Fire Safety Management in a Vocational and Technical College in Guizhou Province, People's Republic of China: Basis for Enhancement

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Abstract – *This study investigates the fire safety management systems and practices at the Guizhou Vocational and Technical College of Communications in Guizhou Province, PRC. Fires pose a critical threat to the safety of educational institutions, potentially causing harm to students, staff, and infrastructure. Effective fire safety management is vital in minimizing risks and ensuring a safe learning environment. The research assesses the existing fire safety measures, including regular fire drills, equipment maintenance, and safety training. Additionally, it explores the role of fire safety committees, updated management plans, and the dedication of safety teams responsible for handling emergencies. Key findings indicate that the Guizhou College has a robust fire safety management system with a committed leadership and continuous updates to training and inspection programs. The college prioritizes fire safety, evident in its comprehensive safety features and the annual review of its management plan. The study identifies a significant relationship between the thoroughness of fire safety management and the effectiveness of the fire safety officers. Areas for enhancement include regular training for safety officers, investigating fire incidents to determine their causes, stringent enforcement of fire safety regulations, and periodic updating of fire safety education. The research also proposes an action plan to further enhance current practices, ensuring a safer educational environment.*

Keywords – *Fire Safety Management, Vocational College, Educational Institutions, Safety Training, Risk Assessment.*

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INTRODUCTION

Fires can have devastating effects. During a fire, flames and smoke can spread quickly and cause severe damage to people and property. Proper implementation of fire safety management is a key to providing total fire safety. Effective fire safety measures and procedures can reduce the risk of injury and save lives.

Fire safety management is the process of developing and implementing policies and procedures to reduce the risk of fire and to protect people and property in the event of a fire. It is a critical component of any business or organization, as fires can cause significant damage to property and loss of life. Including the secure and productive learning environment in educational institutions. The risk of fire incidents can pose a significant threat to the safety of students, staff, and the overall infrastructure. Hence, it is essential to establish comprehensive fire prevention measures and ensure their effective implementation (Kaushal, 2023).

One key component of fire safety in educational institutions is conducting regular fire drills. These drills help familiarize students and staff with evacuation procedures and enable them to respond calmly and efficiently in case of a real emergency. Additionally, ensuring that all fire safety equipment, such as fire alarms and extinguishers, are regularly maintained and in working condition is vital. Another important aspect is educating students and staff about fire hazards and the importance of fire safety practices. This can be done through workshops, training sessions, or informational campaigns to raise awareness and promote a culture of safety within the institution.

In the event of a fire, having designated fire wardens or safety officers who are trained to handle such situations can make a significant difference in ensuring a prompt and organized response. Furthermore, establishing clear communication protocols and emergency contacts can help facilitate timely evacuation and coordination with external emergency services if needed. By prioritizing fire safety measures and fostering a proactive approach toward prevention and preparedness, educational institutions can create a safer environment for everyone on campus.

According to Li and Pang [2], In accordance with the applicable provisions of the "Fire Safety Regulations

of Colleges and Universities," colleges and universities should prioritize raising internal teacher, student, and employee fire awareness. They should also bolster their public relations and education management efforts related to fire safety education, and establish a foundation for the seamless implementation of a safety management system. Second, by building on the earlier improved safety management technique, colleges and institutions can create complementary incentive systems. To achieve the successful implementation of the new safety management system, college counsellors must be closely supervised and managed in conjunction with student departments, other departments, and university security organizations.

Guizhou Vocational and Technical College of Communications has a comprehensive fire safety management system in place, which includes a fire safety committee headed by the college president which is a fire safety management plan that is reviewed and updated annually. Part of the plan is a fire safety training program for all staff and students with a fire safety inspection program that is conducted regularly. There is also a fire safety equipment maintenance program that ensures that all fire extinguishers, fire alarms, and other fire safety equipment are in good working order.

Guizhou Vocational and Technical College of Communications (GVTC) also has a dedicated fire safety team that is responsible for responding to fire emergencies. The team is regularly trained on fire safety procedures and has the necessary equipment to extinguish fires and rescue people from burning buildings. In addition to its fire safety management system, GVTC also has a number of fire safety features in its buildings and on its campus, including fire alarms and sprinklers in all buildings and fire extinguishers located throughout the campus. Exits that are clearly marked and well-maintained and fire lanes that are kept clear of obstructions are in place.

GVTC takes fire safety very seriously and is committed to providing a safe environment for its staff and students. The college's fire safety management system and features are designed to prevent fires from starting, to detect fires early if they do start, and to evacuate people safely from burning buildings. Fire occurs in colleges and universities when there are a large number of students, high living density, certain fire risk in teaching and experiment, low fire resistance grade of some buildings, aging electrical lines and other reasons. Subjectively, it is caused by the weak awareness of fire safety, violation of school management regulations and lack of basic fire safety knowledge.

Colleges and universities have an important position and influence in the society. Strengthening fire safety management is not only the responsibility to the members of the school, but also to the society. Colleges and universities should play an exemplary role, convey the importance and methods of safety management to the society, and have a positive impact on the construction of a wider safety culture in the society.

This study aimed to analyze the current situation of fire safety management in Chinese universities. More specifically Guizhou Vocational and Technical College of Communications conducted an in-depth analysis according to the current form, analyze the root causes of these deficiencies one by one, discuss how the local government further improve the emergency capacity, give full play to the functions of government, and make scientific and effective decisions.

Measuring fire safety management could improve its performance. The researcher, as a supervisor in the fire safety office at Guizhou Vocational and Technical College of Communications (GVTC), Guizhou Province, People's Republic of China, would like to look into the implementation of fire safety management and see how it affected the performance of fire safety personnel.

OBJECTIVES OF THE STUDY

The study generally aimed to assess the implementation of fire safety management at Guizhou Vocational and Technical College of Communications (GVTC), Guizhou Province, People's Republic of China. More specifically to: describe the profile of the respondents in terms of category, assess the implementation of fire safety management and performance of fire safety personnel, test the significant difference in the implementation of fire safety management and performance of fire safety personnel when respondents were grouped according to category; test the significant relationship between the implementation of fire safety management and performance of fire safety personnel, propose and action plan to enhance the implementation of fire safety management and performance of fire safety personnel at Guizhou Vocational and Technical College of Communications, Guizhou Province, PROC.

MATERIALS AND METHODS

Research Design

The descriptive research design was employed to determine Fire Safety Management in Guizhou

Vocational and Technical College of Communications and the effectiveness of Fire Safety Officers in the performance of their duties. Calderon (2008), the descriptive approach, sometimes referred to as statistical research, provides information about the features and data of the population or phenomenon under study. For computing frequencies, averages, and other statistical values, this research methodology is employed. Often, doing a survey investigation is the best course of action before publishing a descriptive study. Additionally, this study followed a quantitative approach. According to Babbie (2010), quantitative methods emphasize objective measurements and the statistical, mathematical, or numerical analysis of data collected through the use of polls, questionnaires, and surveys, or by manipulating pre-existing statistical data via computational techniques.

Participants of the Study

Participants of the study were school employees and students of Guizhou Vocational and Technical College of Communications. A total of 80 respondents or 100% of the total population of school personnel and administrators were selected and 240 questionnaires were distributed to the students per college but only 237 questionnaires were returned.

Instrument

The study utilized a researcher-made questionnaire taken from previous researches, research journals, and information taken from the Guizhou Vocational and Technical College of Communications. Part 1 was about the category of the respondents, Part 2 tackled fire safety management referred to the Tarlengco [5] as cited in Safety Culture Fire Safety Plan Article and Part 3 was about the effectiveness of fire safety officers from Railing [6] listed in the article "The Importance of using a Fire Performance Safety Checklist". The questionnaire was submitted to the research professor for approval.

Data Gathering Procedure

After the approval of the questionnaire by the research professor, it was subjected for validation of the experts in fire safety management in Guizhou Province, Peoples Republic of China. After the validation of the questionnaire, the researcher submitted a letter of request to the management of Guizho Vocational College asking permission to conduct the survey. To obtain the data from the respondents, the questionnaire was distributed to the administrators and students per college. Given an enough time to answer the survey, respondents returned the survey questionnaire that was analyzed and interpreted using statistical treatment.

Data Analysis

To perform data analysis, the following statistical tools were used. Weighted means and ranking were used to assess the implementation of fire safety management and performance of fire safety personnel and the Effectiveness of the Performance of Fire Safety Officers. The result of the Shapiro-Wilk Test revealed that the p-values of the main variable was greater than 0.05 which means that the data set is normally distributed. Therefore, Mann Whitney U test for two groups were used as part of the non-parametric tests to determine the significant differences. Likewise, Pearson product Moment Correlation was used to test the association of the two variables. In addition, all data were treated using a statistical software known as IBM SPSS version 29 to further interpret the result of the study using an alpha level of 0.05 and 0.01.

Ethical Considerations

The study was carried out in accordance with ethical standards. Prior to the data collection process, consent will be obtained from the respective authorities of the selected municipalities. Similarly, permission from respondents was ensured. In which the researcher discussed the parameters of confidentiality with the respondents. Correspondingly, the researcher ensured that the participants fully understood what they were being asked to do and were informed of any potential consequences of their participation. This undertaking was accomplished by attaching an information sheet to the research questionnaire and distributing it to everyone who had been invited to participate. The information sheet also highlighted that participant responses would be kept confidential and/or anonymous. Furthermore, respondents were given sufficient time during the data collection process to complete the questionnaire in their true thoughts and opinions.

RESULTS AND DISCUSSION

Table 1 presents the respondent's assessment of fire safety management. The composite mean of 3.52 indicates that it is highly implemented in general. Among the items cited, planning and organizing the start of fire safety maintenance work and conducting annual plans and quarterly inspections got the highest mean score of 3.63, followed by rely on professional fire

technical maintenance units to carry out comprehensive maintenance of the school's firefighting facilities and equipment to ensure the effectiveness of firefighting facilities, strengthen the investigation of fire hazards and eliminate fire safety hazards and create an atmosphere in which everyone pays attention to fire safety by publicizing fire laws and regulations to all teachers and students.

Table 2
Fire Safety Management

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. Planning and organizing the start of fire safety maintenance work and conducting annual plans and quarterly inspections.	3.63	Highly Implemented	1
2. Inspect and maintain fire fighting equipment to ensure that fire fighting facilities and equipment are in good condition.	3.48	Implemented	10
3. Strengthen the investigation of fire hazards and eliminate fire safety hazards	3.54	Highly Implemented	3.5
4. Formulate escape and firefighting plans to do emergency rescue work.	3.52	Highly Implemented	6
5. Create an atmosphere in which everyone pays attention to fire safety by publicizing fire laws and regulations to all teachers and students	3.54	Highly Implemented	3.5
6. Prevention first, combination of prevention and elimination. Strengthen the coordination with the professional fire rescue departments of the government, and carry out fire practical exercises for students regularly or irregularly every semester	3.50	Highly Implemented	8
7. Develop and improve the fire management system of facilities.	3.50	Highly Implemented	7
8. Implement special funds to improve the construction of campus fire infrastructure.	3.44	Implemented	11
9. Rely on professional fire technical maintenance units to carry out comprehensive maintenance of the school's fire fighting facilities and equipment to ensure the effectiveness of fire fighting facilities.	3.55	Highly Implemented	2
10. Set up the school volunteer fire team to conduct regular or irregular inspections of the school and give timely feedback when problems are found	3.49	Implemented	9
11. Ensure that the coverage rate of fire safety knowledge reaches 100% through the combination of safety education library and online learning.	3.52	Highly Implemented	5
Composite Mean	**3.52**	**Highly Implemented**	

Legend: 3.50 – 4.00 = Highly Implemented; 2.50 – 3.49 = Implemented; 1.50 – 2.49 = Less Implemented; 1.00 - 1.49 = Not Implemented

Overall, the Fire Safety Management practices in the institution or organization are highly implemented. It is important to maintain and continuously improve these practices to ensure the safety of everyone in the campus or workplace. These results were correlated to Hassanain et al. [7] study, which concludes that Universities and office buildings are regarded as high-risk facility categories in the case of a fire. Required fire safety and preventive procedures reduce the number of fires, injuries, fatalities, and property losses when they are implemented and maintained. Reducing the risk of fire in constructed facilities is one way to accomplish this.

On the other hand, items such as setting up the school volunteer fire team to conduct regular or irregular inspections of the school and give timely feedback when problems are found (3.49), inspecting and maintaining firefighting equipment to ensure that firefighting facilities and equipment are in good condition (3.48) and implement special funds to improve the construction of campus fire infrastructure (3.44) were verbally interpreted as implemented only.

This result was supported by Gao and Li [8], declaring that, as stated in the statement presented, the formation of a school volunteer fire team is a crucial component of a fire safety program. Additionally, having a volunteer fire department at a school can greatly raise knowledge of fire safety and lower the likelihood of school fires. The fire department can help detect potential threats and make sure that fire safety precautions are being properly maintained by conducting routine or sporadic inspections of the school.

The implementation of special funds to improve the construction of campus fire infrastructure also contributes to the measure for ensuring fire safety in schools. According to a study conducted by Dong et al. [9] a thorough fire safety program for schools should include the formation of a volunteer fire squad at the school, the upkeep and inspection of firefighting apparatus, and the allocation of special money for the improvement of fire infrastructure. These actions are widely acknowledged in the literature as efficient means of preventing school fires or lessening their effects.

Table 2 displays the respondent's evaluation of the effectiveness of the performance of fire safety officers. The composite means of 3.54 that there is a very effective performance of safety officers. It is presented that inspecting fire safety equipment regularly and ensuring it is in working order had the highest weighted mean of 3.63, followed by conducting drills to ensure that employees are familiar with evacuation procedures with a weighted mean of 3.60 and monitoring hazardous materials and handling them by safety regulations with a weighted mean of 3.59 which also indicates very effective

The National Fire Protection Association (2020) cited that regularly assessing and making sure that fire safety equipment is in functioning order is the most important thing that fire safety officers can do. This include making sure that sprinklers, alarms, fire suppression systems, and other equipment are operational and compliant with codes. Regular inspections can assist in identifying potential threats and averting fires, according to National Fire Protection.

Moreover, the Occupational Safety and Health Administration [11] added that it also helps to perform drills to make sure staff members understand evacuation protocols. Employees can learn how to react in the event of a fire and find any holes in the evacuation strategy by participating in fire drills. Frequent exercises can also guarantee that staff members are ready and self-assured in their capacity to handle an emergency.

Table 2
Effectiveness of the Performance of Fire Safety Officers

Indicators	Weighted Mean	Verbal Interpretation	Rank
1.Inspect fire safety equipment regularly and ensure it is in working order	3.63	Very Effective	1
2. Educate employees on fire safety procedures	3.53	Very Effective	7
3. Investigate fires to determine their cause	3.48	Effective	11
4.Prepare reports on findings	3.50	Very Effective	9
5.Keep up to date on changes in fire safety regulations	3.52	Very Effective	8
6.Enforce fire safety regulations	3.50	Very Effective	10
7.Develop and implement evacuation plans	3.55	Very Effective	5
8.Conduct drills to ensure that employees are familiar with evacuation procedures	3.60	Very Effective	2
9.Monitor hazardous materials and handle them in accordance with safety regulations	3.59	Very Effective	3
10.Respond to emergencies and provide assistance to those affected	3.47	Effective	12
11.Coordinate with other agencies, such as the police and ambulance service, during emergencies	3.55	Very Effective	6
12.Keep records of all incidents and investigations	3.56	Very Effective	4
Composite Mean	**3.54**	**Very Effective**	

Legend: 3.50 – 4.00 = Very Effective; 2.50 – 3.49 = Effective; 1.50 – 2.49 = Less Effective; 1.00 - 1.49 = Not Effective

Another important metric for evaluating the efficacy of fire safety officers is their ability to monitor hazardous products and handle them in compliance with safety requirements. This entails locating hazardous materials at work, making sure they're stored correctly, and creating procedures for managing and getting rid of them. Fire safety officers monitor hazardous chemicals

and enforce safety laws to help avoid fires and other mishaps [12].

With the overall effectiveness of fire safety officers, there were areas for improvement, such as Investigate fires to determine their cause, with a weighted mean of 3.48 and respond to emergencies and providing assistance to those affected, with a weighted mean of 3.47 indicated effective for fire safety officers

A recent study reinforced the effectiveness of fire safety officers in performing their duties, and the results suggest that they are doing an excellent job. In the study of Wong and Chua [13], one of the most important aspects of preventing and fighting fires is routine maintenance and inspection of fire safety equipment, such as sprinkler systems, smoke detectors, and fire extinguishers. Inspections assist in locating possible equipment problems, such as broken smoke detectors or fire extinguishers that have reached the end of their useful life, which can be quickly fixed to stop fires.

It is significant to remember that the resources and assistance offered by their organization also have a role in how effective fire safety officers are, in addition to their own performance. The study's conclusions show that fire safety officials are carrying out their responsibilities successfully. To further strengthen workplace fire safety, there is, nevertheless, space for improvement in a few areas. Organizations should continue to prioritize fire safety and provide appropriate resources and support to their fire safety officers [14].

Table 3
Difference of Responses in the Implementation of Fire Safety Management of Two Category

Category	F-value	p-value	Interpretation
Fire Safety Management	1.187	0.277	Not Significant

Legend: Significant at p-value < 0.05

Table 3 displays the comparison of responses on table 3 illustrates the comparison of responses on fire safety management when grouped according to category. It was observed that there was no significant difference when grouped according to profile since the obtained p-values all greater than the alpha level. This means that the responses do not differ statistically.

The F-value obtained is 1.187 and the p-value is 0.277. The interpretation of these results is that there is no significant difference in the responses on fire safety management when grouped according to profile. The profiles of the respondents did not have a significant impact on their responses to questions about fire safety management. This finding suggests that fire safety management practices may be consistent across different demographic groups.

According to a recent study published in the Journal of Safety Research by Lopez and Byrd [15], there was no significant difference in fire safety knowledge between men and women. The study analyzed data from over 1,000 participants and found that both genders had similar levels of knowledge when it came to fire safety management. However, the study did find that women were more likely to have smoke alarms installed in their homes than men. This suggests that while there may not be a gender difference in knowledge, there could be differences in behavior related to fire safety. Overall, the study emphasizes the importance of promoting fire safety education and awareness for all individuals regardless of gender.

Table 4
Difference of Responses on the Effectiveness of the Performance of Fire Safety Officers When Grouped According to Profile

Category	F-value	p-value	Interpretation
Effectiveness of the Performance of Fire Safety Officers	0.110	0.740	Not Significant

Legend: Significant at p-value < 0.05

Table 4 illustrates the comparison of responses on the effectiveness of the performance of fire safety officers when grouped according to category between administrators and students. It was observed that there was no significant difference when grouped according to profile since the obtained p-values were all greater than the alpha level. This means that the responses did not differ statistically.

The F-value in the table was 0.110, which was relatively low. The p-value was 0.740, which was higher than the standard threshold of 0.05. Therefore, the statistical analysis concluded that the differences in responses on the effectiveness of the performance of fire safety officers, when grouped according to their profile, were not significant.

In other words, the profiles of the fire safety officers did not appear to have a significant impact on their effectiveness in performing their duties. It is important to note, however, that this conclusion is based solely on the statistical analysis of the data and does not take into

account other factors that may affect the performance of fire safety officers.

A study conducted by Jones et al. [16] found that regular training and instruction on fire safety regulations and practices has been shown to improve the performance of fire safety officers in their tasks. Better decision-making and problem-solving during emergencies can result from including people with diverse backgrounds and experiences. The efficacy of fire safety officers can be affected by a number of elements, such as consistent education and training, proficient communication abilities, and inclusivity and diversity in the workplace. To protect their facilities and residents, building managers and owners must take these elements into account when choosing and assessing fire safety officers.

Table 5
Relationship Between the Fire Safety Management and Effectiveness of the Performance of Fire Safety Officers

Fire Safety Management	r-value	p-value	Interpretation
Effectiveness of the Performance of Fire Safety Officers	0.786**	0.000	Highly Significant

Legend: Significant at p-value < 0.01

Table 5 displays the association between fire safety management and the effectiveness of the performance of fire safety officers. The computed r-values indicate a strong direct correlation and the resulting p-values was less than the alpha level. This means that there was significant relationship between the two variables and implied that the better was the assessment on fire safety management, the more effective was the performance of fire safety officers.

According to the data presented in the table, there was a strong positive correlation (r-value = 0.786) between Fire Safety Management and the Effectiveness of the Performance of Fire Safety Officers. Furthermore, the p-value of 0.000 indicates that this correlation was highly significant.

This means that good Fire Safety Management practices are associated with highly effective performance of Fire Safety Officers. The better the management practices, the more effectively the officers perform their duties.

More investigation is required to prove a causal relationship between fire safety management and the effectiveness of fire safety officers' performance because correlation does not always imply causation. However, the information presented here implies that funding fire safety management strategies could enhance the performance of fire officers and, in turn, improve the security of people and property in high-risk locations. The danger of fire incidents can be considerably decreased by using efficient fire safety management techniques. A thorough fire safety management strategy that include routine inspections, educational initiatives, and equipment upkeep is crucial, according to the report. Furthermore, the significance of implementing a risk-based approach to fire safety management was highlighted in a recent report published by the National Fire Protection Association [10]. In order to lower the likelihood of fire occurrences, the research emphasised the necessity for fire safety officials to perform routine risk assessments and put in place suitable risk mitigation measures.

Table 6
Proposed Action Plan to Enhance Fire Safety Management

Programs/Projects/Activities (PPAs)	Strategy	Performance Indicator	Office Responsible
1. Allocate funds for the improvement and construction of campus fire infrastructure.	Coordinate with the Finance Dept of Guizhou Province through the school management.	Funds for the improvement & construction of camous fire infrastructure allocated.	Finance Dept of Guizhou Province School management. Of Guizhou Vocational and Technical College of Communications
2. Conduct periodic inspection to maintain the quality of firefighting equipment.	Coordinate with the management of Guizhou Vocational and Technical College of Communication through GCVTC Volunteer Fire Brigade	Quality of firefighting equipment maintained through period inspection and maintenance.	Management of Guizhou Vocational and Technical College of Communication GCVTC Volunteer Fire Brigade
3. Encourage more students to be part of the GCVTC Volunteer Fire Brigade to	Coordinate with the management of GCVTC and	Increase in the number of students volunteer to the GCVTC Fire Brigade	Management of GCVTC Student Office Volunteer Fire Brigade

conduct inspection of the school premises and give timely feedback when problems are found to the school management.	Student Office through the Volunteer Fire Brigade		

CONCLUSIONS AND RECOMMENDATIONS

The study concluded that fire safety management in Guizhou Vocational & Technical College in Guizhou Province, PRC, was highly implemented. The majority of participants in the study were students, followed by school administrators and personnel. The Fire Safety Officers were found to be very effective in their roles, with no significant difference in the perception of their performance across different respondent categories. Importantly, there was a demonstrated significant relationship between the rigor of fire safety management implementation and the effectiveness of the Fire Safety Officers. This suggests that enhanced fire safety management practices correlate directly with the improved performance of the officers responsible for enforcing these practices.

For further improvement, the management of Guizhou Vocational and Technical College should conduct regular training and refresher courses for safety officers to bolster their emergency response capabilities and provide assistance during incidents. Rigorous enforcement of fire safety regulations is imperative, and regular maintenance and inspection of facilities should be undertaken to identify potential fire hazards. Staff should be trained to recognize and report possible hazards. Additionally, the recommended action plan should be discussed and evaluated for future implementation. Periodic training and seminars for fire safety officers and key officials are suggested to stay informed about changes in fire safety regulations, and future research might explore the compliance of educational institutions in China with these regulations.

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