

Awareness of University Students on Laboratory Safety

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ABSTRACT

In laboratories where dangerous conditions might exist, safety precautions are important. Rules exist to minimize the individual's risk, and safety equipment is used to protect the lab user from injury or to assist in responding to an emergency. The purpose of the research is to create an awareness of university students on laboratory safety. After a thorough survey, the following aspects were identified and are briefly discussed here is rule and regulations, safety and role of Occupational Safety, Health and Environment (OSHE) in the laboratory. Based on the survey done from 30 respondents, the awareness of students on laboratory safety is good but there are some students not following the rules in the laboratory.

Keywords: Safety precautions, rules and regulations, occupational safety, health and environment, OSHE

1. INTRODUCTION

Laboratory safety involves skills and accountability development and must be an integral part of any chemistry curriculum. The laboratory safety also means that safety awareness needs to be integrated into each laboratory course, including more advanced-level research with increasing scope. Building a laboratory safety culture requires a broad commitment from all levels of the educational institution. At the department level, faculty need to assume responsibility for continuing review of safety issues with students in teaching and research laboratories, especially the persons responsible for undergraduate instruction, often graduate students or instructors. In a coordinated departmental security effort, the faculty must lead by example. At the administrative level, this will involve implementing a chemical hygiene plan in line with any efforts on chemical hygiene/safety at the campus and addressing the safe handling, storage and disposal of chemicals. Eyewash and showers must be in operating condition, and fume hoods with proper sashes are essential. Anyone who works or visits the laboratory must wear goggles and should not be allowed to eat food or drink. A clean, uncluttered laboratory is more likely to encourage careful work. Development of safety skills may be divided into four emphasis areas.

The objective of this paper is to determine whether students are following the rules and regulations in the laboratory. The second objective is to make sure student safety in the lab. Lastly is to oversee the role of Occupational Safety, Health and Environment OSHE and how does it affect student safety in the laboratory. Therefore, to minimize risks, experiments should be designed to mitigate potential risks. These steps may involve tests with a protective shield in a fume hood and

wearing protective gloves and goggles. Waste management and storage is a critical component. Case stories of incidents that have resulted in injury or damage are often useful.

The crucial problem occurred was that the students do not follow the rules and regulations set by the university. As known, students frequently disobey the laws in the laboratory, such as bring food and eat and wear slipper in the laboratory. Next, students do not follow the safety in the laboratory. Things the students usually do during lab is they do not wear the safety equipment like a lab coat and safety goggles that cause harm to students, especially chemical lab. Besides, some technical assistant does not check the material used in the lab before students do an experiment that can cause harm to students. Lastly, some of students and staff do not follow the conditions set by Occupational Safety, Health and Environment (OSHE) in the laboratory.

2. LITERATURE REVIEW

2.1. Probabilistic Automata

Recognize hazards: A hazard is a potential source of danger or harm and may result from the use of chemicals, equipment, and instruments. Introduction to this subject can begin with an understanding of the terms that describe chemical hazards, such as "toxic," "flammable," or "corrosive," and how to obtain information from synthetic labels, Safety Data Sheets (SDS), and other reference sources.

Assess risks: Once a hazard is recognized, Laboratory safety requires a risk assessment or assessment of potential hazard exposure. The identification of possible exposure routes is followed by evaluating the relative risk posed by the experiment's hazards.

3. METHODOLOGY

The survey instrument for this study is a set of questionnaires filled in through google form as shown in figure 1. We first created a whole bunch of questions related to our topic which is Awareness of University Students on Laboratory Safety. All the questions are included with multiple choice answers. The set of questionnaires are then being spread through *WhatsApp* group to be filled by our respondents.



Figure 1 Link of questionnaires spread through *WhatsApp* group

The questionnaire is divided into three parts: individual, the laboratory, and the safety equipment in the laboratory. The google form questionnaire is targeting 30 respondents only. After that, the interview session for laboratory assistants has been conducted. The central three laboratories that have been approached are Advance Electronic, Institute High Voltage & Current (IVAT), and Microprocessor. The question in interview session consists of three main points which are:

- i. How does the student perform in the laboratory?
- ii. Do the safety equipment in the laboratory is sufficient?
- iii. Do they be checked frequently?
- iv. Do you think the laboratory is safe enough for the student to experiment?
- v. If no, what is the thing that can be upgraded or added?

Data Collection

The data were collected from the respondents at Universiti Teknologi Malaysia. The data collection involved three

phases. First, brainstorming and creating questions and suitable possible answer for the set of questionnaires. Then, distributing the questionnaires to the respondents after it has been finalized. Each respondent will only take 5 to 10 minutes to complete the survey. For the interview sessions, the sessions only take 10 minutes for each interview session with a laboratory assistant. Finally, review and analyzing the data collected to come out with the conclusion. The target of this study is to gain as much response as possible from the students. We spend about two weeks spreading the questionnaires to the respondents.

4. RESULTS AND FINDINGS

Rules and Regulations in Laboratory

This paper's first objective is to determine whether students are following the rules and regulations in the laboratory. As we know that there are standard laboratory rules and regulations in the laboratory that everyone should follow, for instance, do not wear slippers and do not eat in the laboratory. Hence, a few questions are used to achieve this objective. The questions are:

Do you wear slipper into the laboratory?

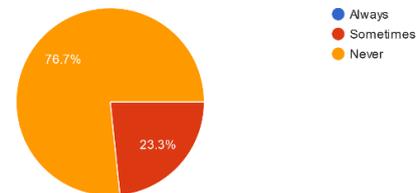


Figure 2 Pie chart of wear slipper into the laboratory

From the data obtained, out of 30 respondents, there are 23.3% of whoever wore slipper into the laboratory. This pie chart shown is dangerous as wearing slippers or sandals will increase the probability of accidents happens in the laboratory. 76.7% of them always wear shoes in the laboratory. This pie chart shown is good practice and should be maintained.

Do you dispose e-waste properly?

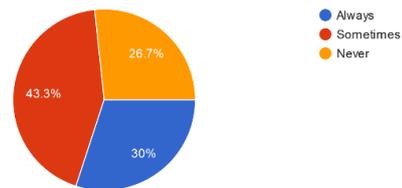


Figure 3 Pie chart of dispose e-waste properly

Out of 30 responses, 30% of them dispose of the e-waste properly. Almost half of the students said that they do correctly dispose of e-waste, but not every time, whereas nearly a quarter of them do not have a high awareness of the importance of proper e-waste disposal. E-waste usually contains chemicals or toxic, which is needed to be handled carefully before throwing. One of the common examples is the battery. Proper disposal of batteries is essential because there are chemicals in the cell, which will pollute the earth if they are just thrown away improperly.

Do you bring foods and drinks into the laboratory?

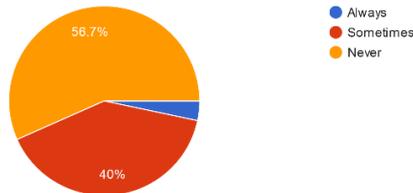


Figure 4 Pie chart of bringing foods and drinks into the laboratory

The chart above shows that they are more than half (56.7%) of students do follow the laboratory rules for not bringing foods and drinks into the laboratory. This pie chart is vital because some laboratory is highly polluted with chemicals. Eating or drinking in the laboratory will increase the probability of food poisoning to occur. However, some students are not following the rules and regulations, and they should be advised to bring the food out of the laboratory.

Do you cleaning the workstation after conducting experiments?

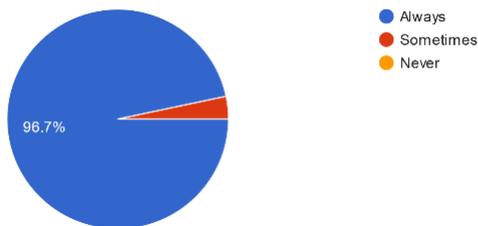


Figure 5 Pie chart of cleaning the workstation after conducting experiments

From the results, most of the students do clean their workstation before leaving the laboratory or after the experiments. There are only 1 out of 30 respondents (3.3%) who do not do so. It is a good practice to clean the workspace or tables after any experiment to make the laboratory safe for others.

How does the student perform in the laboratory?

This study has an interview question that is asked to three lab assistants. From their response, some students follow the rules and regulations, and some are not. However, after advices and warning are given, most of the students will follow the rules.

In a nutshell, from the data obtained, it can be concluded that there are students who are not aware of the importance of following the rules and regulations held by the laboratory, and this situation may bring risk to the students' life.

Student Safety in Laboratory

The second objective is to make sure student safety in the lab. Security is critical in the lab, for example, wearing a lab coat and safety goggles. The instrument and apparatus must be check frequently to ensure that it does not harm students. Thus, a few survey questions are conducted to achieve this objective.

Does the lab assistant brief you about the safety in the laboratory when you first go in?

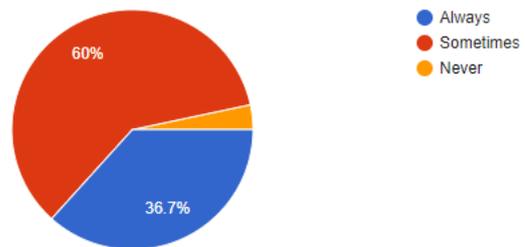


Figure 6 Pie chart of lab assistant brief you about the safety in the laboratory

From the 30 respondents, 60% of the student says that the lab assistant only briefs about the safety in the laboratory sometimes but not always. Only 36.7% of students say the lab assistant is still brief about the lab safeness when they first go to the lab. A small portion of the student says the lab assistant never briefs them about the lab safeness.

Do you feel the laboratory is safe to conduct any work?

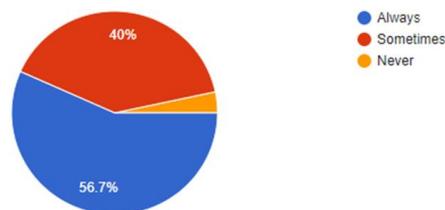


Figure 7 Pie chart of lab is safe to conduct any work

From the chart, more than half of the students feel the lab is always safe to conduct work, while 40% think that the lab is sometimes secure to act. Only a small part of the student feel the lab is not safe to conduct work.

From the lab assistants' interview, we also get that most of the lab is safe for students to experiment with. According to Mr. Jeffri Bin Ismail from Microprocessor Lab, very little or almost no severe accidents occur in a year. In Advance Electronic Lab, according to the lab assistant, Ms. Wan NorAfiza, as the voltage used in the lab is low, no incidents have happened since her on duty. According to Mr. Mohamad Syahrin Mohamad from IVAT, the lab is safe, but all precautions must be taken before experimenting because it involves high voltage and current. He also mentioned that the lab assistant would brief about safety in the lab before they study.

From the results, the lab assistant need always brief about safety in the lab to ensure the safeness of students in the lab. The lab's safety can still be improved as sometimes the student feels unsafe when they conduct work. Besides, students need to report to the lab assistant whenever there is any malfunctioning equipment so that the lab assistant can record and improve. Students also should always seek help from a lab assistant when facing some safety issues when they conduct experiments.

Role of OSHE

The third objective is to oversee the role of Occupational Safety, Health and Environment OSHE, and how it affects student safety in the laboratory. One of the OSHE standards is to locate fire extinguishers in every laboratory as a precaution to avoid accidents.

Do you wear any safety equipment when experimenting in the laboratory?

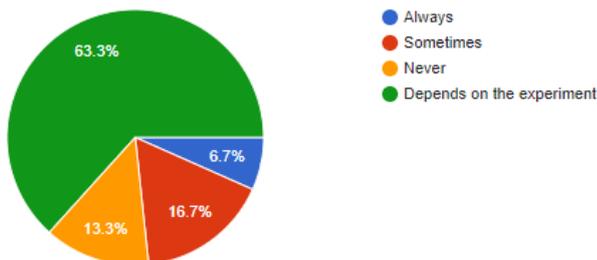


Figure 8 Pie chart of wear any safety equipment

The pie chart shows that most of the respondents wear safety equipment only when the experiments require them to do so. 13.3% of the respondent stated that they never wear safety equipment when experimenting. It is a good habit to wear safety equipment, regardless of how simple the experiment is. Apart from that, by implementing the practices to wear safety equipment, more accidents can be avoided.

Do laboratory have suitable equipment to use whenever accidents occur?

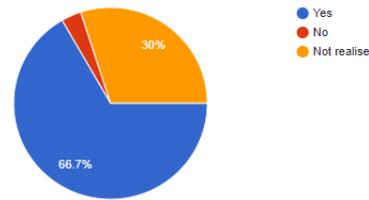


Figure 9 Pie chart of suitable equipment to use whenever accidents occur

66.7% of respondent among students said that there is enough suitable equipment to be used in case there is accidents occur. Another 30% did not realized the existence of safety equipment and 3.3% of the respondents stated that there is no safety equipment in the laboratory. It is very important to have suitable equipment to avoid accidents such as fire extinguisher. Even though some laboratory specializes for small and harmless experiment, it still need basic equipment as accident can occur not only from the experiment, it may have external causes as well.

Do you notice the OSHA poster in the laboratory?

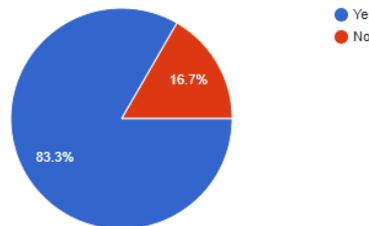


Figure 10 Pie chart of notice the OSHA poster

From the chart, more than half or to be exact 83.3% of the respondent noticed the OSHA poster in the laboratory. While a small number of students is not aware of the OSHA poster.

An interview session was done with the lab assistants of the laboratory in the Faculty of Electrical Engineering. The question asked was to do the safety equipment in the laboratory is sufficient and whether they are being checked frequently. Based on an interview with Mr. Jeffri of Microprocessor Lab, the safety equipment is adequate and is being checked occasionally. Ms. Wan NorAfiza also stated that the OSHE unit would come to the laboratory to inspect and change if necessary, the safety equipment in the lab such as first aid kit, fire extinguisher and electric check wood. The lab assistant of Institute High Voltage & Current Laboratory (IVAT), which is Mr. Mohamad Syahrin, said that the IVAT lab is complete with safety equipment. The expired date of the safety equipment, such as fire

extinguisher, was taken note by the lab assistant and said that the safety equipment is checked once a week.

To sum it all, OSHA has done its part well in maintaining laboratory safety by frequently checking the safety equipment. They also have to take some precautions, such as placing a poster inside the laboratory to avoid unwanted accidents occur.

5. CONCLUSION

In conclusion, all the objectives stated were obtained. We identify that majority of students obey the laboratory rules and regulations, and only a small portion disobeys. After the action is taken, the percentage of the students who violate the standards and laws will decrease. For the time being, the safety of the students in the laboratory is adequately monitored. Laboratory assistant performs their duties well to make the laboratory environment a safe place for students to conduct their experiments. After the action plan implementation and evaluation from the students' feedback, we can speak that the problem is almost resolved. The students' laboratory safety rule awareness is better than the previous one. That is, they know about laboratory safety rules and their importance. The students also perform the laboratory safety rule what they know and learned in the laboratory properly. Therefore, the result of this research shows that the students' laboratory safety rule awareness is improved.

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