

Incidence of Mishap and Level of Awareness on Laboratory Safety Among First Year College Students

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Abstract

The study aimed to determine the level of awareness on laboratory safety among first-year college students of MSU-Sulu. A quantitative descriptive research design was utilized in analyzing the data. The study was conducted with ninety-eight (98) first-year college students of MSU-Sulu that were randomly selected from different courses who were officially enrolled with laboratory subjects and who have experienced laboratory activities. A self-devised Likert Scale questionnaire was constructed to gather the data for the study. The data collected was analyzed using descriptive statistical methods. The findings indicated that most first-year college students had moderate to low awareness of the pictograms posted in the laboratory rooms. Although there was a low rate in terms of mishaps (accidents) that occurred in the academic laboratory, however with the findings provided by the study, it is still highly recommended that further implementation and improvement of lab safety measures to enhance students' awareness and ensure a safe and healthy working environment in the institution. In general, the study's findings reveal a need for further improvement in education and training on laboratory rules and safety in handling laboratory chemicals and equipment.

Keywords: Laboratory safety, College students, Laboratory accidents, Laboratory rules

1. Introduction

As the world of science continuously improves along with technological advances, it is undeniable that various chemical substances are seen inside the laboratory facilities that are not only been dealt with by the researchers of different fields of science but have incredibly long been utilized by universities and schools to educate and to apply the theories and concepts learned from class through experimentation. For this reason, there is a high probability for students to be exposed to hazardous chemicals, so laboratory safety guidelines should be properly taught.

According to Michael's (2019) article titled "Lab Safety: Terrifying Statistics," a significant proportion of laboratory personnel, ranging from 25% to 38%, have experienced accidents or injuries in the laboratory that went unreported to their supervisors or principal investigators. According to Langerman's (2009) findings, the incident that occurred in a university laboratory in Los Angeles, resulting in the unfortunate death of a student, led to the conclusion that a significant number of academic laboratories are deemed unsafe for both educational purposes and professional engagement. The study conducted by the Chemical Safety and Hazard Investigation Board involved identifying 94 laboratory accident cases and examining various accidents reported in the news (Abdul Samad, 2021).

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Moreover, in its publication dated March 2017, a national newspaper in the Philippines has documented incidents wherein numerous students and staff members of Manila Science High School were inadvertently exposed to and suspected of being contaminated with the toxic heavy metal mercury. Chemical laboratories have documented instances of ecumenical injuries stemming from various causes, including inadequate provision of personal protective equipment (PPE), insufficient training, improper handling of chemicals, and a lack of awareness regarding appropriate emergency response protocols (Manuel, 2021).

A spectrum of adverse consequences, from minor occurrences to instances resulting in loss of life, persistently transpire. According to a study by Harper and Watt (2012), 46% of the 2374 laboratory personnel surveyed reported experiencing at least one injury while working in a laboratory setting. The reevaluation of university laboratory safety policies has been prompted by widely publicized incidents in recent years (US Chemical Safety Board, 2010). Occurrences are not exclusively confined to laboratory settings within universities. For instance, four students were admitted to a medical facility after a fire incident in their laboratory at a secondary educational institution (Nicholson, 2014). Frequent incidents indicate the imperative to enhance accident prevention measures within laboratory settings.

Furthermore, as academic institutions have expanded, there has been a corresponding rise in laboratories that handle hazardous chemicals. It is widely acknowledged that most laboratories in educational settings employ hazardous chemicals (Furr, 2000). While these chemicals are generally familiar, the dosage, usage, and management of such substances present a considerable risk to researchers across all levels. The documentation of laboratory incidents can aid in identifying the specific factors that contribute to these occurrences. In light of this, the researcher was motivated to investigate whether there have been any accidents experienced by MSU-Sulu students during their chemistry laboratory sessions.

Moreover, this study evaluates if the students at MSU-Sulu are familiar with and knowledgeable about the chemical hazard warning signs posted inside the laboratory room. Henceforth, this study further aims to know if Laboratory Safety rules are being strictly observed and implemented, and followed to determine if the first-year college students are aware and are well guided about the laboratory safety guidelines and emergency intervention to prevent mishaps.

2. Methods

The current study used a descriptive research approach to acquire the necessary information on the incidence of mishaps and the level of awareness of laboratory safety among first-year college students of MSU-Sulu. Descriptive research design systematically collects data to depict a phenomenon, situation, or group. To be more precise, it aids in addressing inquiries related to the research problem, such as those about what, when, where, and how, as opposed to the question of why (Voxco, 2021).

2.1 Locale

The study was conducted at Mindanao State University-Sulu. MSU-Sulu is a home to improve the educational environment of the province of Sulu through rehabilitation efforts, the government created the campus in 1974. The institution is located at Capitol Site, Jolo, Sulu. MSU-Sulu is one of the eight campuses of Mindanao State University. It offers graduate studies, eight colleges, one senior high school, and one laboratory high school.

2.2 Respondents and Sample

The data of the study were gathered from primary sources. The participants in the survey were first-year college students of Mindanao State University-Sulu. The study participants consisted of 98 first-year college

students officially enrolled in the second-semester academic year of 2022-2023 across eight colleges of Mindanao State University-Sulu. Cochran's formula was used in determining the sample size.

After the sample size was determined, stratified random sampling was employed to identify participants in the research study. Stratified sampling involves dividing data into sub-groups, or strata, based on shared characteristics such as age, sex, race, income, education, and ethnicity. A stratified random sampling approach was employed, selecting a sample randomly from each stratum. One advantage is that it ensures the representation of all necessary population groups. Stratum characteristics can be estimated and compared. It decreases systematic sampling variability. Limitations of stratified sampling include the need for precise information on stratum proportions and the high cost associated with preparing stratified lists (Acharya, 2013).

2.3 Instrument and Tool

A self-devised questionnaire was used in this study to gather pertinent data related to the research. The questionnaire was composed of four parts. The first part looked into the profile of MSU-Sulu first-year college students. The second part was to assess the first-year students if they have encountered mishaps during their chemistry laboratory, and this is answerable with a yes or no scale. The third part of the questionnaire consisted of 9 pictograms of chemical hazard warning signs, and a score was provided for each given answer to evaluate if the students were familiar with and knowledgeable about the chemical hazard warning signs posted inside the laboratory room. The last part of the questionnaire was a list of statements related to laboratory safety which were measured based on a scale of 1-5, where one represents strongly disagree, two disagree, three neutral, four agree, and five strongly agree. It underwent validity and reliability testing before administering it to the study participants.

The internal reliability result based on Cronbach's alpha was .761 with 34 questionnaire items, indicating a Cronbach alpha of 0.7 level of significance, which stated that the self-devised questionnaire was reliable.

2.4 Data Gathering

The researchers personally administered the questionnaires to the participants. The researchers provided instructions to the respondents on how to complete the survey questionnaire. The college students were given a survey questionnaire and instructed to complete it promptly. The researchers were present during the questionnaire administration to address any inquiries from respondents and personally collected the data. The respondents were thanked for their participation in the survey.

The collected questionnaire data underwent statistical analysis using SPSS version 21 to facilitate tabulation, processing, and scientific interpretation of results. The research data were coded numerically and entered into computer software following data collection. The data were statistically analyzed and subsequently interpreted.

2.5 Data Analysis

Frequency and percentage distribution were used to determine the profile of MSU-Sulu first-year college students and the incidence of mishaps in a chemistry laboratory. Mean and SD were used to assess the familiarity and understanding of chemical hazard warning signs and the awareness of laboratory safety among first-year college students at MSU-Sulu.

2.6 Ethical Consideration

The researchers established study objectives that comprised three primary components: a. Providing the respondents with a thorough comprehension of the study's purpose and significance; b. Ensuring that the

questionnaire was clearly explained to the respondents to facilitate accurate data collection; c. Being receptive to any inquiries raised by the respondents after they consented to participate in the study. This study must ensure the safety and confidentiality of participant information. The Respondent's background was kept confidential. Respondents were assured of strict confidentiality regarding their identities or names.

3. Results

The data in Table 1 shows the gender and course among the first-year college students of MSU-Sulu. Of 98 first-year college students, 72 or 73.5% were female, and 26 or 26.5% were male. The findings mean that the majority of the first-year students were female.

While in the disciplinary field, the College of Nursing attained the highest frequency of 42 with a percentage of 42.9%, followed by the College of Education (COED) with 16 or 16.3%, college of Agriculture (COA) with 9 or 9.2%, college of fisheries (COF) with 8 or 8.2%, college of computer studies (CCS) and college of public affairs and criminology with 7 or 7.1%, college of arts and sciences (CAS) with 5 or 5.1% and college of business administration and accountancy (CBAA) with 4 or 4.1%. Most of the respondents were from the College of Nursing (CON).

Table 1 Profile of College Freshmen of MSU-Sulu

Profile	Freq.	%
Gender		
Female	72	73.5
Male	26	26.5
Course		
College of Nursing (CON)	42	42.9
College of Education (COED)	16	16.3
College of Agriculture (COA)	9	9.2
College of Fisheries (COF)	8	8.2
College of Computer Studies (CCS)	7	7.1
College of Public Affairs and Criminology (CPAC)	7	7.1
College of Arts and Sciences (CAS)	5	5.1
College of Business Administration and Accountancy (CBAA)	4	4.1

Table 2 shows the incidence of mishaps in the chemistry laboratory among the first-year college students of MSU-Sulu. Of 98 first-year college students, 93, or 94.9%, answered yes, and 5, or 5.1%, answered no. The data shows that most first-year college students did not encounter mishaps during their chemistry laboratory. The findings can be associated with the lack of laboratory facilities and equipment observed on the campus.

Table 2 Incidence of Mishap in Chemistry Laboratory

Incidence	Freq.	%
No	5	5.1
Yes	93	94.9

Table 3 shows the mean results of the assessment of familiarity and understanding of chemical hazard warning signs. The findings suggest that the mean scores for the explosive, inflammable, oxidizing, gas under pressure, corrosive, acute toxicity, health hazard/hazardous, serious, and hazardous to environment were 1.65, 2.56, 1.62, 1.48, 2.15, 2.56, 2.74, 1.46 and 2.08, respectively. The result indicates that first-year college students were moderately aware of inflammable, acute toxicity, and health hazards/ hazardous signs.

However, the students were unaware of explosive, oxidizing, gas under pressure, corrosive, and hazardous to environment signage in the laboratory room. Moreover, the participants needed to know the 'serious' pictogram in the laboratory room signages. The findings present that most first-year college students must be aware of the pictograms posted in the laboratory rooms, which may put them at risk during their laboratory classes.

Table 3 Assessment of Familiarity and Understanding of Chemical Hazard Warning Signs

Pictogram	Mean	SD	Description
Explosive	1.65	.761	Not Aware
Inflammable	2.56	.627	Moderately Aware
Oxidising	1.62	.739	Not Aware
Gas under pressure	1.48	.692	Not Aware
Corrosive	2.15	.829	Not Aware
Acute toxicity	2.56	.690	Moderately Aware
Health hazard/hazardous	2.74	.543	Moderately Aware
Serious	1.46	.676	Highly Not Aware
Hazardous to environment	2.08	.858	Not Aware

Table 4 indicates the mean results of the level of awareness of laboratory safety among first-year college students at MSU-Sulu. The findings suggest that the mean scores for emergency equipment and procedures, chemical laboratory safety procedures, and attitude towards chemical laboratory safety were 3.4564, 3.8333, and 2.9821, respectively. The result shows that first-year college students were moderately aware of emergency equipment and procedures. Additionally, the students were mindful of chemical laboratory procedures but must be aware of their attitude towards chemical laboratory safety in the laboratory room. The findings suggest that the students must know the significance of Personal Protective equipment, how to dispose of chemical waste during their laboratory class, and safety rules for managing accidental chemical spills.

Table 4 Level of Awareness on Laboratory Safety among College Freshmen Students in MSU-Sulu

Laboratory Safety	Mean	SD	Description
Emergency Equipment and Procedures	3.4564	.68217	Moderately Aware
Chemical Laboratory Safety Procedure	3.8333	.69030	Aware
Attitude towards Chemical Laboratory Safety	2.9821	.96808	Not Aware

4. Discussion

The research was conducted to ascertain the incidence of mishaps and the level of awareness of laboratory safety among first-year college students at MSU-Sulu. Additionally, the study sought to investigate whether the incidence of accidents was experienced by MSU-Sulu students during their chemistry laboratory. Moreover, the study evaluated whether the students at MSU-Sulu were familiar with and knowledgeable about the chemical hazard warning signs in the laboratory room. In general, it can be observed that first-year college students were unaware of the pictograms posted in the laboratory rooms, which may put them at risk during their laboratory classes. The students needed to be acquainted with the significance of Personal Protective equipment, how to dispose of chemical waste during their laboratory class, and safety rules for managing accidental chemical spills. The results highly recommend the need for education on laboratory safety rules among students to prevent serious mishaps. There should be a need to improve laboratory facilities conducive to learners and to teach the importance of laboratory safety rules.

5. Conclusion

The issue concerning the level of awareness on laboratory safety among first-year college students is a matter that should be taken seriously. Upon examining the data, the result critically shows a need for further attention to further improve regarding safety rules and regulations of the academic lab. The study benefits not only students in the academe but also researchers and institutions who are steadfast in providing students with quality education. The research paper will help reduce the risk of accidents from handling chemicals. It will improve the academic lab environment by mandating policies and conducting brief orientations on laboratory safety practices to ensure the safe and proper handling of equipment, chemicals, biological specimens, and laboratory facilities.

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Declaration of Conflict

The author declares that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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