RISK MANAGEMENT

CONTENTS

Overview

All activities involve potential risks, however, all injuries are predictable and preventable. In order to keep science teachers, assistants and students safe, teachers must be able to manage risks. This means that teachers must have the proper safety education and training (including WHMIS and TDG), and be able to teach students safe attitudes and behaviors. This will help teachers be proactive in health and safety rather than solely reactive. Risk management involves identifying hazards and assessing the frequency, severity and probability of risk. This assessment determines the degree of risk and the level of management needed. Furthermore, it is important for teachers to consider the full life cycle of an experiment from the materials required to the disposal of the materials used to ensure that all aspects of risk are accounted for.

Risks

Inherent risks

Inherent risk means there is an inseparable risk associated with particular materials and activities used. Most science activities involve some inherent risks. An example of inherent risk would be an activity aimed at helping students learn about heat. This activity might require use of heat sources and heat resistant containers, hence creating an underlying risk of burns and minor cuts. More serious risks are inherent in the use of particular chemicals, equipment or procedures and a risk assessment should be performed to determine the degree of risk and how to control the hazards.

Before selecting materials and activities, it is important to consider ways to minimize inherent risks. For example, in planning an activity that requires elementary students to transfer liquids from one container to another, teachers can avoid the inherent risk of cuts caused from broken glassware by opting instead to use plastic containers. Similarly, a teacher could minimize inherent risks in an activity involving the handling of acid solutions by preparing the solutions in advance, rather than have students prepare them as part of the activity. Decisions such as these should also take into account the learning outcomes, the grade level, and the students' skill level.

Situational risks

Situational risks arise from the context in which the materials and procedures are used. For example, if heat sources are used in a crowded workspace, the situation of crowding creates an additional risk of burns. If situational risks are not considered, an activity that has low inherent risk can grow into a high-risk situation.

Situational risks can be minimized by ensuring that:

- Teacher and students are aware of inherent risks involved in an activity.
- Teacher and students understand and are able to carry out appropriate procedures.
- Steps are taken to minimize potential distractions or disruptions.
- Workspaces are adequately sized and well-organized.
- Sufficient supervision and guidance are provided at all times.
- Appropriate safety equipment is available, and
- Teacher and students are aware of emergency procedures.

The most effective way to minimize situational risks is through a collaborative effort between teachers and students. Teachers can enlist students in safety planning and in establishing safe classroom procedures. This strategy for risk minimization can be supported by involving students in activities such as:

- Developing a safety contract for students to sign at the beginning of the school year.
- Identifying and reporting hazards.
- Developing lists of accepted and prohibited laboratory activities, and
- Creating posters that show appropriate and inappropriate activities.

Choosing science activities

Safety is a primary concern when selecting science class activities. Factors to consider before proceeding with a science activity include:

- Potential hazards (including both inherent and situational risks).
- Knowledge, skills and maturity of the students.
- Experience, expertise and training of the teacher, and
- Equipment and facilities available to safely carry out the activity.

Inherent risks increase dramatically with the use of materials that are highly toxic, corrosive or flammable. The selection of materials can thus help minimize risks. Teachers need to assess the risks of different alternatives and select the one that presents the least hazards for students – even though another choice might produce a more spectacular result. Alternatively, an activity might be carried out as a demonstration by a teacher with appropriate safety precautions in place. A further alternative is to use videos or CD-ROMs. Although this may take away from the drama of a live demonstration, it effectively communicates what students need to know and understand.

In addition, many of the approaches described in **Chapter 8 Strategies for minimizing hazardous waste production** are excellent ways to reduce safety risks. These strategies include micro-scale experiments, dispensing pre-measured quantities of chemicals and using laboratory stations. Teachers should also be aware that the *OHS Regulations, 1996*, part IV section 19 specifies that:

> "an employer shall ensure that no worker is permitted to perform work unless the worker has been trained, and has sufficient expertise to perform the work safely and in compliance with the Act and Regulations; or the worker is under close and competent supervision."

This section places an onus on the employer (school divisions), to evaluate the competency of a teacher to perform the activities chosen to be carried out in the classroom, or to ensure adequate supervision during said activities. Section 23 under the *OHS Act, 1993*, allows for any worker, including a substitute or regular teacher to refuse an assignment that requires a specific task to be carried out that is perceived to be unusually dangerous to the worker's health or safety or to the health or safety of any other person at the place of employment. An example could be where the worker is not competent to perform a specific task such as handling controlled products without WHMIS certification or receiving or transporting chemicals without TDG training.

Field trips

Field trips are a valuable addition to any science program, giving students the opportunity to explore applications of science and to investigate living things in their environment. Potential hazards associated with off-site excursions depend on the nature of the trip and the site visited, but in general the risk of incidents can be reduced if the field trip is well-planned and organized. Field trip planning should be guided by division field trip policy which will often identify standards in such areas as supervision and first aid preparation. Planning for adequate supervision should take into account the age and number of students, the kinds of hazards present at the site, and the types of activities to be carried out. Planning for first aid preparation should take into account Table 10 in the appendix of the *OHS Regulations, 1996* which lists the required first aid items and the tables in the OHS guidance document "First Aid in Saskatchewan Workplaces" which lists the recommended quantities of first aid supplies. See **Appendix 2**.

Transportation is a further element of field trip planning. Division policy should be reviewed to determine what modes of transportation are considered acceptable and what guidelines apply. For example, there may be local guidelines on the use of parent, guardian or student-supplied transport.

Preparations for field trip safety should also include briefing students on safe and unsafe activities.

Museum, zoo or industrial site

The two primary concerns for these kinds of trips are safe transportation and adequate supervision. Be aware of any on-site hazards (if these exist), and make students and supervisors aware of them prior to the trip. Also ensure that a first aid kit and someone who can provide first aid (certified first aider) is available on site at all times. In many cases, this may be available at the site to be visited, but if in doubt, this should be included in trip preparation.

When visiting industrial sites, a hazard assessment should be done prior to the visit to ensure staff and students are fitted with appropriate personal protective equipment for the site. Examples of personal protective equipment include hearing protection, safety glasses, hard hats, and steel toed boots.

Nature site

Field trips to environmental sites present its own set of challenges because students are exposed to the weather, physical hazards and local organisms. Taking the following precautions can reduce risks:

- Be thoroughly familiar with the site and any potential hazards; visit the site prior to the field trip if necessary.
- Provide students with a site map, identifying the specific locations to be visited, the routes by which they will get there and the potential hazards.
- Specify the clothing and footwear to be worn.
- Identify special requirements such as insect repellent during breeding of biting insects, particularly mosquitoes.
- Use appropriate precautions and equipment if working on or near water
    - For example, whistles, life jackets, throw line, 'buddy' system.

- Ensure supervisors are located so that all students have an adult relatively nearby at all times.
- Have a first aid kit and someone who can provide on-site first aid at all times.
- Maintain access to a vehicle at all times in case of an emergency, and
- Carry a cell phone to access emergency services and information.

For more information on Biology field trips, see **Chapter 5 Field trip hazards**.

Safety awareness and education

Safety awareness and education is a responsibility at all levels of planning. All staff should be aware of hazardous materials and procedures used in their working environment, and have the knowledge and skill needed to eliminate or minimize risks to themselves and to others. As employers, school divisions have a responsibility to ensure that school staff have the appropriate level of knowledge and skill – a responsibility that also falls onto each employee. As overseers of school programs and school environments, school divisions also have responsibility for ensuring that students develop the knowledge, skills and attitudes they need to support their own safety and the safety of others. With appropriate safety education, all staff and students will be able to act responsibly, follow appropriate safety procedures to avoid hazards and injuries, and deal appropriately with injuries or incidents if they occur.

Workplace Hazardous Materials Information System (WHMIS)

As described in Chapter 1, WHMIS is designed to identify and minimize risks for human health and safety. Under federal, provincial and territorial legislation, people in every workplace have the right and responsibility to know whether materials they are working with are hazardous, the nature of the hazard and what safety measures to take. Although students are not specifically referred to in WHMIS (except in the case of registered apprenticeship or work experience programs), their presence in the school workplace suggests that a level of care be provided consistent with WHMIS standards. This implies making students aware of any potentially hazardous materials in areas accessible to them, and providing training in the safety skills needed to use these materials. The safest and most practical approach is to manage the environment so that student access to these materials is limited to times of teacher supervision.

Although the legal force of WHMIS requirements is not well-defined with respect to students, this is not the case when it comes to school staff and school divisions. School staffs that use controlled products are bound by the WHMIS requirements in its capacity as workers, and each school division is bound by the regulations that apply to employers.

This means, among other things, science teachers and other school staff who work with potentially hazardous materials, must be WHMIS trained. This training must be provided by the employer to enable employees to:

- Recognize risks of controlled products they are handling.
- Learn how to safely handle, store and dispose of these materials.
- Know where the MSDSs are filed and how to use the provided information, and
- Apply proper labeling to containers holding controlled products.

This training must be generic, as well as product- and site-specific, so that all staff know, among other things, what hazardous materials they will encounter in their work location, where the hazardous materials and safety equipment are located, as well as the location of the MSDSs. Since the site-specific component of WHMIS training differs from school to school, science teachers who move to a new school should go through a safety orientation that covers such detail without having to repeat the generic WHMIS training.

A yearly review of the WHIMIS program is required under section 318 of the *OHS Regulations, 1996*, to determine if workers are competent in WHMIS, if they need a refresher course, or if full retraining is required. This review must be performance orientated. Some divisions require that staff working with WHMIS controlled products receive refresher training at least once every three years. Schools may find it useful to maintain records of courses taken, but this is not a formal requirement. The ability of workers to demonstrate the above knowledge and skills is sufficient evidence of the requirement being met.

For more details on what must be covered by WHMIS training, refer to part VI of the *OHS Act, 1993* and part XXII in the *OHS Regulations, 1996*.

WHMIS training is offered online through WorkSafe Saskatchewan. You can visit the website at http://www.worksafesask.ca/WHMIS-course for more information. You can also look to safety associations and post-secondary institutions for on-site training availability.

Staff training

Training of science teachers and support staff would generally cover much of the following through WHMIS training. Any details not covered could be included as part of a school refresher or orientation for members of the science staff.

- Legislation that regulates or defines safety standards in the school, particularly Occupational Health and Safety, Environmental Protection, WHMIS and TDG regulations.
- Due diligence and staff responsibilities.
- School or division safety policies for science classrooms, laboratories and field trips.
- Safety equipment (including personal protective equipment), location, use and maintenance.
- Management of chemicals: location, storage, classes, specific risks, safe use of controlled products, and disposal of chemicals.
- Location of MSDSs and how to read them.
- Response to spills and spill clean-up.
- Response to incidents, including first aid procedures.
- Incident and near-miss reporting procedures, and
- Review of basic laboratory techniques and identification of inherent hazards.

See **Appendix 12** for examples of such techniques and the associated hazards.

Transportation of dangerous good act and regulations

The purpose of the *Transportation of Dangerous Goods Act, 1992* and Regulations is to protect the general public and the environment during the transportation of dangerous goods. The *Transportation of Dangerous Goods Act, 1992* and Regulations require that anyone transporting, shipping or receiving dangerous goods be trained and have a training certificate available for inspection. A training certificate is valid only for three years; after that time, the individual must be retrained and issued a new certificate. These requirements apply to anyone who:

- Offers dangerous goods for transport, such as a shipper at a chemical supply company.
- Receives dangerous goods. This includes the individual at a school who accepts delivery and signs the delivery docket or manifest.
- Handles dangerous goods by loading or unloading materials, or
- Drives a vehicle carrying dangerous goods.

Principals and administrators are responsible for ensuring that staff members who receive or ship dangerous goods are TDG trained and certified.

Environmental legislation and local bylaws

Canadian Environmental Protection Act, 1999, *The Environmental Management and Protection Act, 2002*, c. E-10.22

These standards outline systems to protect, improve and ensure wise use of the environment. The provincial statute sets the standard on a broader regulatory level with regards to human environmental impact, whereas municipalities take responsibility for establishing specific guidelines and standards for waste management. Such standards are embedded in local bylaws, identifying prohibited or restricted materials and regulating where and what wastes may be disposed of via local landfill sites and the sewage system. For specific details about bylaws in your area, contact your local municipality.

Principals and administrators can ensure standard compliance with these regulations and local bylaws by educating staff. See **Chapter 1** for more details on legislation.

Use of safety equipment

Science teachers need to be familiar with the location, use, maintenance and limitations of all safety equipment in the science area. Such familiarity may require initial training and periodic refresher sessions. Sharing this information with students will help them take appropriate action if the teacher is not immediately available during an emergency or incident.

Safety and the student

Part of the science educators' role is not only to ensure a safe learning environment, but to instill in students an understanding of their own safety responsibilities in the science classroom. Learning about science includes learning to respect the materials being used, and this respect can be taught only by example. In this way, science teachers are role models – advocates and practitioners of safety. Increasing students' awareness of safety issues in general, and knowledge of safety practices specifically, is one of the most important ways to reduce situational risks.

Student safety training

Safety training is an integral part of learning laboratory techniques. Though infrequently put to the test, safety training is an excellent way of encouraging students to make safety a lifelong practice at home and in the workplace. As part of such training, general safety issues and student expectations would be addressed at the beginning of each course. These would be posted and periodically reviewed. See **Appendix 6** for example science safety rules and procedures for students. More specific safety issues inherent in the activities would be discussed as part of the pre-activity instruction.

Safety expectations can be taught in a number of ways:

General safety practices

- Handing out written copies of best laboratory practices and reviewing these with students throughout the term.
- Posting lists of safe practices in appropriate areas and regularly reminding students of them.
- Modelling safe behavior during all activities.

Specific safety concerns

- Reviewing specific safety issues and procedures before each activity, including relevant WHMIS information, required personal protection equipment, and emergency response procedures in case of incidents.

Developing common expectations for student behaviors and procedures can be a helpful starting point in planning safety training. By planning as a science team, and by sharing common lists of expectations and procedures, the science staff in a school can ensure consistency in their messages, and avoid student confusion about what they may and may not do. See **Appendix 13** for suggested science department safety policies and procedures.

Making safety an integral part of every course helps to reinforce the importance of safety and conditions students to think about safety whenever they undertake any activity.

Developing safety awareness and responsible habits

One of the most important ways to promote safety in science classrooms is to increase students' awareness of safe practices and to help them develop responsible attitudes. Best laboratory practices can be broken down into three time periods: before, during and after.

1. Before entering the laboratory

- Confine long hair and loose clothing.
- Put on closed-toe shoes.
- Put on eye protection.
- Cover exposed areas of the body with chemical-resistant clothing (protective gloves, aprons or lab coats, and face shields) when using toxic or corrosive material.
- Know the hazards of chemicals to be used, and
- Understand response procedures in case of an incident; if unsure, ask the teacher or check the MSDS information.

2. While in the lab

- Behave responsibly and respect the safety of others at all times.
- Never work alone or unsupervised.
- Do not eat, drink or chew gum.
- Do not bring drinks or food into the laboratory.
- Never pipette by mouth.
- Replace stoppers and caps of chemical containers immediately after use.
- Treat a substance as hazardous unless definitely known as safe – read the WHMIS label to be sure, and
- Work under a fume hood if using substances that produce a hazardous vapour or dust.

3. Prior to leaving the lab

- Dispose of hazardous wastes in specified containers or as instructed by the teacher.
- Turn off and put away all equipment, and clean all glassware, and
- Wash hands thoroughly.

The more awareness students have of these issues, the greater chance they will develop safe and responsible habits of mind. For a more comprehensive list, see **Appendix 6.**