

Report of the Survey on Laboratory Accidents in Secondary Schools for the 2014/2015 School Year

Background

As one of the ways to monitor the standard of safety in school science laboratories, survey of laboratory accidents occurring at schools were conducted since the 1995/1996 school year. From the 2002/2003 school year onwards, the survey has been conducted on a triennial basis. The findings from the survey are disseminated to all secondary schools to provide updated information on common laboratory accidents, so that preventive measures can be taken. This report presents findings of the survey for the 2014/2015 school year.

Results and Observations

2. A total of 412 secondary schools responded to the survey for the 2014/2015 school year, in which 301 (73%) reported that there were no laboratory accident cases. A total number of 280 accident cases were reported, in which 241 students and 10 members of staff were injured. Most of the injuries were minor. The majority of the cases (96%) were due to carelessness of students. Detailed statistics of the survey is shown in the **Appendix**.

3. Cuts and heat burns/scalds were the most common laboratory accidents accounting for about 83% of the cases reported. A breakdown of the number of cases in different types of reported accidents is listed in the **Appendix**. The nature of each type of accident is summarised below:

(a) **Cuts:** Most cases involved small cuts caused by broken glass apparatus (e.g. test tubes, beakers, glass rods), tools (e.g. dissection instruments, blade, scissors) or sharp edges. Injuries were mostly made on fingers and palms. In one case, a student was hurt by a broken pipette when he/she fitted a pipette into a pipette filler inappropriately.

(b) **Heat burns or scalds:** Most cases were mainly caused by carelessness in handling hot objects (e.g. tripods, crucibles, tongs, combustion spoons, glassware), hot liquids or Bunsen flame. About 78% of the cases under this category occurred in Science (S1-3) lessons and 16% in Chemistry lessons. Slight heat burns on hands were most common.

(c) **Eye accidents:** All cases were minor ones. Many cases involved splash of liquid chemicals onto the eyes or rubbing eyes with hands contaminated with chemicals, giving rise to slight irritation or discomfort. The chemicals commonly involved were copper(II)

sulphate solution and dilute acids. In one case, the eyes of a student were irritated by ether vapour.

- (d) **Chemicals on skin:** Many cases involved spillage of chemicals during transfer, mixing or heating of liquid chemicals. Concentrated and dilute acids were the most common chemicals involved. In one case, chemicals splashed on students when one of them shook a separating funnel containing liquid chemicals. In another case, chemicals splashed on students' face in an experiment of evaporation to obtain copper(II) sulphide crystal.
- (e) **Chemical spillage:** All cases were minor ones. Most cases involved small-scale spillage of chemicals during transfer. Only a few cases involved injury of students of which all were minor ones.
- (f) **Discomfort arising from inhalation of gases:** Only two cases were reported. In one case, a student inhaled hydrogen chloride gas, leading to discomfort on his/her nasal passages. In the other case, a student inhaled unknown gas while making polystyrene.
- (g) **Substances catching fire:** Only one case was reported and no injury was involved.
- (h) **Bites by animals:** No case under this category was reported.
- (i) **Others:** All reported cases under this category were very minor ones. A few cases involved the experiment using Magdeburg hemispheres. Two students hurt their fingers and one student fell on the ground while trying to separate the hemispheres.

4. Information on the usage of science laboratories in schools was also gathered in this survey and the following accidents rates were computed:

- (a) **Accident rate per 1,000 students:** The schools reported that in the 2014/2015 school year, there were 280 accident cases and a total of 255,130 students (S1-6) studied science courses. This corresponded to an accident rate of 1.10 cases per 1,000 students studying science courses, i.e. a 8% decrease when compared with the rate of 1.19 from the survey for the 2011/2012 school year.
- (b) **Accident rate per 10,000 practical periods:** The schools reported that in the 2014/2015 school year, a total of 870,186 periods were conducted with science practical activities, including student experiments, teacher demonstrations, preparation/try-out of

experiments, project work and science club activities. This corresponded to an accident rate of 3.22 cases per 10,000 practical periods, i.e. a 11% decrease when compared with the rate 3.60 from the survey for the 2011/2012 school year.

Recommendations

5. Although accidents resulting in serious injuries rarely occur in school science laboratories, schools should continue to be on the alert and take active measures to reduce laboratory accidents to a minimum.

(a) Enhancing Safety Awareness of Laboratory Users

Different resources have been developed to enhance the safety awareness of laboratory users. Teachers and laboratory technicians may refer to the handbook "Safety in Science Laboratories (2013)" (http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/SafetyHandbook2013_English.pdf) for the related information. New laboratory safety posters and hazard warning labels have been produced for schools to collect (http://cd1.edb.hkedcity.net/cd/science/laboratory/form_safety_Jan_2014.pdf). Safety equipment such as protective gloves has been included in the "List of Furniture and Equipment" for the Senior Secondary (SS) Science curricula (<http://www.edb.gov.hk/en/sch-admin/sch-premises-info/furniture-equipment/primary-secondary-schools.html>).

Teachers, laboratory technicians and students may use these resources to prepare or conduct experiments safely. Besides, the following learning packages are available at the EDB website to facilitate teachers in planning and conducting lessons on laboratory safety:

- Learning and Teaching Resources on Safety in Science Laboratories (http://cd1.edb.hkedcity.net/cd/science/laboratory/SAFETY/safety_exemplars_e.pdf)
- Safety in Exploring Science (<http://resources.edb.gov.hk/~ses>)

(b) Enriching Knowledge of Laboratory Safety and Management

A series of web-based courses on laboratory safety and management has been developed to enrich teachers and laboratory technicians with the knowledge of laboratory safety and management with a view to maintaining high safety standard of school laboratories. The courses also aim to facilitate schools to plan and conduct regular laboratory safety training for their science teachers and laboratory technicians, provide adequate training for newly appointed teaching and laboratory staff, and facilitate science teachers and laboratory technicians to get access to different

information on laboratory safety and management whenever need arises. There are a total of 18 courses covering topics from general safety and management in school laboratories to subject specific safety practices. For details, please refer to the website at <http://minisite.proj.hkedcity.net/safetyonline/eng/index.html>.

(c) Risk Assessment

In science learning, students are encouraged to conduct more inquiry-based experiments and scientific investigations/STEM¹ related projects. Risk assessment before practical activities is especially important to ensure safety in the laboratory. Teachers, laboratory technicians and also students should be able to recognise potential hazards, assess risks associated and take corresponding control measures and precautions to control the risks. Schools may refer to material safety data sheets (MSDS) for the safety information about chemicals and other relevant information when conducting risk assessment (http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/msds_ss_2000.pdf).

(d) Standing Committee on Laboratory Safety

Laboratory safety is everyone's responsibility. We need a constant and concerted effort to maintain the standard of laboratory safety in schools. In order to establish and maintain an effective safety management system, all secondary schools are advised to set up a standing committee on laboratory safety (SCLS) or a school safety management committee to better equip schools with capacity to deal with emergency situations. It is also important for the committee to meet regularly so that the members could coordinate and monitor the safety measures more closely, and review the laboratory management practices more systematically.

(e) Disposal of Chemical Waste

Improper disposal of chemical waste may lead to laboratory accidents. For proper handling of chemical waste, schools are strongly recommended to follow *the Guide on the Segregation, Packaging, Labelling and Storage of Laboratory Chemical Wastes for Schools* prepared by Environmental Protection Department, which is available at http://cd1.edb.hkedcity.net/cd/science/laboratory/waste/cw_e.htm.

¹ STEM is an acronym that refers to the academic disciplines of Science, Technology, Engineering and Mathematics.

Concluding Remarks

6. The statistics of the survey of the 2014/15 school year revealed that schools have not only maintained a high standard of laboratory safety, but also have shown improvements in it. Nevertheless, schools should continue to take a proactive role in monitoring the standard of laboratory safety. Based upon the fact that about 96% of accident cases were due to carelessness of students, students' attitudes towards and knowledge of safe practices in laboratories should be enhanced. Laboratory safety should be emphasised for each and every practical activity. Risk assessments should be made in advance and suitable personal protective equipment should be worn when conducting experiments. For more guidelines and resource materials on laboratory safety, please refer to the website of Science Education – Laboratory Safety and Management at the following website: <http://www.edb.gov.hk/en/curriculum-development/kl/science-edu/ref-and-resources/lab-safety-and-management.html>.

Science Education Section

Education Bureau

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**Statistics of the Survey on Laboratory Accidents
in Secondary Schools for the 2014/2015 school year**

Summary of Survey Results

Number of schools responded	412
Number (percentage) of schools reported laboratory accidents	111 (27%)
Total number of accident cases	280
Number of accident cases per school	0.68
Total number of students injured*	241
Total number of staff injured*	10
Accident rate per 1,000 students studying science courses**	1.10
Accident rate per 10,000 practical periods	3.22

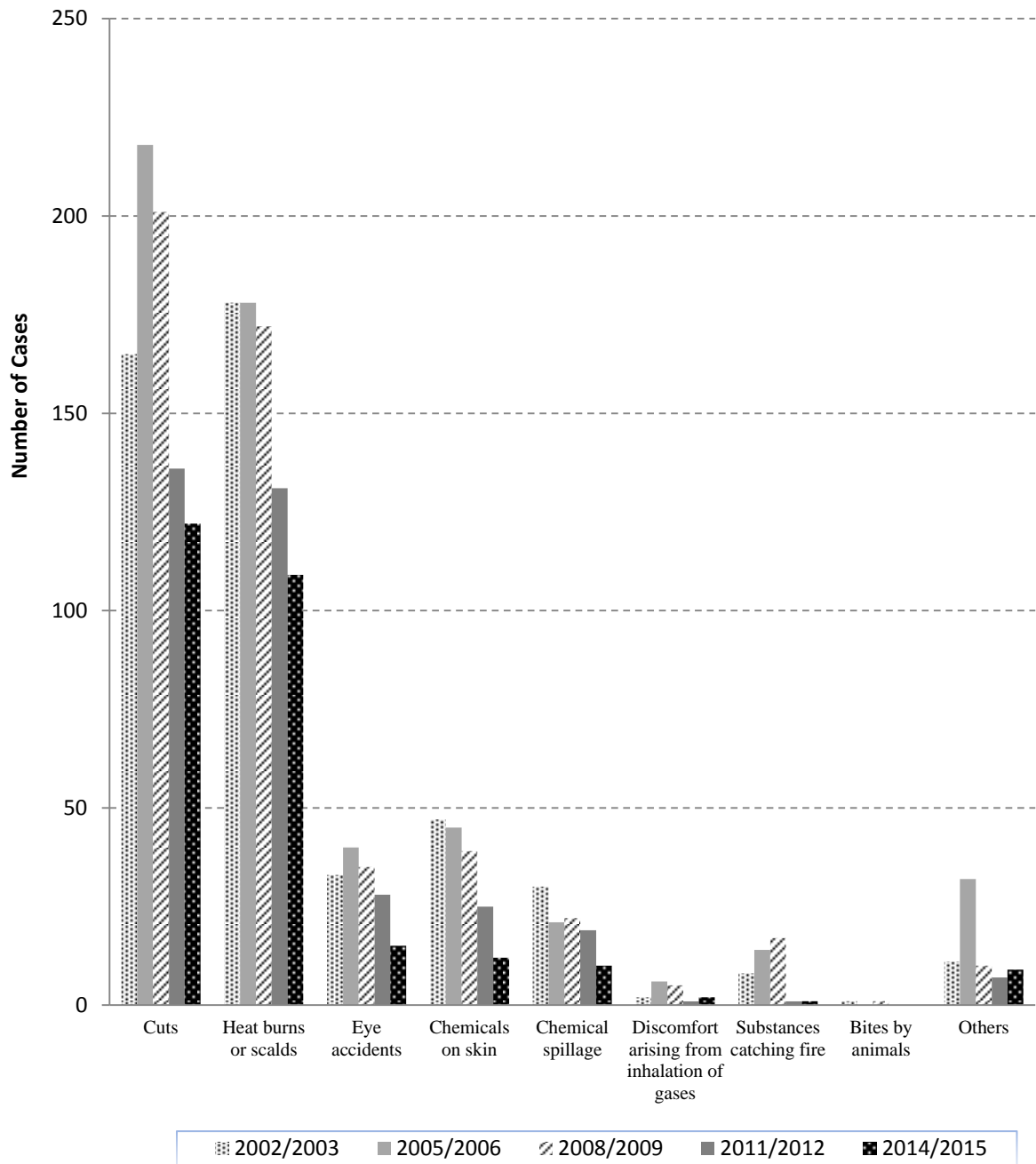
* Most of the injuries were minor ones, e.g. minor cuts, heat burns or scalds on hands.

** In 2014, the traffic accident rate in Hong Kong was 2.18 cases per 1,000 population (Source: Road Traffic Accident Statistics 2014, the Transport Department); the industrial accident rate in all industries was 19.0 cases per 1,000 workers (Source: Occupational Safety and Health Statistics 2014, the Labour Department).

Type of accident	Number of cases	Percentage
Cuts	122	43.6
Heat burns or scalds	109	38.9
Eye accidents	15	5.4
Chemicals on skin	12	4.3
Chemical spillage	10	3.6
Discomfort arising from inhalation of gases	2	0.7
Substances catching fire	1	0.4
Bites by animals	0	0.0
Others	9	3.2
Total	280	

Subject	Number of cases	Percentage
Science (S1-3)	165	58.9
Biology	55	19.6
Chemistry	47	16.8
Physics	8	2.9
Integrated Science (S4-6)	5	1.8
Total	280	

Surveys on Laboratory Accidents in Secondary Schools 2002/2003 - 2014/2015 School Years



Number of cases:	464	522	502	348	280
Number of schools responded:	422	464	459	401	412