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Compliance on Laboratory Safety Guidelines and Policies in Chemistry

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Abstract – *This study aimed to assess the Compliance on Laboratory Safety Guidelines and Policies in Chemistry across the 9 Campuses of Pangasinan State University. This study used the descriptive survey design with descriptive survey questionnaire; twenty four (24) Chemistry laboratory custodians and faculty served as respondents; stratified random technique was used to determine the samples of this study; descriptive statistics like frequency counts and weighted mean, and Chi-square test were used to treat the collected data.*

The study revealed that Chemistry laboratories of the nine (9) campuses of Pangasinan State University are "Compliant" on laboratory safety guidelines and policies with an overall mean of 3.46. The general weighted mean of 4.36 was obtained on the extent of safety and precautionary measures practice of Chemistry laboratory custodians and faculty of the nine (9) campuses of Pangasinan State University in terms of performing laboratory techniques which described as "Very Highly Practiced". There is a significant relationship between the extent of safety and precautionary measures practice in terms of laboratory techniques, and the extent of compliance on safety guidelines and policies in Chemistry (r=0.983).

Data revealed that the level of seriousness of the problems encountered by the respondents with regard to compliance on laboratory safety guidelines, and policies in Chemistry described as "Serious" in: "goggles or safety glasses are not worn when dealing with chemicals" (WM of 3.08), "appropriate personal protective equipment is not worn at all times" (WM of 3.0), "unawareness of proper hygiene" and "improper disposal of unused chemicals" (WM of 2.88), and "activities in which toxic gases or vapors used are not carried out in the fume hood" (WM of 2.71). The perceived over- all level of seriousness regarding the problems encountered in terms of compliance on laboratory equipment, safety guidelines and policies in Chemistry is "Moderately Serious" with a weighted mean of 2.44.

In view of the above-stated findings, a plan of action which can improve the compliance of Chemistry laboratories on equipment, safety guidelines, and policies has been proposed for consideration and adaption of the laboratory custodians and faculty of the nine (9) campuses of Pangasinan State University.

Keywords – *compliance, laboratory safety guidelines and policies, Chemistry*

INTRODUCTION

Science education is very significant due to its relevance to the lives of students and teachers. Studying science enables students to develop the aspects of problem solving and critical thinking skills that contribute to the development of a well-rounded individual. In order for the students to understand and internalize various science concepts, it is essential for the teacher to apply appropriate teaching strategies, not just depending on the availability of books and using conventional classroom teaching.

The teaching and learning process of science can be effective through the use of several senses which include seeing and manipulating real objects and materials. Moreover, there is an ineffective way of attaining the higher order thinking skills of students unless they are actually expose to Chemistry experimentation, observe the process and understand the chemical concepts of action and reaction. Students who are engage in a laboratory where chemicals, scientific equipment and apparatus are available enable them to learn effectively and develop higher order thinking skills (HOTS), as well as skills in proper manipulation of scientific equipment correctly and safely in a laboratory setting, thus, making it imperative for the students to directly and safely observe chemical properties, reactions and hazards in utilizing laboratory equipment and apparatus.

Laboratory is one of the most important assets of schools that help teachers and students to apply the scientific concepts that provides the opportunity for the students to undergo experimentation which enable them to arrive on theories and tangible results that can be

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observed, measured and re-tested in several conditions Franzer et al. (2012).

The use of appropriate teaching equipment and teaching method is critical to the success of teaching and learning process of science subjects like Chemistry. According to Franzer et al. (2012), "no matter how the professional and competent science teachers are well trained, it would be critical for them to put their ideas into practice if the school is lack of laboratory apparatus and equipment necessary for them to translate their competence into reality in the classroom" (p. 40). With these, "in order to attract and retain good students in Chemistry classes, the learning environment must be made more student-friendly and this can only be achieved by investing in relevant instructional materials especially laboratory equipment and encouraging teachers to utilize them to enhance the teaching and learning process effectively" (Akuezillo, 2012 p.119). In addition, availability of safety equipment should also be present inside the laboratory and safety and precautionary measures should always be observed by the teachers and students in order to minimize or eliminate the incidents.

Laboratory work is an established part of courses in chemistry in higher education. With the use of Chemistry laboratory, it enables the students to engage in the advances in the field of science and engineering. However, it is necessary to ensure that students and Chemistry teachers are equipped with knowledge and skills on the laboratory safety and precautionary measures in order to successfully engage students in the laboratory in an ethical and safe manner. Teachers play a big role when it comes to laboratory safety which should be discussed before the start of laboratory proper. Demonstration of procedures before allowing students to begin the experiments particularly on dealing with chemicals and glassware is highly needed since the creation of a culture of laboratory safety demands a broad commitment from the laboratory instructors and custodians.

Chemistry teachers and laboratory custodian play a big role in managing chemistry laboratory especially in most higher education institutions where intensive studies are made particularly in the area of science as specialization. Several tasks such as inventory, preparation of chemicals and reagents, proper handling of laboratory equipment and apparatus, storage, conducting scientific experiments, cleaning of apparatus and hazardous waste management are the main tasks of the Chemistry teachers (School Chemistry Laboratory Safety Guide, 2006). Therefore, they must provide information and training to the students at every stage of experiment planning and always present to observe, supervise, instruct, and correct during the experimentation.

To be more definitive of the problem of this proposed study, the research draws from the insight of Dahar and Faize (2014), "safety awareness is a critical aspect in the laboratory. Several accidents occur in the laboratory due to lack of laboratory facilities for emergency preparedness, lack of appropriate knowledge on laboratory safety and precautionary measures, indifferent attitude among students and lack of implementation of safe laboratory practices. In the conduct of Chemistry experiments, students are mostly exposed towards handling equipment and chemicals which may directly expose them to potential or most dangerous risks".

With these, it is therefore essential to observe the safety awareness considering the occupational hazards are inevitable. Good laboratory practices must be highly implemented in every aspects of laboratory work. Malpractice in laboratory occurs when teachers, students and laboratory personnel fail to observe the precision and accuracy in the conduct of laboratory techniques and experiments (Journal of Chemical Health and Safety, 2011). With the presence of these malpractices, the laboratory requires compliance to safety guidelines and policies to ensure the availability of emergency equipment, to prevent injury and minimize inherent dangers and hazards.

Faculty teaching Chemistry must observe the safe handling, storage, and disposal of chemicals. According to the (Guidelines for Chemical Laboratory Safety in Academic Institutions, 2016), "intensive discussions of chemical and physical hazards must be done so that students are able to identify the various hazards themselves during the conduct of experiments" (p. 11). Once a hazard is recognized, laboratory safety necessarily requires an assessment or evaluation of risk from potential exposure to the hazard. Different potential routes of exposure are followed by the relative risk posed by the hazards of the experiment. Based on a risk assessment, understanding of all the potential hazards of the materials, the process, and the equipment involved in every laboratory activity is highly needed. Experiments in which toxic gases or vapors are involved should be carried out in the fume hood with appropriate personal protective equipment (PPE). Hazardous waste management is also a critical component. The

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availability of laboratory facilities for emergency preparedness such as first-aid kits, fire extinguishers, fire alarm system, eye shower and wash stations, spill kit, and antidotes are essential in order to react promptly and deliberately to emergency situations. Moreover, safety devices and stations must be clearly labeled, and their use and location are known are known to all those working inside the laboratory" (Guidelines for Chemical Laboratory Safety in Academic Institutions, 2016, p. 19).

Based on the scenario cited above, the following are among the usual observations of the researcher with regards to the set-up inside the Chemistry laboratory: first, not all apparatus and safety equipment are properly labeled and available; and if the pieces of equipment are available, some of them are not functional; second, not all Chemistry faculty are aware of existing policies, rules and safety precautionary measures; third, not everyone is knowledgeable on observing safety while performing experiments using chemicals and equipment for testing the theoretical concepts in Chemistry classes; fourth, there is a great need for the Chemistry instructors to know how to select experiments for students while knowledgeably considering both educational impact and safety risks; fifth, not everyone is oriented on the location and appropriate use of safety equipment and the emergency response procedures to be undertaken if incidents happen. With these, the researcher is challenged to closely assess the institutions on their compliance on laboratory safety guidelines and policies in Chemistry as a way to motivate faculty on teaching Chemistry with the use of the available equipment and encourage their students to develop interests in Chemistry experiments by honing their reasoning skills while making safety as one of the top priorities. On the practical side, the data which will be obtained by the researcher can be utilized for which recommendations can be formulated as the course of the study goes through. Moreover, the study aims to propose an action plan to improve the compliance of the campuses with Chemistry laboratory safety guidelines, and policies.

OBJECTIVES OF THE STUDY

The purpose of this study is to assess the Compliance on Laboratory Safety Guidelines and Policies in Chemistry across the 9 Campuses of Pangasinan State University. The study aims to determine the extent of compliance on safety guidelines and policies in Chemistry laboratory as perceived by laboratory custodian and faculty along personal protective equipment, chemical safety, glassware safety, hazardous waste management, housekeeping and work practice, and emergency preparedness. It also aims to determine the extent of safety and precautionary measures practice in Chemistry laboratory as perceived by the respondents in terms of laboratory techniques, including the significant relationship between the extent of safety and precautionary measures practice in terms of laboratory techniques, and the extent of compliance on safety guidelines and policies in Chemistry laboratory. Moreover, this study aims to find out the level of seriousness of the problems encountered by the respondents with regards to compliance on laboratory equipment, safety guidelines, and policies in Chemistry.

MATERIALS AND METHODS

Design and Procedure

The descriptive survey method was employed in this study to determine the Compliance on Laboratory Safety Guidelines and Policies in Chemistry. The respondents of the study were taken from the pool of Chemistry laboratory custodian and faculty who handled Chemistry-related subjects of the nine (9) Campuses of Pangasinan State University. The study's respondents were twenty-four (24) Chemistry faculty and laboratory custodian: 1 from Pangasinan State University – Alaminos City Campus, 1 from Asingan Campus, 3 from Bayambang Campus, 3 from Binmaley Campus, 2 from Infanta Campus, 7 from Lingayen Campus, 2 from San Carlos City Campus, 1 from Sta. Maria Campus, and 4 from Urdaneta City Campus.

RESULTS AND DISCUSSION

Table 1. Extent of Compliance on Laboratory Safety Guidelines and Policies in Chemistry along Personal Protective Equipment

A. PERSONAL PROTECTIVE EQUIPMENT	Extent of Compliance					
	HC	C	MC	FC	NC	WM
1. Personnel are trained on the use of required Personal Protective Equipment (PPE).	**7**	**7**	3	2	5	3.38
2. Safety glasses are worn when handling hazardous materials.	1	**10**	2	6	5	2.83

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3. Appropriate laboratory gown are available and used in the laboratory.	7	1	4	4	**8**	2.79
4. Protective gloves are available and matched to hazards involved.	4	6	1	5	**8**	2.71
5. Goggles are available.	3	5	5	3	**8**	2.67
Overall Mean	**2.88**	**MC**				

N=24 DE=Descriptive Equivalent WM=Weighted Mean
1.0-1.80 – **Not Compliant (NC);** 1.81-2.60 - **Fairly Compliant (FC);** 2.61-3.40 – **Moderately Compliant (MC);** 3.41-4.20 – **Compliant (C)**; 4.21-5.00 – **Highly Compliant (HC)**

Table 1 shows the extent of compliance on laboratory safety guidelines and policies in Chemistry along personal protective equipment (PPE). As indicated in the extent of compliance on personal protective equipment, among the five indicators, indicator number five (5) got the highest weighted mean of 3.38 and interpreted as "Moderately Compliant" which implies that the Chemistry laboratory personnel among the nine (9) campuses of Pangasinan State University are moderately trained on the use of required personal protective equipment (PPE) during the conduct of experiment. Moreover, other indicators also show a descriptive equivalent of "Moderately Compliant" which indicates that most of the personal protective equipment (PPE) are not always used in the experiment inside the Chemistry laboratory.

In totality, findings reveal that the Chemistry laboratory custodians and faculty respondents among the nine (9) campuses of Pangasinan State University described the extent of compliance on laboratory safety guidelines and policies in Chemistry along personal protective equipment (PPE) as "MC" or "Moderately Compliant" with an overall mean of 2.88.

Table 2. Extent of Compliance on Laboratory Safety Guidelines and Policies in Chemistry along Chemical Safety

B. CHEMICAL SAFETY	**Extent of Compliance**					
	HC	**C**	**MC**	**FC**	**NC**	**WM**
1. Appropriate labels are present on all hazardous chemical containers.	7	11	1	4	1	3.79
2.Storerooms of chemical containers, shelves, and cabinets are properly labeled.	8	7	4	4	1	3.71
3. Laboratory personnel are familiar with the symptoms of exposure to the chemicals and the precautions necessary to prevent exposure.	7	9	3	3	2	3.67
4.Shelves and chemical containers are in good condition (no leak, rust).	4	7	9	3	1	3.42
5.Systematic ways of safely storing potentially reactive, toxic, or hazardous chemicals are maintained.	5	6	7	5	1	3.38
6. Material information sheets are acquired, and specific warning sign are shown for potentially dangerous chemicals.	5	6	7	4	2	3.33
7.Chemical properties and hazards of the substances are introduced.	6	4	7	5	2	3.29
8. Well-ventilated fume hood is available.	2	9	3	2	8	2.79
9.Laboratory supplies and materials are regularly replenished or replaced whenever applicable.	4	2	8	4	6	2.75
10.Spill control equipment (neutralizers. absorbent pads) is present.	1	5	8	5	5	2.67
Overall Mean	**3.28**	**MC**				

N=24 DE=Descriptive Equivalent WM=Weighted Mean
1.0-1.80 – **Not Compliant (NC);** 1.81-2.60 - **Fairly Compliant (FC);** 2.61-3.40 – **Moderately Compliant (MC);** 3.41-4.20 – **Compliant (C)**; 4.21-5.00 – **Highly Compliant (HC)**

A read-through of the table shows that the first indicator which is the presence of appropriate labels on all hazardous chemical containers got the highest weighted mean of 3.79 and interpreted as "Compliant" on laboratory safety guidelines and policies in Chemistry along chemical safety.

On the other hand, Chemistry laboratories of the nine (9) campuses of Pangasinan State University are moderately complied when it comes to the presence of spill control equipment with a weighted mean of 2.67. Moreover, indicators number three (3) and six (6) which refers to the replacement of laboratory supplies, and availability of well-ventilated fume hood respectively, nearly shows that the Chemistry laboratories of the nine

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(9) Campuses of Pangasinan State University are moderately complied. These indicate that there is still a need for the campuses to provide laboratory supplies and well-ventilate fume hood for carrying out experiments that involve hazardous chemicals to ensure the safety of students, faculty and laboratory personnel.

As provided from the data, chemical laboratory safety among the nine (9) Chemistry laboratories of Pangasinan State University obtained an overall mean of 3.28. Thus, there is a clear indication that the Chemistry laboratories of Pangasinan State University are moderately complied when it comes to chemical safety which is one of the most important aspects when it comes on dealing with Chemistry experiments.

Table 3. Extent of Compliance on Laboratory Safety Guidelines and Policies in Chemistry along Glassware Safety and Hazardous Waste Management

C. GLASSWARE SAFETY	**Extent of Compliance**					
	HC	**C**	**MC**	**FC**	**NC**	**WM**
1. Glassware is inspected for cracks and contamination before use.	10	11	1	0	2	4.13
2. Glassware is stored properly when not in use. Caps or stoppers on Reagent bottles are replaced and open vessels are covered, especially when working with volatile solvents.	11	9	2	0	2	4.13
3.Glasswares are clean and air-dried before storage.	11	7	3	1	4	4.08
4. Broken and other waste glasses are properly discarded.	8	8	2	2	4	3.58
5.Heat or rapid temperature changes are applied only to borosilicate (e.g., "Pyrex") glassware that is designed for such applications.	4	12	5	0	3	3.58
Overall Mean	**3.90**	**C**				
D. HAZARDOUS WASTE MANAGEMENT	**HC**	**C**	**MC**	**FC**	**NC**	**WM**
1. Chemical wastes are disposed properly. Liquid wastes are segregated from solid wastes.	6	8	5	2	3	3.50
2. Waste containers are clearly, indelibly and accurately labeled as to the contents, and are kept closed unless wastes are added.	7	6	4	4	3	3.42
3. Waste bins in the hallways are available and in good condition.	7	5	5	3	4	3.33
4. There is an approved method for disposal of waste generated by the experiment or procedure.	3	3	11	3	4	2.92
5. Waste disposal is efficiently and effectively managed.	5	3	6	3	7	2.83
Overall Mean	**3.2**	**MC**				

N=24 DE=Descriptive Equivalent WM=Weighted Mean
1.0-1.80 – **Not Compliant (NC);** 1.81-2.60 - **Fairly Compliant (FC);** 2.61-3.40 – **Moderately Compliant (MC);** 3.41-4.20 – **Compliant (C)**; 4.21-5.00 – **Highly Compliant (HC)**

As indicated in the extent of compliance on laboratory safety guidelines and policies in chemistry along glassware safety, among the five(5) indicators on table 5C, indicators number one (1) and indicator number four (4) got the highest weighted mean of 4.13 and interpreted as "Compliant" which implies that Chemistry laboratory personnel among the nine (9) campuses of Pangasinan State University inspects for cracks and contamination before use and reagent bottles are replaced and open vessels are covered, especially when working with volatile solvents. It can be noted that the extent of compliance on laboratory safety guidelines and policies in chemistry along glassware safety was rated as "Compliant" with an overall mean of 3.90.

As to the extent of compliance on laboratory safety guidelines and policies in chemistry along hazardous waste management, indicator number one (1) got the highest weighted mean of 3.50 and interpreted as "Compliant" which implies that the chemical wastes in Chemistry laboratories of the nine (9) campuses of Pangasinan State University are most of the time undertaken by the laboratory custodian and faculty.

The result shows that the Chemistry laboratory custodians and faculty respondents among the nine (9) campuses of Pangasinan State University described the extent of compliance on laboratory safety guidelines and policies in chemistry along hazardous waste management as "MC" or "Moderately Compliant" with an overall mean of 3.2. This implies that the facilities or conditions are oftentimes complied or moderately undertaken by the Chemistry laboratory custodian and faculty.

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Table 4. Extent of Compliance on Laboratory Safety Guidelines and Policies in Chemistry along Housekeeping and Work Practice

E. HOUSEKEEPING AND WORK PRACTICE	Extent of Compliance					
	HC	C	MC	FC	NC	WM
1. Eating, drinking, and smoking are strictly forbidden within the laboratory.	17	6	0	0	1	4.58
2. Hands are washed after handling chemicals.	16	7	0	0	1	4.54
3. The laboratory room is neat and organized including, but not limited to the floors, counter spaces and fume hoods.	7	14	4	0	0	4.29
4. No glass containers are stored on the floor.	12	7	3	2	0	4.21
5.Laboratory equipment, supplies and materials are kept in separate stock rooms.	11	9	3	0	1	4.21
6.Equipment arrangement allows free flow of movement and enables students to work comfortably without interference.	9	12	2	0	1	4.17
7.Doors of the laboratory are closed and locked if unoccupied. Access is restricted to authorized persons only.	11	9	2	0	2	4.13
8. Pieces of laboratory equipment are properly clean and return to storage cabinets after use.	9	10	4	1	0	4.13
9. Pieces of laboratory equipment are in good condition (free from flaws such as cracks, chips, and obvious defects) and inspected before use.	8	9	6	1	0	4.00
10. Areas where work with hazardous materials occurs are segregated from non-hazardous work areas.	6	10	6	1	1	3.79
11. A demonstration table, equipped with sink, water, electrical and gas outlets is available and utilized.	7	9	6	0	2	3.79
12. Laboratory surfaces are cleaned and disinfected after use.	8	4	9	3	0	3.71
13. Bench tops and hoods are maintained and free of clutter.	7	8	4	3	2	3.63
14. Maintenance system is employed to ensure the good working condition of the equipment at all times.	4	9	9	2	0	3.63
15. Fume hoods are inspected, tested, and maintained regularly to ensure a proper operation and provide adequate protection for laboratory personnel, faculty and students.	1	5	8	3	7	2.58
Overall Mean		**3.96**	**C**			

N=24 DE=Descriptive Equivalent WM=Weighted Mean
1.0-1.80 – **Not Compliant (NC);** 1.81-2.60 - **Fairly Compliant (FC);** 2.61-3.40 – **Moderately Compliant (MC);** 3.41-4.20 – **Compliant (C)**; 4.21-5.00 – **Highly Compliant (HC)**

On the extent of compliance of custodians and faculty on laboratory safety guidelines and policies in Chemistry among the nine (9) campuses of Pangasinan State University rated the following housekeeping and work practice as "Compliant", areas where work with hazardous materials occurs are segregated from non-hazardous work areas (WM of 3.79), bench tops and hoods are maintained and free of clutter (WM of 3.63), laboratory surfaces are cleaned and disinfected after use (WM of 3.71), pieces of laboratory equipment are in good condition and inspected before use (WM of 4.00), pieces of laboratory equipment are properly clean and return to storage cabinets after use (WM of 4.13), equipment arrangement allows free flow of movement and enables students to work comfortably without interference (WM of 4.17), a demonstration table, equipped with sink, water, electrical and gas outlets is available and utilized (WM of 3.79), and maintenance system is employed to ensure the good working condition of the equipment at all time (WM of 3.63).

Moreover, among the 15 indicators, indicator six (6) got the lowest weighted mean of 2.58 and interpreted as "Fairly Compliant".

As a whole, results show that the Chemistry laboratory custodians and faculty respondents among the nine (9) campuses of Pangasinan State University described laboratory safety guidelines and policies in Chemistry along housekeeping and work practice as "C" or "Compliant" with an overall mean of 3.96.

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Table 5. Extent of Compliance on Laboratory Safety Guidelines and Policies in Chemistry along Emergency Preparedness on Laboratory Facilities

F. EMERGENCY PREPAREDNESS on LABORATORY FACILITIES	Extent of Compliance					
	HC	C	MC	FC	NC	WM
1. Laboratory room is properly lighted and well-ventilated.	7	**14**	3	0	0	4.17
2. Laboratory room has at least two exit doors that open outward.	**12**	7	2	3	0	4.17
3. Hallway is clear and free of obstructions and tripping hazards.	8	**12**	4	0	0	4.17
4. Laboratory personnel, faculty and students are familiar with the building evacuation procedures including evacuation routes.	**10**	8	6	0	0	4.17
5. Safety posters and emergency information are posted at various locations in the laboratory.	5	**16**	2	1	0	4.04
6. Exit doors are clear and free of obstructions and tripping hazards.	**11**	7	2	4	0	4.04
7. Emergency exit signs are marked and illuminated.	**10**	5	6	3	0	3.92
8. Electrical cords are in good condition, out of travel paths, and free of any cracks or breaks in insulation.	6	**9**	**9**	0	0	3.88
9. Bulletin boards are available to maximize students in giving information.	2	**16**	4	2	0	3.75
10. Electrical equipment is inspected and tested periodically.	3	9	**10**	2	0	3.54
Overall Mean		**3.98**	**C**			

N=24 DE=Descriptive Equivalent WM=Weighted Mean
1.0-1.80 – **Not Compliant (NC);** 1.81-2.60 - **Fairly Compliant (FC);** 2.61-3.40 – **Moderately Compliant (MC);** 3.41-4.20 – **Compliant (C)**; 4.21-5.00 – **Highly Compliant (HC)**

The table reveals that several indicators got the highest weighted mean of 4.17 which indicates that the Chemistry laboratories of Pangasinan State University are compliant when it comes to proper lightning and ventilation of Chemistry laboratory room, the presence of two exit doors that open outward, clean and free obstructions and tripping hazards of hallways, and familiarization of Chemistry laboratory personnel, faculty and students with the building evacuation procedures including evacuation routes.

On the other hand, indicator number two (2) which refers to the availability of bulletin boards was rated with a lowest weighted mean of 3.75.This implies that there is a need to enhance more the use of bulletin board in the different campuses in order to maximize students on giving information when it comes to laboratory safety and precautionary measures that must be considered inside the Chemistry laboratory.

The result nearly shows that the overall mean of 3.98 with "Compliant" as its descriptive equivalent indicates that the compliance on laboratory safety guidelines and policies in Chemistry along emergency preparedness on laboratory facilities is not that high. As can be inferred from the result, it suggests that an overall mean of 3.98 was obtained due to the "Moderately Compliant" feedback of respondents on indicators regarding the inspection and testing periodically of electrical equipment and condition of electrical cords.

Table 6. Extent of Compliance on Laboratory Safety Guidelines and Policies in Chemistry along Emergency Preparedness on First Aid Kits and Fire Extinguishers

Emergency Preparedness FIRST-AID-KITS	Extent of Compliance					
	Extent of Compliance					
	HC	C	MC	FC	NC	WM
1. First aid signage is visible.	8	11	2	1	2	3.92
2. A first aid kit is located in the near vicinity.	9	6	6	1	2	3.79
3. Demonstration and training on the proper use of first aid kits are periodically conducted.	8	7	6	1	2	3.75
4. First aid kits are accessible and stocked.	6	9	4	3	2	3.58

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5. Available first aid kits are listed and up-to-date.	3	7	10	2	2	3.29
Overall Mean			**3.67**	**C**		
FIRE EXTINGUISHERS						
1. Fire extinguishers are accessible to staff and students, and clear of obstruction.	15	4	5	0	0	4.42
2. Fire extinguishers are properly labeled and inspected regularly.	14	5	5	0	0	4.38
3. Fire extinguishers with casing are mounted out in the hallway.	15	3	6	0	0	4.38
4. Fire extinguishers are properly tagged with current certification tags.	13	4	7	0	0	4.25
5. Demonstration and training on the proper use of fire extinguishers are periodically conducted.	10	7	7	0	0	4.13
Overall Mean			**4.31**	**HC**		

N=24 DE=Descriptive Equivalent WM=Weighted Mean
1.0-1.80 – **Not Compliant (NC);** 1.81-2.60 - **Fairly Compliant (FC);** 2.61-3.40 – **Moderately Compliant (MC);** 3.41-4.20 – **Compliant (C)**; 4.21-5.00 – **Highly Compliant (HC)**

Based on the table, as to the extent of compliance on laboratory safety guidelines and policies in chemistry along emergency preparedness on first aid kits, among the five (5) indicators, the first indicator got the highest weighted mean of 3.92 and interpreted as "Compliant" which implies that Chemistry laboratory personnel among the nine (9) campuses of Pangasinan State University posts visible signage on first aids most of the time. It may be inferred that the extent of compliance on laboratory safety guidelines and policies in chemistry along emergency preparedness on first aid kits had a descriptive rating of 3.67 described as "Compliant".

Moreover, among the indicators on fire extinguishers, indicator four (4) got the highest weighted mean of 4.42and interpreted as "Highly Compliant" while indicator five (5) obtained the lowest weighted mean of 4.13.

Henceforth, the Chemistry laboratory custodians and faculty respondents among the nine (9) campuses of Pangasinan State University described the extent of compliance on laboratory safety guidelines and policies in chemistry along emergency preparedness on fire extinguishers as "HC" or "Highly Compliant" with an overall mean of 4.31. This indicates that the facilities or conditions are much complied or always undertaken by the Chemistry laboratory custodian and faculty.

Table 7. Extent of Compliance on Laboratory Safety Guidelines and Policies in Chemistry along Emergency Preparedness on Fire/Emergency Alarm System, Eye Shower and Wash Stations, and Spill Kit

FIRE / EMERGENCY ALARM SYSTEM	**Extent of Compliance**					
	HC	**C**	**MC**	**FC**	**NC**	**WM**
1.Emergency evacuation routes are posted in hallways and the nearest fire alarm indicated.	12	4	2	3	3	3.79
2. Emergency exit lights are working and clear of obstruction.	8	8	3	2	3	3.67
3. Fire alarm is accessible and free of obstructions and tripping hazards.	9	4	2	7	2	3.46
4. Fire alarm is mounted in the hallway.	8	3	5	6	2	3.38
5. Demonstration and training on the proper use of fire alarms are periodically conducted.	7	5	5	4	3	3.38
Overall Mean			**3.53**	**C**		
EYE SHOWER AND WASH STATIONS						
1. Emergency eye shower and wash stations are free of obstructions and tripping hazards.	11	3	1	5	4	3.50
2. An emergency eye shower and wash stations are available in the laboratory or in close proximity to it with unimpeded access.	9	5	1	5	4	3.42
3. Emergency eye shower and wash stations are functional and clear directions are posted in the laboratory.	8	6	1	5	4	3.38

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4. Laboratory personnel, faculty and students are aware of the eye shower and wash locations and know how to operate the equipment.	9	3	3	3	6	3.25
5. Emergency eye shower and wash stations are inspected regularly to ensure that there are no damage or broken parts.	7	5	3	4	5	3.21
Overall Mean			**3.35**	**MC**		
SPILL KIT						
1. Biohazard and chemical spill kits are located in appropriate posted locations.	9	2	6	6	1	3.50
2. Laboratory personnel are periodically trained in spill-clean-up procedures.	3	5	5	3	8	2.67
3. Spill kits are appropriate and accessible.	2	4	7	1	10	2.46
4. Spill kits are fully stocked.	0	6	7	1	10	2.38
5. Spill kits are maintained and operational.	0	5	7	2	10	2.29
Overall Mean			**2.66**	**MC**		

N=24 DE=Descriptive Equivalent WM=Weighted Mean
1.0-1.80 – **Not Compliant (NC);** 1.81-2.60 - **Fairly Compliant (FC);** 2.61-3.40 – **Moderately Compliant (MC);** 3.41-4.20 – **Compliant (C)**; 4.21-5.00 – **Highly Compliant (HC)**

As indicated in the extent of compliance on laboratory safety guidelines and policies in chemistry along emergency preparedness on fire/emergency alarm system and eye shower and wash stations and spill kit, among the five (5) indicators on fire emergency alarm system, indicator four (4) got the highest weighted mean of 3.79 and interpreted as "Compliant". This implies that Chemistry laboratory personnel among the nine (9) campuses of Pangasinan State University had posted emergency evacuation routes in hallways and the nearest fire alarm indicated. Meanwhile, the availability and periodically conduct of demonstration and training on the proper use of fire alarms got the lowest weighted mean of 3.38.

On the other hand, among the indicators on eye shower and wash stations, indicator three (3) got the highest weighted mean of 3.50 and interpreted as "Compliant". This implies that emergency eye shower and wash stations are free of obstructions and tripping hazards Furthermore, most of the indicators in eye shower and wash station are interpreted as "MC" or "Moderately Compliant" which means that eye shower and wash stations used in the Chemistry laboratory are moderately used, operated and moderately functional.

On area under the extent of compliance on laboratory safety guidelines and policies in chemistry along emergency preparedness on spill kit, indicator one (1) got the highest weighted mean of 3.50 and interpreted as "Complied". This implies that personnel placed biohazard and chemical spill kits in appropriate posted locations inside the Chemistry laboratories of the nine (9) campuses of Pangasinan State University. Furthermore, most of the indicators in spill kit are interpreted as "MC" or Moderately Compliant" which means that most of chemistry laboratory's spill kit are moderately used, operated, or cleaned up.

Table 8. Extent of Compliance on Laboratory Safety Guidelines and Policies in Chemistry along Emergency Preparedness on Antidotes

Emergency Preparedness			**Extent of Compliance**					
ANTIDOTES			**HC**	**C**	**MC**	**FC**	**NC**	**WM**
1	List of poisons and their antidotes are posted inside the laboratory.		5	7	5	1	6	**3.17**
2	Availability of antidotes for the following common poisons in the laboratory:							**2.68**
	Poisons	**Antidotes**						
a.	Acids and Formaldehyde	Milk of magnesia / Baking soda	1	1	5	13	4	2.25
b.	Alcohol	Aromatic Ammonia Spirit	9	0	1	8	6	2.92

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		Coffee	2	7	1	11	3	2.75
c.	Alkalis	Vinegar	4	8	4	5	3	3.21
		Egg white	3	6	4	8	3	2.92
		Ammonia	2	7	4	7	4	2.83
		Starch	1	7	5	8	3	2.79
		Lye	9	0	1	4	10	2.75
		Flour paste	1	7	3	10	3	2.71
		Gelatin	0	8	3	10	3	2.67
		Olive oil	0	9	2	8	5	2.63
		Sour milk	1	5	3	11	4	2.50
		Potash	0	7	2	5	10	2.25
d.	Arsenic paris green	Raw egg	3	6	4	7	4	2.88
e.	Bichloride of mercury	Milk	3	6	3	8	4	2.83
f.	Carbolic acid	Alcohol	5	5	5	5	4	3.08
		Epsom salt	0	2	2	14	6	2.00
g.	Silver nitrate and other salts of silver	10 % salt solution (NaCl)	3	7	2	8	4	2.88
		Codeine	0	5	1	12	6	2.21
h.	Metallic poison	Ethanol	3	7	1	10	3	2.88
		Flour	2	7	3	8	4	2.79
i.	Methanol	Ethanol	3	7	1	10	3	2.88
j.	Bleaching solution	Eggs	2	7	3	8	4	2.79
		Aluminum Hydroxide gel	1	1	0	14	8	1.88
Overall Mean			**2.92**	**MC**				

N=24 DE=Descriptive Equivalent WM=Weighted Mean
1.0-1.80 – **Not Compliant (NC);** 1.81-2.60 - **Fairly Compliant (FC);** 2.61-3.40 – **Moderately Compliant (MC);** 3.41-4.20 – **Compliant (C)**; 4.21-5.00 – **Highly Compliant (HC)**

As indicated in the extent of compliance on laboratory safety guidelines and policies in chemistry along emergency preparedness on antidotes, among the two indicators, indicator number one (1) got the highest weighted mean of 3.17 and interpreted as "Moderately Compliant" which implies that the Chemistry laboratory personnel among the nine (9) campuses of Pangasinan State University are moderately posting on the list of poisons and their antidotes inside the laboratory.

Moreover, the second indicator also shows a descriptive equivalent of "Moderately Compliant" which indicates that most of the antidotes inside the Chemistry laboratory are oftentimes complied or moderately undertaken by the laboratory custodians.

Majority of the rating indicated above implies that the extent of compliance on antidotes for the following poisons, arsenic paris green (WM of 2.88), bichloride of mercury (WM of 2.83), carbolic acid (WM of 3.08), metallic poison (WM of 2.88), and methanol (WM of 2.88) are interpreted as "Moderately Complied" and contributed a lot to the overall mean of 2.92. On the other hand, the institutions of Pangasinan State University are "Fairly Compliant" when it comes to the antidotes for the following poisons, acids and formaldehyde (WM of 2.25) and bleaching solution (WM of 1.88).

In totality, findings reveal that the Chemistry laboratory custodian and faculty respondents among the nine (9) campuses of Pangasinan State University described the extent of compliance on laboratory safety guidelines and policies in chemistry along emergency preparedness on antidotes as "MC" or "Moderately Compliant" with an overall mean of 2.92.

Table 9. Summary of the Extent of Compliance on Laboratory Safety Guidelines and Policies in Chemistry

	Laboratory Safety Guidelines and Policies in Chemistry	WM	DR
A.	**Housekeeping and Work Practice**	3.96	C
B.	**Glassware Safety**	3.90	C
C.	**Emergency Preparedness**	3.49	MC
	Fire Extinguishers	*4.31*	*HC*
	Laboratory Facilities	*3.98*	*C*
	Fire /Emergency Alarms	*3.67*	*C*
	First -Aid- Kits	*3.53*	*MC*
	Eye Shower and Wash Stations	*3.35*	*MC*
	Antidotes	*2.92*	*MC*
	Spill Kit	*2.66*	*MC*
D.	**Chemical Safety**	3.28	MC
E.	**Hazardous Waste Management**	3.20	MC
F.	**Personal Protective Equipment**	2.88	MC
	Grand Mean	**3.46**	**C**

N=24 DE=Descriptive Equivalent WM=Weighted Mean
1.0-1.80 – **Not Compliant (NC);** 1.81-2.60 - **Fairly**

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Compliant (FC); 2.61-3.40 – **Moderately Compliant (MC);** 3.41-4.20 – **Compliant (C)**; 4.21-5.00 – **Highly Compliant (HC)**

On the summary of extent of compliance on laboratory safety guidelines and policies in Chemistry, the respondents rated the following laboratory safety guidelines and policies in Chemistry as "Compliant", glassware safety (WM of 3.90), housekeeping and work practice (WM of 3.96), emergency preparedness on laboratory facilities (WM of 3.98) and fire / emergency alarms (WM of 3.53), and educational attainment (WM of 3.52). On the other hand, majority of the respondents rated the extent of compliance on laboratory safety guidelines and policies in Chemistry as "Moderately Compliant" which includes the personal protective equipment (WM of 2.88), chemical safety (WM of 3.28), hazardous waste management (WM of 3.20), and emergency preparedness on first-aid kits (WM of 3.67), eye shower and wash stations (WM of 3.35), spill kit (WM of 2.66), and antidotes (WM of 2.92).

Further analysis of the data on the second table indicates that the grand mean of 3.46 rated the extent of compliance on laboratory safety guidelines and policies in Chemistry as "Compliant".

Table 10. Extent of Safety and Precautionary Measures Practice in terms of Chemistry Laboratory Techniques

Chemistry Laboratory Techniques	Extent of Safety and Precautionary Measures Practice					
	VHP	HP	P	MP	SP	WM
A. Heating solids or liquids						
1. Turn off heat sources when they are not in use.	**21**	2	1	0	0	4.83
2. When heating flasks or beakers over the laboratory burner, use a ring-stand setup with a square of wire gauze.	**20**	3	1	0	0	4.79
3. When heating with a laboratory burner, gently move the test tube over the hottest part of the flame.	**20**	3	1	0	0	4.79
4. Point test tubes away from yourself and others when heating substances in them.	**19**	4	1	0	0	4.75
5. To avoid burns, do not handle heated glassware or materials directly. Use tongs, test-tube holders, or heat-resistant gloves or mitts.	**19**	3	2	0	0	4.71
6. Use a water bath to heat solids.	**19**	3	2	0	0	4.71
7. Do not pour hot liquids into plastic containers.	**19**	3	2	0	0	4.71
8. Use the proper procedures when lighting a Bunsen burner.	**18**	4	1	0	1	4.58
Overall Mean		**4.74**		**VHP**		
B. Detecting the odors of gases						
1. Waft the gas closer to your nose so that the odor can be detected without irritating your nose.	**14**	8	2	0	0	4.83
2. Hold the test tube evolving the gas about 20 cm. away from your nose.	**16**	6	2	0	0	4.50
Overall Mean		**4.54**		**VHP**		
C. Diluting acid with water						
1. Always pour the acid to water.	16	4	2	1	1	4.38
2. In most cases, an acid splash should be treated by rinsing the affected area with running water. Acid splashes onto the lab bench or other surfaces may be neutralized by adding a weak base solution (e.g., baking soda in water).	10	13	1	0	0	4.38
3. Protective goggles, gloves, and a lab coat should be worn.	13	5	3	1	2	4.08
4. Because of the risk of splashes and release of dangerous fumes, acids and water should be mixed inside a fume hood.	10	8	0	3	3	3.79
Overall Mean		**4.16**		**HP**		
D. Transferring liquid chemical						
1. In transferring liquid from reagent bottle to a beaker, hold a string rod against the lip of the reagent bottle and pour slowly the solution.	15	7	0	2	0	4.46

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2. In transferring liquid from reagent bottle to test tube, tilt the test tube and have the lip of the reagent bottle rested against the lip of a test tube.	15	7	0	1	1	4.42
3. In transferring liquid from medicine dropper to a test tube, let the lip of a dropper rested just below the lip of the test tube and draw off the liquid slowly from the dropper.	13	8	2	1	0	4.38
Overall Mean 4.42 VHP						
E. Removing crystals from reagent bottle						
1. Tap the spatula until the desired quantity is obtained.	16	3	3	1	1	4.33
2. With the use of the spatula, shovel out the crystals from the reagent bottle.	14	5	4	0	1	4.29
Overall Mean 4.31 VHP						
F. Monitoring						
1. Enforce all safety rules and procedures at all times.	12	8	4	0	0	4.33
2. Ensure that chemical containers and cabinets are properly labeled.	9	4	11	0	0	3.92
3. Keep records of all laboratory incidents and organize records on safety training of laboratory personnel.	10	9	2	1	0	3.92
4. Conduct regular inspections of safety and first aid equipment.	7	7	9	0	1	3.79
5. Maintenance of laboratory equipment.	8	7	7	0	1	3.75
Overall Mean 3.94 HP						
G. Inventory						
1. The inventory of chemicals in the laboratory is systematically and periodically conducted.	15	6	2	1	0	4.46
2. An inventory of all chemicals and equipment present in the laboratory include the quantities and remarks.	15	6	2	1	0	4.46
3. The inventory of laboratory facilities and equipment is systematically and periodically conducted.	13	8	2	1	0	4.38
4. Up-to-date inventory are maintained for all hazardous materials.	14	4	5	1	0	4.29
Overall Mean 4.4 VHP						

1.0-1.80 – **Slightly Practiced (SP)** 1.81-2.60 –**Moderately Practiced (MP)** 2.61-3.40 – **Practiced (P)**
3.41-4.20 – **Highly Practiced (HP)** 4.21-5.00 – **Very Highly Practiced (VHP)** WM=Weighted Mean

Table 10 presents the extent of safety and precautionary measures practice in terms of chemistry laboratory techniques along heating solids or liquids, detecting the odors of gases, diluting acid with water, transferring liquid chemical, removing crystals from reagent bottle, monitoring, and inventory.

As indicated on the extent of safety and precautionary measures practice in terms of chemistry laboratory techniques on heating solids or liquids, among the eight indicators, indicator one (1) got the highest weighted mean of 4.83 and interpreted as "Very Highly Practiced" which implies that the Chemistry laboratory custodians and faculty among the nine (9) campuses of Pangasinan State University turns off heat resources when they are not in used.

Moreover, majority of the respondents answered all the indicators of heating solids or liquids as "Very Highly Practiced" which resulted to an overall mean of 4.74. This indicates that safety precautionary measures are very highly practiced when it comes on heating solids and liquids during the experiment.

On the other hand, as indicated in the extent of safety and precautionary measures practice in terms of chemistry laboratory techniques on detecting the odor of gases, 16 out of 24 respondents answered "Very Highly Practiced" with a weighted mean of 4.50 when it comes to the process of detecting the odors of gases of certain chemicals by holding the test tube.

Furthermore, 14 respondents answered "Very Highly Practiced" while 8 of them answered "Highly Practiced" when it comes to the proper way of detecting the odors of gases of certain chemicals which obtained a weighted mean of 4.83.

In totality, findings reveal that the Chemistry laboratory custodian and faculty handling Chemistry subjects "Very Highly Practiced" the safety and precautionary measures when dealing on Chemistry

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laboratory techniques particularly on detecting the odors of gases which is considered as one of the crucial way on dealing with chemicals with an overall mean of 4.54.

On the other hand, as indicated on the extent of safety and precautionary measures practice in terms of Chemistry laboratory techniques on diluting acid with water, among the four (4) indicators, indicator two (2), "Always pour the acid to water" and indicator four (4), "Acid splashes onto the lab bench or other surfaces may be neutralized by adding a weak base solution", got the highest weighted mean of 4.38 and interpreted as "Very Highly Practiced". This implies that Chemistry laboratory custodians and faculty among the nine (9) campuses of Pangasinan State University "Very Highly Practiced" the safety and precautionary measures when dealing on Chemistry laboratory techniques particularly on the proper way of diluting acids with water.

On the other hand, indicator three (3) which refers to mixing of acids to water in a fume hood got the lowest weighted mean of 3.79. In totality, it can be gleaned from the first part of the table that Chemistry laboratory custodians and faculty among the nine (9) campuses of Pangasinan State University "Highly Practiced" the safety and precautionary measures when dealing on Chemistry laboratory techniques particularly on the proper way of diluting acids with water with an overall mean of 4.16.

Majority of the indicators on extent of safety and precautionary measures practice in terms of chemistry laboratory techniques on transferring liquid chemical, are described as "Very Highly Practiced" with an overall mean of 4.42. This means that Chemistry laboratory custodians and faculty among the nine (9) campuses of Pangasinan State University very highly practiced the correct way of transferring liquid chemical from on apparatus to another.

On the other hand, majority of the indicators on removing crystals from reagent bottles, are interpreted as "Very Highly Practiced" with an overall mean of 4.31. This shows that Chemistry laboratory custodians and faculty among the nine (9) campuses of Pangasinan State University very highly practiced the proper way of removing crystals from the reagent bottle.

As indicated on the extent of safety and precautionary measures practice in terms of chemistry laboratory techniques on monitoring, among the five (5) indicators, indicator four (4), "Enforce all safety rules and procedures at all times", got the highest weighted mean of 4.33 and interpreted as "Very Highly Practiced". This implies that the Chemistry laboratory personnel among the nine (9) campuses of Pangasinan State University enforce all safety rules and procedures to students at all times inside the laboratory.

On the other hand, majority of the indicators on the extent of safety and precautionary measures practice in terms of chemistry laboratory techniques on monitoring ranges from weighted mean of 3.41-4.20 and interpreted as "Highly Practiced". In totality, the extent of safety and precautionary measures practice in terms of chemistry laboratory techniques on monitoring obtained an overall mean of 3.94. This implies that monitoring on the laboratory equipment / apparatus, safety and first-aid equipment, chemicals and cabinets, and enforcement of safety rules and procedures are highly practiced by the laboratory custodians and faculty.

As to the extent of safety and precautionary measures practice in terms of inventory, among the indicators on the third part of the table, indicator one (1), "The inventory of chemicals in the laboratory is systematically and periodically conducted" and indicator two (2), "An inventory of all chemicals and equipment present in the laboratory include the quantities and remarks", got the highest weighted mean of 4.46 and interpreted as "Very Highly Practiced". This means that Chemistry laboratory personnel among the nine (9) campuses of Pangasinan State University very highly practiced the systematically and periodically conduct of the inventory of chemicals. On the other hand, indicator four (4) which refers to "Up-to-date inventory are maintained for all hazardous materials got a weighted mean of 4.29 and interpreted as "Very Highly Practiced".

In totality, the Chemistry laboratory custodian and faculty respondents among the nine (9) campuses of Pangasinan State University described the extent of safety and precautionary measures practice in terms of chemistry laboratory techniques on inventory as "HP" or "Highly Practiced" with an overall mean of 4.4. This merely shows that the conduct of inventory of laboratory facilities, equipment / apparatus, and chemicals by the Chemistry laboratory custodian is very highly practiced.

Table 11. Summary of the Extent of Safety and Precautionary Measure Practice in terms of Chemistry Laboratory Techniques

Extent Of Safety and Precautionary Measures Practice Chemistry Laboratory Techniques	**WM**	**DR**
A. Heating solids or liquids	4.74	VHP

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B. Detecting the odors of gases	4.54	VHP
C. Diluting acid with water	4.16	HP
D. Transferring liquid chemical	4.42	VHP
E. Removing crystals from reagent bottle	4.31	VHP
F. Monitoring	3.92	HP
G. Inventory	4.40	VHP
Grand Mean	**4.36**	**VHP**

1.0-1.8 –**Slightly Practiced (SP)** 1.81-2.60–**Moderately Practiced (MP)** 2.61-3.40–**Practiced (P)** 3.41-4.20–**Highly Practiced (HP)** 4.21-5.00–**Very Highly Practiced (VHP)** WM=Weighted Mean

Table 11 shows that the respondents highly practiced the diluting of acid with water and monitoring with a weighted mean of 4.16 and 3.92 respectively.

On the other hand, the Chemistry laboratory custodian and faculty very highly practiced the heating of solids or liquids (WM of 4.74) as the highest weighted mean which is the most common laboratory technique used on testing theoretical concepts that involves solid and liquid reagents. Moreover, detecting the odors of gases (WM of 4.54), transferring liquid chemical (WM of 4.42), removing crystals from reagent bottle (WM of 4.31), and inventory of laboratory facilities and equipment (WM of 4.40) are described as "Very Highly Practiced".

Therefore, table 11 reveals that Chemistry laboratory custodians and faculty of the nine (9) campuses of Pangasinan State University very highly practiced the safety and precautionary measures on performing laboratory techniques with the students which has an overall weighted mean of 4.36. This is indicative because most of the Chemistry laboratory custodians who also act as teachers in different Chemistry subjects of all campuses of Pangasinan State University are aligned with Chemistry as their specialization.

Table 12. Relationship between the Extent of Safety and Precautionary Measures Practice in Laboratory Techniques, and the Extent of Compliance on Safety Guidelines and Policies in Chemistry Laboratory

	Pearson Correlation (r)	Sig.
Extent of Safety And Precautionary Measures And Extent of Compliance on Safety Guidelines and Policies	0.983**	.000

**. Correlation is significant at the 0.01 level

It can be gleaned from the table that in general, the relationship between the extent of safety and precautionary measures practice in terms of laboratory techniques, and the extent of compliance on safety guidelines and policies in Chemistry laboratory is very high or very dependable according to Guilford 1956 since the Pearson r correlation value is .983. This further means that as the extent of safety precautionary measures increases, the extent of compliance on safety guidelines and policies also increases or reinforced.

Therefore at 0.01 level of significance, the data reveals that there is a significant relationship between the extent of safety and precautionary measures practice in terms of Chemistry laboratory techniques, and the extent of compliance on safety guidelines and policies.

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Table 13. Problems in terms of Compliance on Laboratory Equipment, Safety Guidelines and Policies in Chemistry

Problems In Terms of Compliance On Laboratory Equipment, Safety Guidelines And Policies In Chemistry		Level of Seriousness						
		VHS	HS	S	MS	LS	WM	DR
1	Goggles or safety glasses are not worn when dealing with chemicals.	4	8	3	4	5	3.08	S
2	Appropriate personal protective equipment is not worn at all times.	6	5	4	1	8	3.00	S
3	Unawareness of proper hygiene.	1	6	5	2	10	2.88	S
4	Improper disposal of unused chemicals.	5	4	4	5	6	2.88	S
5	All activities in which toxic gases or vapors used are not carried out in the fume hood.	5	2	5	5	7	2.71	S
6	Not familiar in handling hazardous chemicals or procedures.	7	1	6	2	8	2.50	MS
7	Unable to use laboratory equipment for its designed purpose only.	3	5	3	3	10	2.50	MS
8	Not checking the labels on all chemical bottles twice before removing any of the contents.	4	4	1	4	11	2.42	MS
9	Improper handling of chemicals and equipment.	4	3	2	4	11	2.38	MS
10	Lack of demonstration of procedures before allowing students to begin the activity.	4	3	3	2	12	2.38	MS
11	Unable to follow the instruction of waste disposals such as discarding chemicals through the sink or to a regular trash.	2	4	5	2	11	2.33	MS
12	Accidents or incidents are not immediately reported to the instructor or laboratory custodian.	5	1	1	7	10	2.33	MS
13	Improper way of returning equipment to the proper places. Used benches, instruments and glassware are not properly cleaned.	2	5	3	2	12	2.29	MS
14	Fearful of doing experiments or using reagents or equipment.	3	3	3	3	12	2.25	MS
15	Pieces of equipment are not regularly inspected.	4	3	1	3	13	2.25	
16	Immersing of hot glassware in cold water.	1	5	4	2	12	2.21	MS
17	Leaving an open flame unattended	1	6	1	4	12	2.17	MS
18	Return of unused chemicals to stock bottles.	5	1	1	2	15	2.13	MS
19	Lack of understanding of all the potential hazards of the materials, the process, and the equipment involved in every laboratory activity.	2	5	0	3	14	2.08	MS
20	Difficulty on developing students' positive attitude towards safety.	1	3	3	4	13	1.96	MS
Overall Mean							**2.44**	**MS**

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Table 13 presents the perceived level of seriousness regarding the problems encountered in terms of compliance on laboratory equipment, safety guidelines and policies in Chemistry. As shown in the table, the problem which obtained the highest weighted mean is, "goggles or safety glasses are not worn when dealing with chemicals" with 3.08 weighted mean and interpreted to be "serious" problem. This means that it is really important to wear protective eyewear in order to protect the surrounding of the eyes of the faculty and students especially when dealing with chemicals in order to prevent harmful chemicals to enter in the eyes.

Coming as second "serious" problem is the "appropriate personal protective equipment is not worn at all times", which had a weighted mean of 3.0. Next in line, a weighted mean of 2.88, indicators 3 and 12, "Unawareness of proper hygiene", and "Improper disposal of unused chemicals", respectively are perceived to be the third "serious" problems. It means that it is crucial to have a proper hygiene and proper disposal of unused chemicals to prevent contamination of the environment and harming human health.

The next problem perceived to be "serious" is, "all activities in which toxic gases or vapors used are not carried out in the fume hood", which obtained 2.71 as weighted mean. It is essential to have fume hood in a laboratory to limit the exposure of toxic gases or vapors that may cause harmful diseases to particularly students and teachers.

Among the twenty (20) problems encountered in terms of compliance on laboratory equipment, safety guidelines and policies in Chemistry, fifteen (15) are perceived to be "moderately serious". The problem that obtained the lowest weighted mean is, "difficulty on developing students' positive attitude towards safety" rated as 1.96. Even it got the lowest weighted mean, it is perceived to be "moderately serious" because it plays a very important part on prevention to disastrous accidents that may affect the health of students and teachers, as well as the environment.

The perceived over- all level of seriousness regarding the problems encountered in terms of compliance on laboratory equipment, safety guidelines and policies in Chemistry is "moderately serious" with a weighted mean of 2.44. It implies that the Chemistry laboratory custodians and faculty only encountered such moderate seriousness when it comes to compliance on laboratory equipment and implementation of safety inside the Chemistry laboratory. Nevertheless, it is essential for the laboratory personnel to make a necessary action on how to address such problems especially the serious ones in order to minimize the risks inside the laboratory.

Table 14. Action Plan to Improve the Institutions' Compliance on Laboratory Equipment, Safety Guidelines, and Policies in Chemistry

Identified Problems	Objectives	Action to be Taken	People Involved
1. Goggles or safety glasses are not worn when dealing with chemicals.	-To inform or train chemistry laboratory custodians, faculty and students on the appropriate use of personal protective equipment (PPE).	-Training should be conducted regarding the use of safety glasses inside the Chemistry laboratory. -A strict policy of wearing safety glasses should be implemented on conducting experiments inside the laboratory.	-Chemistry laboratory custodians and faculty -Students
2. Appropriate personal protective equipment is not worn at all times.	-To inform or train chemistry laboratory custodians, faculty and students on the proper use of personal protective equipment (PPE).	-Conduct seminar or trainings related to the importance and proper use of personal protective equipment (PPE).	-Chemistry laboratory custodians and faculty -Students
3.Unawareness of proper hygiene.	-To train students on proper hygiene inside the laboratory before the start of the semester.	-Include the discussion of proper hygiene during the orientation proper in Chemistry subjects as stipulated in the syllabus.	-Chemistry faculty -Students
4. Improper disposal of unused chemicals.	-To implement proper disposal of unused chemicals.	-Make an approved communication to concerned government agencies regarding the proper disposal of unused chemicals which could be a solid or liquid.	-Chemistry laboratory custodians and faculty -Campus Executive Directors
5. All activities in which toxic gases or	-To build or install fume hoods on each Chemistry	-Make a request to the University for the installation of fume hoods on	-Chemistry laboratory custodians

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vapors used are not carried out in the fume hood.	laboratory among the nine (9) PSU Campuses.	each Chemistry laboratory among 9 PSU Campuses. -Conduct a monitoring on the use of fume hoods in carrying out activities which include toxic gases.	and faculty -Campus Executive Directors

To achieve the institutions' compliance on Chemistry laboratory safety guidelines and policies, an action plan was made to serve as a guide for teachers who also act as laboratory custodian in order to prevent or minimize the serious problems mostly encountered inside the Chemistry laboratory.

CONCLUSION AND RECOMMENDATION

Based on the findings of the study, the following conclusions were drawn:

1. The Chemistry laboratories of the nine (9) campuses of Pangasinan State University are moderately complied on laboratory safety guidelines and policies.
2. Chemistry laboratory custodians and faculty of the nine (9) campuses of Pangasinan State University very highly practiced the safety and precautionary measures on performing Chemistry laboratory techniques.
3. There is a significant relationship between the extent of safety and precautionary measures practice in terms of laboratory techniques, and the extent of compliance on safety guidelines and policies in Chemistry.
4. The five (5) serious problems encountered by the respondents with regard to compliance on laboratory equipment, safety guidelines, and policies in Chemistry include the following: "Goggles or safety glasses are not worn when dealing with chemicals", "appropriate personal protective equipment is not worn at all times", "unawareness of proper hygiene", "improper disposal of unused chemicals", and "all activities in which toxic gases or vapors used are not carried out in the fume hood".

Based on the conclusions drawn, the following recommendations are offered:

1. Chemistry laboratory custodians and faculty should provide a top priority and make a necessary action to highly comply on laboratory safety guidelines and policies in Chemistry particularly on personal protective equipment, chemical safety, hazardous waste management, and emergency preparedness.
2. Encourage the Chemistry faculty to sustain their highly practice on safety and precautionary measures in performing Chemistry laboratory techniques.
3. Strictly follow the safety and precautionary measures in performing experiments inside the laboratory especially on: wearing of goggles when dealing with chemicals, wearing of appropriate personal protective equipment at all times, safety first by observing a proper hygiene, proper disposal of unused chemicals, and the use of fume hood on Chemistry experiments that deals with toxic gases or vapours.

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