varying levels of awareness of OSH in TVET institutions. The findings indicate that the respondents were aware of OSH practices in TVET institutions. The findings of this study were consistent with the findings of earlier research that was conducted by Baizura Zubir & Fazidah Saad, (2016)

However, the findings garnered from this study could be somewhat culturally skewed due to geographical variability. Thus, casting the net on a national scale could temper this bias and perhaps render a more comprehensive outlook on OSH awareness in TVET institutions as TVET institutions in Peninsular Malaysia are palpably more varied as they also include technical universities as well as skill colleges. The findings from a wider sample population would provide future researchers with more than ample material to better configure OSH initiatives in more varied TVET institutions on a national level thus providing a better indication of the current OSH situation in Malaysia.

The findings also indicated that the knowledge to assist in any OSH hazards at the workplace is influenced by gender. This finding is further corroborated by Chatigny, Riel, & Nadon, (2012), who established that awareness and knowledge of OSH are influenced by gender. Besides gender playing a role in awareness and knowledge of OSH, Fargnoli, Minicis, & Gravio, (2010) have affirmed that the knowledge to assist in OSH hazard mitigation is also determined by industrial experience.

The results for the main analysis of this study proves that there is equal awareness between genders towards safety and health at the workplace. There is also equal participation between genders on safety and health at the workplace. Furthermore, awareness does not seem to affect participation towards safety and health at the workplace. There is no significance in the relationship between awareness and participation limiting hazards' vulnerability at the workplace based on gender.

Safety in and around various laboratories and workshops at TVET institutions, in what would usually be called a "classroom" in any other non-technical/vocational academic institution, is actually comparable to actual workplaces in the "real world".

TVETs being essentially a preparatory school for the skilled workforce. Thus, maintaining optimum safety and health within all TVETs are a challenge to any staff or technician assigned to maintain them. These challenges are further exacerbated by the lack of resources, making attention to risk evaluation and mitigation in developing countries often overlooked (Abbas, Zakaria, & Balkhyour, 2017).

In addition to OSH hazard prevention, one of the fundamental components for OSH risk/hazard mitigation would be the knowledge to provide first aid. According to the Malaysian Department of Occupational Safety and Health (2004), Malaysian employers are required by law to provide the necessary facilities and provisions for first aid care at the workplace. By including first aid training, in TVET "classrooms" i.e. workshops and laboratories, ensuring that TVET graduates will have a working knowledge of first aid. Providing this fundamental component of OSH will help foster OSH awareness from the onset of the (future) employee's career. It is hoped that equipped with a better OSH awareness, these future employees will adopt a better (attitude and) behavior towards OSH, which will in turn foster a better safety culture at the workplace thereby reducing work-related injuries and illnesses.

Further research related to this study should include the management's commitment to safety by utilizing a quantitative method so as to best measure their effectiveness. Management commitment is believed by other researchers to be a strong predictor of work-related injuries (Alruqi et al., 2018). However, considerations on management commitment to safety differs greatly among the ranks of researchers in the field of safety and health. Thus, the study should adopt a particular epistemology on the definition of safety and health with regards to management commitment.

Management commitment can then be extended to ensure work processes are adhered to in order to handle workplace risks when holding OSH workshops. This is part of enforcing participation among workers by increasing their awareness to the source of hazards within their environment (Bahn, 2013). Since most types of OSH participation comprise of injury and illness prevention programs, implementing OSH initiatives will greatly assist in mitigating and preventing work - related injuries and illnesses within the workplace.

Taking management commitment, a step above, the government is a major stakeholder in TVET institutions, along with other accreditation agencies and various government departments should also be reprised of the importance of OSH awareness at the grassroots level i.e. instilling good attitudes and behaviors towards OSH while TVET students are still being trained to be the skilled workforce of tomorrow. While there are legislations in place for both employers and employees in the private as well as the public sector, the realm of TVET students is still somewhat a grey area. Ascertaining the importance of OSH awareness in TVET institution's student population will help the necessary agencies to set more comprehensive OSH laws and legislation in place that are pertinent to TVET institutions.

From a more detailed perspective, this study can also be used as part of a more comprehensive program where pre-tests and post-tests can be administered. Prior to attending any OSH programs, employees can be asked to take a pre-test to ascertain their awareness of OSH. In addition to determining their level of understanding, with regards to their previous work experience and education, this will help indicate their current level of OSH awareness. From a long-term perspective, the information collected from administering these tests can help trace back the effectiveness of their education (where applicable). TVET syllabus makers, government policy makers and accreditation bodies could utilize these responses in order to engender better awareness in OSH.

After attending OSH programs, the effectiveness of the program (and OSH initiatives at the workplace as a whole) can then be ascertained to better evaluate any improvement in their awareness and understanding of OSH initiatives at the workplace. This will in turn, enhance employees' awareness towards potential occupational hazards in areas such as the provision of safety training, promoting safety advocacy, and enforcement of proper workplace safety regulations.

Accidents can happen anywhere, and at any time. Safety and health are serious issues particularly occupational safety and health. Compromising OSH at the workplace will not only incur health issues by way of work - related injuries and illnesses, but will also cause financial and economic repercussions when productivity is compromised. Therefore, everybody must be involved, both employers and employees must play their part in ensuring that the workplace environment is safe by successfully mitigating hazards, if not completely eliminating them. This, will in turn, promote a healthy safety culture at the workplace. Since TVETs are preparatory institutions for vocational and technical skills, TVET graduates will benefit greatly from being exposed to OSH during their time at TVET institutions. This ensures a skilled workforce that is both aware and knowledgeable in OSH practices.

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.

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