

Familiarity and Understanding of Chemical Hazard Warning Signs Among Select College Students of De La Salle Lipa

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Abstract - Laboratory classes have become crucial parts of teaching science subjects. Most of the laboratories in natural science fields widely use chemicals of different types and hazard levels. Using descriptive- evaluative method of research, the study was carried out to assess students' familiarity and comprehension of chemical hazard warning signs. Data were collected from randomly selected 150 student respondents enrolled in Chemistry and Biology Laboratory Classes during the second semester of SY 2012-2013. A structured questionnaire was used for the data collection. The collected data were analysed using simple quantitative analysis. The results of the study revealed that the majority of the respondents were familiar with hazard signs of laboratory chemicals. After getting information on their level of awareness about potential hazards of laboratory chemicals, the respondents were also requested to match chemicals properties with the corresponding labels or pictograms. The results indicate that familiarity and understanding of hazard warning signs is low among the students. It also surveyed the preferred labelling technique which revealed that majority favoured the use of both colors and signs. An action plan was drafted as an output of the study aimed at putting forward corrective measures to address the laboratory related problems identified in the study.

Keywords – Chemical Hazard, Warning Signs, Chemistry, Biology, Laboratory

I. INTRODUCTION

Most of the laboratories in natural science fields widely use chemicals of different types and hazard levels. Chemistry and Biology are two of the fields that intensively and extensively use chemicals for laboratory classes and other experimentations. The chemicals are inorganic and organic in nature and could be in the form of gases, liquids or solids. These chemicals may be corrosive, explosive, easily oxidizing, flammable, harmful, irritating, radioactive or toxic to human being and may pollute the environment (Kan, 2007).

Accidents due to laboratory chemicals are highly likely in the case of inexperienced employees and students who are not well aware of the dangers or risks associated with the majority in their laboratory. It is

wrong to conclude that chemicals are totally hazardous or risky. They are beneficial if they are properly handled or utilized (Warhurts, A.M., 2006). It is deemed necessary to carry out a survey to assess situations in order to get preliminary information about the general status of students in the school on this regard.

This study is anchored on the concept of Globally Harmonized System of Classification and Labelling of Chemicals (GHS). This concept was adopted by the UN Economic and Social Council (ECOSOC) in July 2003. The goal of the system is to harmonize existing classification of chemicals according to their hazards and communicate the related information through labels and safety data sheets.

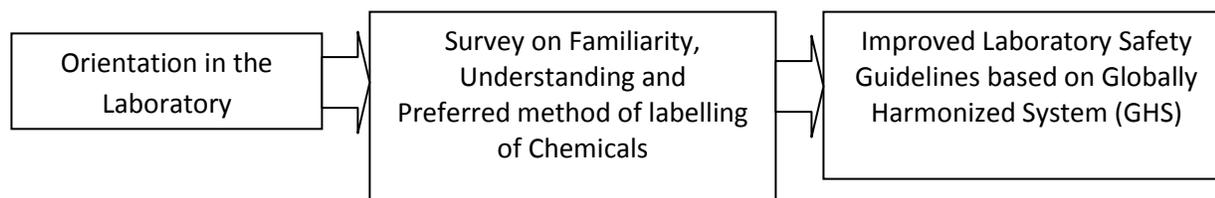


Figure1. Operational Framework

For this study, an orientation in the laboratory done during the first day of laboratory meeting will serve as an input. On that same meeting, a survey on the students' familiarity and understanding of chemical hazard signs was surveyed. Furthermore, their preferred method of labeling was assessed. As an output, an improved set laboratory guideline, as regards labeling of hazardous chemical, was proposed.

The study assessed the awareness of students about hazards and risks of laboratory chemicals and comprehensibility of hazard warning signs of chemicals. Specifically, it aimed to know students' awareness of potential hazards and risks of laboratory chemicals; ascertain if students can correctly match properties of chemical with the corresponding pictograms; identify preferred ways to communicate hazard and risk information of laboratory chemicals; and correlate awareness and understanding with profile.

The results of the study provide information about hazard warning sign comprehensibility of students and help the Biology Department and Science Area to take correct measures as regards laboratory management.

II. METHODS

The study was conducted at the De La Salle Lipa, an institution that was founded in 1962 by the Brothers of the Christian School, De La Salle Lipa was built on a 5.9- hectare lot along the National Highway, an institution located at Lipa City, Batangas. The school provides education from pre-school level to tertiary school level. The tertiary school provides education under these colleges: Education, Arts and Sciences; Information, Technology and Engineering; Nursing; International Hospitality and Tourism Management; Business, Economics, Accountancy and Management; and Law.

The descriptive method of research was employed in this study to ascertain students' familiarity and understanding of chemical hazard signs. Likewise, the study looked into the students' preferred method of labeling hazardous chemicals in the laboratory.

A total of 150 students, 64 percent (96 girls) and 36 percent (54 boys) served as respondents of the study. They were randomly selected from the college students enrolled in Chemistry and Biology Courses during the Second Semester of SY 2012- 2013. The student respondents were all made aware and their consent was sought to be the respondents of this study.

A structured questionnaire, prepared in English, was used for the data collection. Questionnaires were distributed to the respondents by their respective laboratory teachers. Respondents requested to fill-out

the questionnaires immediately after receipt, without any discussion among themselves.

The primary data gathered were then analyzed using simple quantitative analyses such as frequency count, arithmetic means and ranking.

III. RESULTS AND DISCUSSION

As shown on Figure 2, majority of the respondents (92%=138) said that they are aware of the potential hazards of laboratory chemicals both on the environment and on them. On the other hand, a small percentage of students who participated in the survey (8%= 12) claimed that they are not well aware of such hazard that chemical pose to them. This result could account for the observed reluctance of some students in the use of protective gadgets like eye goggles and laboratory gowns.

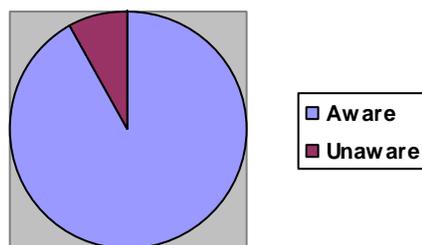


Figure 2. Distribution of respondents based on awareness of potential hazard

When the respondents were asked about their familiarity with the hazard warning signs or labels of the laboratory chemicals, survey revealed that majority of the respondents (82%= 123) claimed that they are familiar with warning symbols but the remaining 27 student respondents (18%) reported that they were not familiar with the hazard symbols of the laboratory chemicals. The reasons stated by the students include: they do not pay attention to labels of the chemicals; no orientation was given to them; and most symbols are hard to remember and understand.

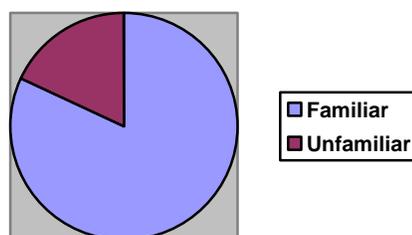


Figure 3. Distribution of respondents based on familiarity with hazard signs

These findings are parallel with the results of a case study done at Jimma University of Southwestern Ethiopia by Adane and Abeje (2012) which assessed students' familiarity and comprehension of chemical hazard warning signs at the Departments of Chemistry and Biology. The results of the study revealed that the majority of the respondents regarded that they were aware of the hazards of laboratory chemicals but with lower familiarity with hazard signs of laboratory chemicals.

In order to evaluate the respondents' knowledge of hazard warning signs of commonly used laboratory chemicals, student respondents were requested to match chemicals properties with the corresponding labels or pictograms. The properties of the laboratory chemicals presented to the students were toxic, flammable, explosive, oxidizing, irritant, harmful, radioactive and corrosive. Table 1 presents the number of respondents who correctly matched the properties of chemicals with the corresponding pictograms of hazard warning signs.

Table 1. Number of respondents who correctly matched properties of chemicals with signs

Properties of Chemicals	No. of Respondents	%
Flammable	85	57%
Toxic	67	45%
Irritant	48	32%
Harmful	34	23%
Explosive	20	13%
Radioactive	16	11%
Oxidizing	11	7%
Corrosive	11	7%

As shown on Table 1, only 57%, 45% and 32% of the respondents were able to match flammable, toxic and irritant, respectively. These properties, with the highest percentage of matched answers, suggest that the student respondents have low level of understanding of chemical hazard warning signs. This finding supports the result of Adane and Abeje (2012) that only 26.5%, 14.45% and 12% of the respondents were able to correctly match "flammable", "toxic" and "irritant", respectively, with their associated signs. Results of similar studies by Nicol and Tuomi (2007) and by Ta et al. (2010) both found out that pictograms or signs of flammable and toxic properties of chemicals were the most easily identifiable. Furthermore, the matching percentages attained the rest of the properties were relatively lower.

Similar to the report by Karapantsios et al. (2008), the results of study indicate that understanding of hazard warning signs is very low among the students. This scenario translates into the need for intensive training and education to raise the level of understanding of the students as regards chemical properties and corresponding signs.

The student respondents' preferred ways to communicate effectively the potential hazards and risks of laboratory chemicals were also surveyed. Table 2 shows that majority of the respondents preferred the use of both colors and symbols and regard it as the best way for effective communication of information regarding the hazards of the chemicals.

Table 2. Preferred ways to communicate hazard and risk of laboratory chemicals

Preferred Ways	f	%	Rank
Colors and Symbols	93	62	1
Symbols	37	25	2
Colors	20	13	3
No idea	0	0	4

This finding is consistent with the data obtained by Adane and Abeje (2012) that sing color or symbol alone are not sufficient enough to serve its purpose as the combination of such would more likely increase understanding and comprehensibility among students.

A related study entitled Analysis of the Level of Comprehension of Chemical Hazard Labels: A Case for Zambia by Banda and Sichilongo (2006) surveyed the impact of chemical hazard label elements on four target sectors. The survey revealed that the level of education, gender and/or age did not influence the respondents' perception of the extent of hazard but rather familiarity or frequency of use of the chemicals and acquaintance with chemical label elements was significant in the assessment of the extent of perceived hazard posed by a given chemical. The study also suggested that effective chemical hazard symbols must not be too abstract to the client but should contain features that are known or easily understood.

IV. CONCLUSION AND RECOMMENDATION

Based on the foregoing findings, it is therefore concluded that despite the student respondents' claim that they are not only aware of the potential hazards of chemicals in the laboratory, but also, are familiar with the corresponding hazard signs, majority of the respondents exhibit poor understanding of the matter. As regards the preferred way of communicating the

potential hazards of the chemicals, majority of the student respondents chose the use of both color and symbols.

In line with these conclusions, the researchers put forward a set of recommended actions and guidelines to the Laboratory Committee of the concerned department and area. With the end goal of preventing chemical hazards to happen because of lack of awareness, familiarity and understanding that lead to improper handling of chemicals, corrective measures in the areas of student orientation, teachers' instruction, and labeling of chemicals in the laboratories, were included in recommended plan of action.

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REFERENCES

- Adane, L. and Abeje, A. 2012. Assessment of Familiarity and Understanding of Chemical Hazard Warning Signs Among University Students Majoring Chemistry and Biology: A Case Study at Jimma University, Southwestern Ethiopia
- Banda, S. and Sichilongo, K. 2006. Analysis of the Level of Comprehension of Chemical Hazard Labels: A Case for Zambia
- Kan, C. W., 2007. Chemical Safety Mangement in Hongkong. *Journal of Chemical Health and Safety*.
- Nicol, A. and S. Tuomi, 2007. Hazard Sign Comprehension Among South African Illiterate Adults. *Stellenbosch Papers in Linguistics*.
- Ta, G.C., M.B. Mokhtar, H.A. Mokhtar, A.B. Ismail and M.F. Abuyazid, 2010. Analysis of the Comprehensibility of Chemical Hazard Communication Tools at the Industrial Workplace. *Industrial Health*.
- Warhurts, A.M. 2006. Assessing and Managing of Hazard and Risks Of Chemicals in the Real World: The Role of the Research Proposal in Future Regulation of Chemicals. *Environmental International*.