



## **Fire Safety Awareness and Practices of Science, Technology, Engineering, and Mathematics Students in a Philippine Public Secondary School**

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### **Abstract**

The Philippines is one of the countries that faced severe fire disasters. However, fire received little recognition in disaster readiness and risk reduction. Seeing that students are gathered in one place, a fire safety assessment is necessary to ascertain their acquisition of competencies in fundamental concepts of fire in their DR subject as an integral part of the Science education curriculum. Anchored on KAP theory, this study investigated the Grade 12 STEM students' safety awareness before, during, and after a fire about practices in public schools in the central Philippines relative to sex and family monthly income. A validated and reliability-tested questionnaire was administered to 94 randomly selected students using a descriptive, comparative, and correlational approach. Mean, Standard Deviation, Mann-Whitney U test, and Spearman Rank correlation were utilized in data analysis. Overall, students possessed a prominent consciousness and could relatively demonstrate the necessary measures and responses to prevent and suppress the fire. Comparatively, no significant difference exists when grouped according to sex and family monthly income. Concurrently, a significant relationship was observed between their awareness and practices, implying that students who possess the consciousness of fire safety will likely demonstrate the measures against the dangers of fire, which validated the KAP theory. Continuous improvement of teachers' instructions is crucial to strengthen students' readiness and resilience in disasters like fire.

**Keywords:** Awareness, Descriptive-Correlational Research, Fire Safety, Philippines, Practices

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## **INTRODUCTION**

The United Nations Office for Disaster Risk Reduction (UNDRR, 2015) works towards lowering the risk of disasters and the resulting losses in terms of human life, health, livelihoods, and the assets people own in different communities and countries. The Philippines is one of the Southeast Asian countries that has experienced severe fire disasters. The country is susceptible to dreadful consequences since fire disasters cause substantial harm (Kurata et al., 2023). In senior high schools, preventive measures, mitigation, preparedness, and response to different kinds of disasters are taught in Disaster Readiness and Risk Reduction (DRRR) as an integral part of the Science education curriculum (Salita et al., 2019). Specifically, many lessons tackled multiple natural disasters, namely volcanic eruptions, typhoons, floods, and earthquakes. Nonetheless,

regarding disaster risk reduction management, fires of all kinds are rarely acknowledged (Kurata et al., 2023).

Fire safety awareness is called knowledge, understanding, and consciousness of preventing and suppressing all kinds of destructive fires. The Department of Education (DepEd) strengthened the fire safety awareness program, emphasizing fire safety procedures in schools before, during, and after an actual fire due to a fire threat to the safety of students and staff and its possible impact on school facilities. In addition to purchasing firefighting equipment, DepEd, the Department of Interior and Local Government (DILG), and the Bureau of Fire Protection (BFP) are working together to deliberately establish an ongoing campaign on fire safety for schools. The BFP will also conduct training sessions to raise awareness (DepEd, 2016). A fire drill is one of school students' most significant safety factors (USFADC, 2007). Children are frequently labeled among the most vulnerable groups during disasters (Ocal & Topkaya, 2011; Rogayan et al., 2022). Thus, they should be equipped with the knowledge, understanding, and ability to apply safety and protection measures before, during, and after disasters such as fire (DepEd, 2015).

Exercise preventive measures and suppress all kinds of fire-characterized fire safety practices (DepEd, 2016). Learning about fire safety and putting that information into practice are both crucial. With 15 662 fire incidents in schools from S.Y. 2009- 2010 to S.Y. 2017-2018, where most regions from the Visayas are affected (DepEd, 2019), from a number standpoint alone, it is evident that providing adequate fire safety practice activities is essential for students' well-being.

DepEd Cebu Province Memorandum No. 062, s. 2023 directed to intensify the monitoring of unattended plugged gadgets, electric fans, and other types of electrical equipment before leaving the school premises after class; proper waste management of combustible waste such as papers, wood, and plastics (DepEd - Cebu Province, 2023); most of it is not evident to STEM students. There is no seriousness in fire safety practices. The researcher also received a report from students that during their fire drill, some students just rushed to any available exits instead of following the designated exit for each section based on the evacuation plan of the school; the same observations were obtained in the study of Paño et al. (2015) in one of the schools in Cebu where students push, run, and talk during fire drills. During the fire drill, only evacuation procedures were practiced, and there was no use of fire-fighting equipment, which the researcher has the same observations in the responding school. In addition, the said fire drill was not coordinated with the BFP of the local community. Hence, the fire safety awareness level and extent of fire safety practices of STEM students shall be measured to make sure that they possess the consciousness, knowledge, and understanding and can transfer into practice their learnings about fire safety principles to be sensitive to any danger in case of actual fire. Educators may also gain valuable information on strengthening students' readiness for disaster risk reduction and resilience regarding fire safety response in case of fire incidents.

Previous studies on fire safety focused on the latent profile of students and fire safety awareness on fire prevention, preparedness, an indirect response to fire, and direct response to fire (Lee et al., 2021) and effectiveness among Filipinos for fire prevention preparedness (Kurata et al., 2023). However, few studies have investigated the relationship between fire safety awareness and the extent of the fire safety practices of STEM students in public high schools. There is no established data yet that can tell that STEM students are conscious and knowledgeable enough of the fire safety principles and can transfer their knowledge, understanding, and consciousness into practice in case of a fire disaster.

This study primarily intended to investigate the relationship between the level of fire safety awareness and the extent of fire safety practices of Grade 12 STEM students. Also, the results of this study served as bases for the proposed fire safety worksheet, which provides students with valuable information to increase their ability to appropriately respond and

suppress the fire, ensure their safety, and minimize the possible effects of fire on the school community. In addition, it can assist the teacher in making the topic more concrete and active, leading to an abstract and reflective interaction process.

## **METHODS**

This study used a descriptive, comparative, and correlational design to determine the level of fire safety awareness and the extent of fire safety practices of STEM students in public high schools. By providing measurable numerical data, generally from instruments, this method allows the numerical data to be analyzed through statistical methods (Creswell & Creswell, 2023). The descriptive approach was employed to determine the level of fire safety awareness and extent of fire safety practices of the Grade 12 STEM students in a public high school. Meanwhile, the comparative approach was used to describe and compare the level of fire safety awareness and the extent of fire safety practices when respondents were grouped according to sex and family monthly income. Furthermore, the correlational approach was used to determine the relationship between fire safety awareness and fire safety practices of Science, Technology, Engineering, and Mathematics (STEM) students.

The respondents of this study were the 124 Grade 12 students taking the Disaster Readiness and Risk Reduction (DRRR) subject at a large secondary school on an island in the central Philippines for the school year 2022-2023. The researcher identified the respondents through stratified random sampling to get a representative sample from each section in the STEM strand. The respondents were grouped according to sex and family monthly income. Sex includes male and female, while family monthly income includes lower and higher family monthly income.

The study utilized a valid ( $r = 4.84$ ) and reliable ( $r = 0.902$ ) researcher-made fire safety awareness and practices questionnaire based on the essential learning competencies of Disaster Readiness and Risk Reduction, DepEd Order No. 062, s. 2023 reiterating DepEd Order No. 28, s.2016, also known as the "Strengthening the Fire Safety Awareness Program," Bureau of Fire Protection Drill Evaluation Checklist, and School Manual for Fire Safety and Evacuation Plan of National Disaster Response Force of India to assess the level of fire safety awareness and extent of fire safety practices of Grade 12 STEM students in public secondary schools in case of an actual fire.

There were three parts of the questionnaire; the first part was the demographic profile of the respondents, such as their names, sections, sexes, and monthly income for their families. The second part was a 31-item test on fire safety awareness. It measures before an actual fire happens, such as proper disposal of combustible waste, the proper way of using electrical equipment in school, knowledge of the proper responses during actual fire incidents, such as how to use the alarm, fight a fire, and after fire incidents such as evacuation procedures, and supporting future activities in terms of fire safety. The third part was a 34-item test on fire safety practices. It assessed if the students can demonstrate and transfer their knowledge of fire safety into practice and apply it to prevent and lessen the possible effects in case of actual fire incidents.

Their responses on both tests were grouped according to sex and family monthly income to analyze whether a significant difference exists between the level of fire safety awareness and the extent of fire safety practices. Likewise, the significant relationship between the level of fire safety awareness and the extent of their practices was determined.

Descriptive, comparative, and correlational data analyses were used to analyze and interpret the data. Mean and standard deviation were used for the descriptive analysis of the level of fire safety awareness and extent of fire safety practices of Grade 12 STEM

students. Comparative analysis was utilized to investigate the difference in fire safety awareness and the extent of fire safety practices when grouped according to sex and family monthly income. On the other hand, correlational data analysis was used to determine the relationship between the level of fire safety awareness and the extent of fire safety practices.

The data underwent a normality test, specifically the Kolmogorov-Smirnov test for normality, to determine the statistical tools for inferential analysis. The normality test revealed that the variable awareness [ $KS=0.342$ ,  $p=0.000$ ] is not normally distributed, while practice [ $KS=0.089$ ,  $p=0.000$ ] is normally distributed. Since the variable awareness is not normally distributed, non-parametric statistics were used for inferential questions. For the variable practices, parametric statistics was used for inferential questions.

Since the data were not normally distributed, non-parametric statistics, specifically the Mann-Whitney U test, was used for inferential questions to find the significant differences in the level of fire safety awareness of Grade 12 STEM students before, during, and after a fire when grouped according to sex and family monthly income. An Independent sample t-test was used to determine the significant difference in the extent of fire safety practices of Grade 12 STEM students before, during, and after a fire when grouped according to their sex and family monthly income. The Spearman Rank Correlation was used to determine the significant relationship between fire safety awareness and practices. All tests were set at  $\alpha = 0.05$ .-space-

## RESULTS & DISCUSSION

### Results

The level of awareness of fire safety before, during, and after an actual fire among STEM students of public secondary schools is presented in Table 1. This data set shows that the Grade 12 STEM students' level of awareness ( $M=4.46$ ,  $SD=0.52$ ) is very high. When grouped according to sex, male ( $M=4.33$ ,  $SD=0.56$ ) and female ( $M=4.5$ ,  $SD=0.50$ ) students have a very high level of awareness. Regarding family monthly income, students from lower ( $M=4.51$ ,  $SD=0.50$ ) and higher ( $M=4.34$ ,  $SD=0.55$ ) income groups have a very high level of awareness.

Table 1. Level of Awareness of Fire Safety Before, During, and After an Actual Fire of STEM Students of Public Secondary Schools

Variable	Before			During			After			Awareness		
	M	SD	Int	M	SD	Int	M	SD	Int	M	SD	Int
Sex												
Male	4.25	0.68	VH	4.25	0.61	VH	4.67	0.56	VH	4.33	0.56	VH
Female	4.54	0.53	VH	4.26	0.58	VH	4.67	0.50	VH	4.50	0.50	VH
Family Monthly Income												
Lower	4.52	0.50	VH	4.23	0.61	VH	4.69	0.50	VH	4.51	0.50	VH
Higher	4.34	0.72	VH	4.31	0.54	VH	4.62	0.56	VH	4.34	0.55	VH
Whole	4.47	0.58	VH	4.26	0.59	VH	4.67	0.52	VH	4.46	0.52	VH

Interpretation: VH – Very High

Specific to the results on the level of awareness of fire safety before, during, and after an actual fire as a whole, this implies that the students exceeded the knowledge and possessed an understanding of the necessary measures and responses before an actual fire, such as good school housekeeping, turning off and unplugging electrical devices when not

in use, proper evacuation procedures, emergency exit routes, emergency hotlines of the BFP; during an actual fire, such as different types of fire extinguishers, the “PASS” method, fire warning alarm, STOP DROP and ROLL method, evacuation plan as practiced in drills; after an actual fire, such as notifying emergency response personnel of injured victims, informing parents of their whereabouts, and supporting activities that will further strengthen their fire safety awareness. In terms of sex, both males and females greatly understood the procedures or necessary measures and responses before, during, and after an actual fire. Given this fact, regardless of sex, both males and females demonstrated consciousness of the proper measures and necessary steps to prevent and suppress the fire, which may influence the development of their ability to respond before, during, and after an actual fire and reduce the risk, danger, and possible casualties. It also implies the importance of providing opportunities to strengthen students’ awareness so that both genders can participate actively. Regarding family monthly income, despite the respondents’ economic status differences, their understanding of and consciousness of fire safety remains the same. This implies that regardless of the economic status of the respondents, they have equal opportunities in the programs of the DepEd and BFP to actively engage in learning fire safety guidelines in school before, during, and after an actual fire.

Table 2 presents the extent of fire safety practices of STEM students of public secondary schools before, during, and after an actual fire. The extent of fire safety practice ( $M=4.14$ ,  $SD=0.57$ ) is excellent. When grouped according to sex, male ( $M=4.13$ ,  $SD=0.54$ ) and female ( $M=4.14$ ,  $SD=0.58$ ) students have much practice. Regarding family monthly income, students from lower ( $M=4.18$ ,  $SD=0.55$ ) and higher ( $M=4.05$ ,  $SD=0.62$ ) income groups have a great deal of practice.

Table 2. The extent of Fire Safety Practices Before, During, and After an Actual Fire of STEM Students of Public Secondary Schools

Variable	Before			During			After			Practice		
	M	SD	Int	M	SD	Int	M	SD	Int	M	SD	Int
Sex												
Male	3.97	0.72	G	4.16	0.58	G	4.48	0.57	VG	4.13	0.54	G
Female	4.03	0.72	G	4.08	0.64	G	4.55	0.51	VG	4.14	0.58	G
Family Monthly Income												
Lower	4.09	0.63	G	4.15	0.61	G	4.48	0.56	VG	4.18	0.55	G
Higher	3.86	0.87	G	4.00	0.63	G	4.67	0.42	VG	4.05	0.62	G
Whole	4.01	0.72	G	4.10	0.62	G	4.54	0.52	VG	4.14	0.57	G

Interpretation: G – Great; VG – Very Great

Specific to the results on the extent of fire safety practices before, during, and after an actual fire, the excellent extent rating inferred that the students could only relatively demonstrate the implementation of fire safety. They can transfer their knowledge, understanding, and consciousness of the precautionary measures and proper response before, during, and after the case of an actual fire. This also implies a need for adept implementation and emphasis on fire safety in the school community. Furthermore, in the case of fire, the students are less susceptible to possible hazards and dangers brought by fire. Regarding sex, this study shows many practices demonstrating that males and females can equally implement fire safety. They can transfer their knowledge, understanding, and consciousness of the precautionary measures and proper responses before, during, and after the case of an actual fire. This indicates that regardless of gender differences, both sexes ensure their safety. It also denotes that the school and community provide equal opportunities to participate in activities to strengthen fire safety insensitivity. Based on their

family monthly income, both groups of respondents with higher and lower family income levels have demonstrated fire safety to a great extent. It indicates that they can successfully implement their knowledge, understanding, and consciousness into action. This means that regardless of the family monthly income of the students, they are capable of responding before, during, and after the events of the fire. Most respondents receive equal support and opportunities from the school to practice their understanding and avoid the possible hazards and dangers, minimizing their vulnerability to fire disasters.

The difference in the awareness of fire safety before, during, and after an actual fire of STEM students is presented in Table 3. There is no significant difference in the level of awareness [ $U=717.5$ ,  $p=0.052$ ] of fire safety of STEM students before [ $U=644.0$ ,  $p=0.052$ ], during [ $U=837.0$ ,  $p=0.976$ ], and after [ $U=828.5$ ,  $p=0.901$ ] a fire when they are grouped according to sex. There is no significant difference in the level of awareness [ $U=805.5$ ,  $p=0.197$ ] of fire safety of STEM students before [ $U=841.0$ ,  $p=0.342$ ], during [ $U=887.0$ ,  $p=0.600$ ], and after [ $U=888.5$ ,  $p=0.582$ ] a fire when they are grouped according to family monthly income.

Table 3. The Difference in the Level of Awareness of Fire Safety Before, During, and After an Actual Fire of STEM Students of Public High Schools

Variable	Sex			Family Monthly Income		
	U	z	p	U	z	p
Before	644.000	-1.943	0.052	841.000	-0.950	0.342
During	837.000	-0.030	0.976	887.000	-0.524	0.600
After	828.500	-0.124	0.901	888.500	-0.550	0.582
Awareness	717.500	-1.222	0.222	805.500	-1.290	0.197

*Note:* The difference is significant when  $p \leq 0.05$

The results demonstrate that awareness of fire safety before, during, and after a fire is not influenced by a person's sexual orientation. The sexual orientation of Grade 12 STEM students in a public high school does not significantly influence the knowledge, understanding, and consciousness of the necessary measures and responses before, during, and after an actual fire. Both males and females are equally conscious of fire safety. When grouped based on family monthly income, students have similar levels of fire safety awareness. Moreover, the students' monthly income is not critical in determining their knowledge, understanding, and consciousness of the appropriate responses to take before, during, and after a fire.

The difference in the extent of fire safety practices before, during, and after an actual fire of STEM students is presented in Table 4. No significant differences were found in the extent of fire safety practices [ $t(92)=0.069$ ,  $p=0.945$ ] of STEM students before [ $t(92)=0.363$ ,  $p=0.718$ ], during [ $t(92)=0.552$ ,  $p=0.582$ ], and after [ $t(92)=0.609$ ,  $p=0.544$ ] a fire when they are grouped according to sex. There is no significant difference in the extent of fire safety practices [ $t(92)=0.994$ ,  $p=0.323$ ] of STEM students before [ $t(92)=1.449$ ,  $p=0.151$ ], during [ $t(92)=1.101$ ,  $p=0.274$ ], and after [ $t(92)=1.639$ ,  $p=0.105$ ] a fire when they are grouped according to family monthly income.

Table 4. Difference in the Extent of Fire Safety Practices Before, During, and After an Actual Fire of STEM Students of Public High Schools

Variable	Sex			Family Monthly Income		
	t	df	p	t	df	p
Before	0.363	92	0.718	1.449	92	0.151
During	0.552	92	0.582	1.101	92	0.274
After	0.609	92	0.544	1.639	92	0.105
Practices	0.069	92	0.945	0.994	92	0.323

Note: The difference is significant when  $p \leq 0.05$

The results show that sex has no bearing on the extent to which fire safety a student practices. Both males and females have the equal capability of implementing fire safety into practice before, during, and after the case of an actual fire. This conveys that regardless of sex, both males and females can demonstrate the proper responses to prevent, stop, and delay to minimize the possible dangers, making them less susceptible to actual fire events. Regarding family monthly income, the extent of fire safety practices of Grade 12 STEM students in public high schools is unaffected by their monthly income. It implies that, regardless of student families' monthly income, it did not significantly determine their ability to demonstrate fire safety implementation into practice.

There is a significant relationship between the level of awareness and the extent of fire safety practices [ $r_s(92)=0.625, p=0.000$ ] of STEM students. Table 5 shows the results.

Table 5. Relationship between Level of Awareness and Extent of Fire Safety Practices of STEM Students of Public High Schools

Variable	$r_s$	df	p
Awareness x Practice	0.625*	92	0.000

Note: relationship is significant when  $p \leq 0.05$

The results suggest that there is a positive and substantial association among STEM students in Grade 12 at public high schools between the level of awareness and the extent of fire safety practices. The null hypothesis is rejected, which asserts that there is no significant relationship between the level of awareness and extent of fire safety practices of Grade 12 STEM students in public high schools. Students who possess knowledge, understanding, and consciousness of fire safety will likely demonstrate the implementation of proper responses to prevent, stop, and delay the dangers of fire before, during, and after an actual event of a fire. When students develop a deep understanding and consciousness of their knowledge of fire safety, it likely affects their behavior or practices. As the students become more aware of fire safety, they become more confident in implementing this awareness into practice. Therefore, the great extent of practice is the result of a very high awareness of fire safety among Grade 12 STEM students.

## Discussion

As to the awareness of fire safety before, during, and after an actual fire among STEM students of public secondary schools, results denote that, as a whole, students have a strong foundation of safety measures, precautions, preparedness, and responses in the incident of fire. Furthermore, these fundamentals of fire safety were learned from their engagement in DRRR's Most Essential Learning Competencies, other academic programs of the Department of Education inside the classroom, and orientation programs outside the classroom with the help of the Bureau of Fire and Protection, which may contribute to their skills and practices during the actual event. The result supports the claim of Yeturu et al.

(2016) that before a fire incident occurs, students are highly aware in terms of the proper evacuation procedures, alerting people, emergency numbers to call, and (Anyanwu et al. (2016) various fire extinguishers available. In addition, Meng et al. (2016) also showed that most students obtained their knowledge and acquired awareness of fire safety through school organization campaigns, which indicates that the Department of Education's program in schools has successfully strengthened students' fire safety awareness. Likewise, this conforms to the data obtained in the study of Rogayan et al. (2022), where students are highly aware of disaster preparedness in case of fire; Ventura & Madrigal (2020) before, during, and after a disaster. Moreover, (2015) and Kulkarni et al. (2016) found that respondents have adequate knowledge of fire safety during the event of fire. Furthermore, Kulkarni et al. (2016) emphasized that respondents knew precisely what to do in the occurrence of the fire incident, knew how to use the fire extinguishers properly, knew the fire emergency number, correctly identified the location of the evacuation map, and were aware of one type of firefighting equipment that was present in the institution. The results of this study differ from the study conducted by Noor et al. (2022) that victims of fire incidents in school showed deficient awareness of fire prevention; Kishoyian et al. (2021), that students do not fully understand all of the fire safety rules' processes, such as fire safety preparedness, presence of fire response team, exit plan, escape route, and importance of assembly point; (Seyedin et al., 2020) that students are unaware of evacuation plan; (Kihila, 2017) that students are unaware of fire responders to call, fire responders contact information and fire assembly points; and Yeturu et al. (2016) claims that respondents' low awareness on the different types of fire and the "PASS" method of fire control. In particular, in terms of sex, the results are supported by the study of Noh and Park (2022); Kulkarni et al. (2016), citing Musigapong and Phanprasit (2013), revealing that knowledge of fire safety is not distinct to a specific sex. Males and females have the same level of fire safety awareness. This implies that regardless of gender orientation, the Grade 12 STEM students strive to be conscious enough to ensure personal safety in case of a fire incident. Meanwhile, the results conform with the findings of Cvetković et al. (2022), where the household monthly income did not affect the individual's fire prevention awareness, and AlWaqfi et al. (2022), where regardless of the household family income, student's fire safety awareness is not different among the respondents. This indicates that the programs and academic activities provided to the students maintain their fire safety knowledge, understanding, and consciousness. Furthermore, in the context of public schools, the results of this study indicate maintaining and strengthening fire safety awareness before, during, and after actual fire for a better and safer school environment for the learners.

The results in the extent of fire safety practices before, during, and after an actual fire may be attributed to the fire drill conducted by the public schools at the beginning of the school year, practicing evacuation procedures. Similarly, according to the study of Rogayan et al. (2022), respondents often practiced fire safety measures, such as evacuation procedures at least twice a year, which is essential for students in case of fire. Paño et al. (2015) also added that most of the university respondents, during a fire, proceed to the assembly point and conduct a roll call or body count to ensure nobody is left inside the building. The results vary from the study of Kihila (2017), which demonstrated that the respondents' level of practice was low and that most of them could not use the facility's firefighting equipment and did not participate in training programs for firefighting and preventive measures. Kishoyian et al. (2021) never practiced fire drills in their institution. Anyanwu et al. (2016) also revealed low fire safety implementation practices during a fire. It also stated that even though the respondents were aware of the fire safety guidelines, most have yet to respond to the need to call the responders. Regarding sex, the results confirm the findings of Kishoyian et al. (2021), in which men and women could equally respond to a fire outbreak during a fire. This means that any gender has the same

responsibility to prioritize their safety, and females are not helpless and less capable of protecting themselves in disasters like fire. In addition, females' physical vulnerability may reduce their ability to respond. However, it increases sensitivity to disaster risk. While women immediately called for help from the fire department and evacuated, men were more concerned with fighting the fire and identifying its origin (Tyler & Fairbrother, 2018). Meanwhile, it contravenes the claim of Nilson & Bonander (2020) regarding low-income families showing a low ability to respond to fire and follow proper evacuation procedures during fire incidents; Wood et al. (2016) assert that a small percentage of the respondents in the lower income households have a fire escape plan but have not shared it with the family and AlWaqfi et al. (2022) where students with higher household monthly income have better practices in fire safety and prevention. Overall, in the context of public schools, the results of this study suggest that teachers' instructions should focus not only on the acquisition of fundamental knowledge, understanding, and consciousness of fire safety but also on the implementation into practice. In addition, further research is needed to understand the extent of fire safety practices fully, and the results obtained can be used to improve the implementation of students' consciousness about fire safety to respond appropriately to fires and create campaigns highlighting fire safety practices among the general public.

Regarding the difference in the level of awareness of fire safety before, during, and after an actual fire of STEM students, no significance was found when respondents were grouped according to sex and monthly family income. The results obtained support the claim of Musigapong and Phanphasit (2013), cited in Kulkarni et al. (2016), that there are no differences in the level of KAP in terms of fire safety. Both sexes are responsible for being aware of the proper fire safety procedures at all times, before, during, and after a fire. The results vary from the study of Zhang et al. (2022), which revealed a significant difference in the comprehension of fire safety awareness between males and females. Males scored higher in terms of firefighting, alarm, and escape equipment during a fire. Moreover, the results of Ventura & Madrigal (2020) revealed a significant difference in disaster preparedness awareness and Lee et al. (2021) fire safety awareness, with females having higher levels than males. Furthermore, Cuesta et al. (2022) emphasized that females were more aware of the results and their potential consequences after a disaster like a fire. Generally, because expectations for men and women are typically predicted by stereotypes, various gender roles may be reinforced during disasters. This study's results suggest strengthening the fire safety education in public schools. Awareness campaigns should be designed to cater to both males and females equally, as both genders have an equal responsibility to prevent and suppress fires and ensure their safety during emergencies. Additionally, the study highlights the importance of continuous fire safety education and adherence to quarterly drills, not only on earthquake drills but also fire drills, as awareness may fade over time without consistent reinforcement. Regarding family monthly income, the results support the claim of Cvetković et al. (2022) that understanding of fire safety and readiness for a fire did not substantially depend on persons' monthly income. The results of this study differ from the study of Jeong & Park (2015), which concluded that low-income respondents show the lowest fire safety awareness, and Wood et al. (2016) found limited awareness of fire safety in lower-income individuals during fire incidents. Low-income individuals are more likely to be susceptible to fire incidents than those with high incomes. Moreover, Shai (2006), cited in Cvetković et al. (2022), mentioned that people with low socioeconomic origin are the least informed and least prepared in case of fire incidents. This also implies that men and women are vulnerable to disasters in different ways, and factors such as sex and family monthly income do not significantly impact an individual's level of awareness. The results suggest that both men and women and individuals with lower and higher family incomes have an equal ability to process and

respond to information in their environment. There is a need for further research to determine other aspects that may have a more significant influence on fire safety awareness with sex and family monthly income. Furthermore, in the context of a public school, this signifies that teachers' instruction should deeply strengthen the acquisition of knowledge, understanding, and consciousness of the fundamental concepts of fire.

No significant difference was found in the extent of fire safety practices before, during, and after an actual fire of STEM students of public secondary schools. The results support Kishoyian et al. (2021), who found out that males and females could respond effectively during a fire outbreak, giving similar duties regardless of sex. Disasters may not be gender-neutral and may affect both men and women differently; however, female's physical vulnerability may have contributed to their reduced ability to respond during fire disasters Cvetković et al., (2022). Contrastingly, Nilson & Bonander's (2020) study concluded that about sex, there is a difference between males and females in terms of fire safety practices, with males showing higher scores than females and implying that males are more capable of demonstrating fire safety prevention and suppression, such as stopping the ignition of fire, hindering fire growth, and initiating and completing evacuation. Additionally, a significant difference was observed in the study of Ventura & Madrigal (2020), where females show a much greater practice of disaster preparedness during a fire than males. Their results indicate a need to highlight the implementation of awareness by strengthening hands-on learning and drills. Meanwhile, regarding family monthly income, the findings of Nilson & Bonander (2020) show that low-income families exhibit fewer fire safety practices than middle- or high-income families. The researchers concluded that high-income families' vulnerability to fire is low. However, they also showed low ability to respond to fire and follow proper evacuation procedures during fire incidents. They added that low-income groups are unlikely to manifest fire safety practices compared to middle or high-income families. In addition, Wood et al. (2016) revealed that fire safety practices were insignificant in lower-income individuals. The researchers found that those with higher incomes are more likely to have better practices. According to the results of this study, it can be implied that socioeconomic factors such as sex and family monthly income do not significantly predict an individual's fire safety practices. This suggests that promoting fire safety behaviors may not require targeted interventions solely based on these variables. Instead, public schools' preventive and response measures could focus on developing instructions, programs, and activities that are inclusive to individuals, regardless of their family monthly income and sex orientation. Moreover, further research is needed to confirm these implications and identify potential factors influencing the comparative analysis of socioeconomic status and sex.

The significant relationship between the level of awareness and extent of fire safety practices of STEM students in public high schools is supported by the study by Kim (2015), Park & Eo (2015), Cogut et al. (2019), and Wagura (2019) where there is a direct correlation between fire safety awareness and the implementation of measures to control the possible effects of fire. It indicates that fire safety awareness greatly influences their practices, concluding that awareness is vital in implementing fire safety practices. Higher awareness is significantly linked to better practices. Kishoyian et al. (2021), referring to Sutton and Tierney (2006), showed that improved fire safety practices result from more awareness. The findings of this study highlight the importance of fire safety awareness in preventing and adequately responding to fire incidents in schools. The significant correlation between fire safety awareness and the extent of practices suggests that schools with higher levels of fire safety awareness among students are less susceptible to fire and less likely to experience fire incidents. Based on these findings, public schools can take several implications to improve their fire safety measures. Public schools should prioritize fire safety education in their DRRR subject. This can be achieved by emphasizing fire

safety topics like any other disasters, such as earthquakes, conducting regular fire drills, and ensuring that firefighting equipment is also used. Given this assumption, the KAP theory is validated in the study's results, which show that the level of fire safety awareness is associated with the extent of fire safety practices. In the context of fire safety, the study assumes that individuals with a higher level of knowledge about fire safety are more likely to get involved in practices such as following good school housekeeping, using fire extinguishers, and following proper evacuation procedures. The study's findings also suggest that schools with higher levels of awareness are less likely to experience fire incidents. The KAP Theory plays a significant role in explaining the importance of knowledge, understanding, and consciousness in students' fire safety practices. Students must first strengthen their knowledge, understanding, and consciousness to develop the proper skills and transfer this awareness into practice.

## **CONCLUSION**

The consciousness of fire safety significantly corresponds to the development and implementation of knowledge and understanding into practices, which will help heal fire safety insensitivity and help improve proper responses toward the individual safety of students at all times. In order to be less susceptible to the dangers of fire, students must first maintain their awareness and strengthen to improve their practices toward fire safety. A fire safety worksheet may provide students with valuable information to increase their ability to appropriately respond and suppress the fire, ensure their safety, and minimize the possible effects of fire on the school community.

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Author Contribution:	Author 1: Conceptualization and Visualization, Writing the Original Draft, Outlining Methodology; Gathering, Secondary Data, Discussing Draft Analysis, Interpretation, and Implications Framing Initial Conclusion
	Author 2: Conceptualization, Writing and Updating the Review of Literature, Validation of the tool, Editing the Draft Manuscript, Formal Analysis, Editing and Formatting APA References Style, Validation, and Supervision
	Author 3: Conceptualization, Writing assistance, Reviewing the Manuscript, Analysis and Interpretation of Data, Improvement of structure, Perspective sharing, Validation and Supervision
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## REFERENCES

- AlWaqfi, S. A. A., Ng, Y. G., Lim, P. Y., & Tamrin, S. B. M. (2022). Factors associated with knowledge, attitude, and practices on fire safety and its prevention among hostel occupants in a higher learning institution. *Malaysian Journal of Medicine and Health Sciences*, 18(SUPP9), 8–20. <https://doi.org/10.47836/mjmhs18.9.2>
- Anyanwu, B. O., Akaranta, O., & Nwaogazie, I. L. (2016). View of Evaluation of Fire Safety Management in a Higher Education Institution: A case study of University of Port Harcourt. *Archives of Current Research International*, 4(4), 1–13. <https://doi.org/10.9734/ACRI/2016/27684>
- Cogut, G., Webster, N. J., Marans, R. W., & Callewaert, J. (2019). Links between sustainability-related awareness and behavior: The moderating role of engagement. *International Journal of Sustainability in Higher Education*, 20(7), 1240–1257. <https://doi.org/10.1108/IJSHE-09-2018-0161/FULL/XML>
- Cuesta, A., Alvear, D., Carnevale, A., & Amon, F. (2022). Gender and public perception of disasters: a multiple hazards exploratory study of EU citizens. *Safety*, 8(3), 1–17. <https://doi.org/10.3390/safety8030059>
- Cvetković, V. M., Dragašević, A., Protić, D., Janković, B., Nikolić, N., & Milošević, P. (2022). Fire safety behavior model for residential buildings: Implications for disaster risk reduction. *International Journal of Disaster Risk Reduction*, 76, 102981. <https://doi.org/10.1016/J.IJDRR.2022.102981>
- Jeong, M. H., & Park, I. (2015). Fire safety consciousness indicators development and national fire safety consciousness research. *Fire Science and Engineering*, 29(4), 89–94. <https://doi.org/10.7731/kifse.2015.29.4.089>
- Kihila, J. M. (2017). Fire disaster preparedness and situational analysis in higher learning institutions of Tanzania. *Jambá: Journal of Disaster Risk Studies*, 9(1), 9. <https://doi.org/10.4102/JAMBA.V9I1.311>
- Kim, S. Y. (2015). Safety awareness and safety practice behavior of college students. *Journal of Digital Convergence*, 13(2), 279–289. <https://doi.org/10.14400/JDC.2015.13.2.279>
- Kishoyian, G., Kioko, J., & Muindi, E. M. (2021). Fire disaster preparedness among students in Kenya medical training colleges in eastern Kenya. *Journal of Health, Medicine and Nursing*, 6(3), 34–48. <https://doi.org/10.47604/JHMN.1301>
- Kulkarni, R. S., Giri, P. A., & Gangwal, P. R. (2016). Knowledge and practices regarding fire safety amongst health care workers in a tertiary care teaching hospital in Marathwada region of Maharashtra, India. *International Journal Of Community Medicine And Public Health*, 3(7), 1900–1904. <https://doi.org/10.18203/2394-6040.IJCMPPH20162062>
- Kurata, Y. B., Ong, A. K. S., Prasetyo, Y. T., Dizon, R. M., Persada, S. F., & Nadlifatin, R. (2023). Determining factors affecting perceived effectiveness among Filipinos for fire prevention preparedness in the National Capital Region, Philippines: Integrating Protection Motivation Theory and extended Theory of Planned Behavior. *International Journal of Disaster Risk Reduction*, 85, 103497. <https://doi.org/10.1016/J.IJDRR.2022.103497>

- Lee, S.-B., Kim, E.-M., & Kong, H.-S. (2021). Latent profile analysis of high school students' fire safety awareness. *International Journal of Advanced Smart Convergence*, 10(4), 124–133. <https://doi.org/http://dx.doi.org/10.7236/IJASC.2021.10.4.124>
- Meng, D., Yao, H. W., Cui, T. Y., & Sun, Y. C. (2016). Survey and countermeasure discussion of college students' campus fire safety. *Procedia Engineering*, 135, 25–28. <https://doi.org/10.1016/J.PROENG.2016.01.074>
- Nilson, F., & Bonander, C. (2020). Household fire protection practices about socio-demographic characteristics: Evidence from a Swedish National Survey. *Fire Technology*, 56(3), 1077–1098. <https://doi.org/10.1007/S10694-019-00921-W/FIGURES/2>
- Noh, G. O., Park, M. J., & Prof, A. (2022). The effect of fire-safety education on college students' knowledge and safety competency. *International Journal of Advanced Culture Technology*, 10(1), 138–143. <https://doi.org/10.17703/IJACT.2022.10.1.138>
- Noor, N. N. M., Ahzahar, N., Zakaria, I. B. Bin, Hashim, S. Z. B., & Azzmi, N. M. (2022). *Creating the Sustainability Environment for Students Well-being: The Awareness Level of Victims after Fire Incident in Private Islamic School*. 26, 121–133. <https://doi.org/10.1108/S2040-726220220000026010>
- Ogbonna, C. I., & Nwaogazie, I. L. (2015). Fire safety preparedness in workplaces in Port Harcourt, Nigeria. *International Research Journal of Public and Environmental Health*, 2(8), 112–121. <https://doi.org/http://dx.doi.org/10.15739/irjpeh.028>
- Paño, J., Abao, E. D., & Boholano, H. (2015). Higher education institutions' risk reduction implementation: victor or victim? *Management and Administrative Sciences Review*, 4(4), 647–678.
- Park, S.-Y., & Eo, Y.-S. (2015). A study on adult learners' safety awareness and safety practice behavior: focusing on 「Civic Safety Culture College」 in Changwon City. *Journal of Fisheries and Marine Sciences Education*, 27(6), 1619–1627. <https://doi.org/10.13000/JFMSE.2015.27.6.1619>
- Rogayan, D. V., Mar, R., Cuarto, D., Louise, M., & Ocsan, A. (2022). Are ninth-grade students aware and prepared when disaster strikes? *Journal of Science and Education (JSE)*, 2(2), 65–80. <https://doi.org/10.56003/JSE.V2I2.96>
- Salita, C., Liwanag, R., Tiongco, R. E., & Kawano, R. (2019). Development, implementation, and evaluation of a lay responder disaster training package among school teachers in Angeles City, Philippines: using Witte's behavioral model. *Public Health*, 170, 23–31. <https://doi.org/10.1016/J.PUHE.2019.02.002>
- Seyedin, H., Dowlati, M., Moslehi, S., & Sakhaei, F. S. (2020). Health, safety, and education measures for fire in schools: A review article. In *Journal of education and health promotion* (Vol. 9, Issue 1). J Educ Health Promot. [https://doi.org/10.4103/JEHP.JEHP\\_665\\_19](https://doi.org/10.4103/JEHP.JEHP_665_19)
- Tyler, M., & Fairbrother, P. (2018). Gender, households, and decision-making for wildfire safety. *Disasters*, 42(4), 697–718. <https://doi.org/10.1111/DISA.12285>
- United Nations Office for Disaster Risk Reduction (UNDRR). (2015). *Sendai Framework for Disaster Risk Reduction 2015-2030*. <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>
- Ventura, G. L., & Madrigal, D. V. (2020). Awareness and practices on disaster preparedness of students of a public high school in antique. *Philippine Social Science Journal*, 3(2), 45–46. <https://doi.org/10.52006/MAIN.V3I2.210>
- Wagura, V. N. (2019). *A Study of Fire Safety within Kariobangi Light Industries*. <http://localhost/xmlui/handle/123456789/5126>
- Wood, R. L., Teach, S. J., Rucker, A., Lall, A., Chamberlain, J. M., & Ryan, L. M. (2016). Home fire safety practices and smoke detector program awareness in an urban

- pediatric emergency department population. *Pediatric Emergency Care*, 32(11), 763–767. <https://doi.org/10.1097/PEC.0000000000000943>
- Yeturu, S. K., R, A., Janakiram, C., Joseph, J., & Pentapati, K. C. (2016). Assessment of knowledge and attitudes of fire safety-an institution-based study. *Journal of Pharmaceutical Sciences and Research*, 8(11), 1281–1284. [moz-extension://b7cd2441-0115-4790-b98b-3d9a3b487d42/enhanced-reader.html?openApp&pdf=https%3A%2F%2Fwww.jpsr.pharmainfo.in%2FDocuments%2FVolumes%2Fvol8Issue11%2Fjpsr08111607.pdf](https://doi.org/10.26907/2474-4690.2016.081112811284)
- Zhang, C., Hong, W. H., & Bae, Y. H. (2022). Fire Safety knowledge of firefighting equipment among local and foreign university students. *International Journal of Environmental Research and Public Health* 2022, Vol. 19, Page 12239, 19(19), 12239. <https://doi.org/10.3390/IJERPH191912239>