

Safety and Welfare in the Classroom

Ashley Grapes

The National Science Education Standards (NSES) urge teachers across the nation to use inquiry-based and active science to create scientifically literate individuals. People generally learn more effectively by “doing,” rather than simply reading because action requires greater use of the senses. Conducting research in a science classroom allows the concepts in the book to jump to life, lending to greater retention, understanding, and appreciation of the words that sometimes run together in a textbook. Successful scientists are creative, problem-solvers, confident, careful, organized, and mindful of the safety and welfare of themselves and others in the laboratory. Gaining research experience will help students build these skills, which are important for success in everyday life.

Experimentation in biology class is especially important, because the field revolves around the study of life, and the processes that make life possible. It requires studying motion and action words indicative of life itself, such as development, contraction, and metabolism. Even complex processes like photosynthesis and mitosis can be visualized in a laboratory setting under low costs and time restraint. The smallest efforts to include real-life simulations in the biology classroom can make the difference between an “aha” moment and continued confusion.

These philosophies indicate why I am adamant about including a laboratory component into my teaching repertoire. There are several factors that are involved in making this type of learning style successful, but the most important and foundational of them all is safety. Students must be given a safety contract that is clear, concise, and comprehensive. The teacher has the legal and ethical responsibility of creating an environment where the students feel safe, respectful, confident, and prepared. The safety contract I have prepared meets the above criteria, and includes all safety and welfare issues required by the National Science Teaching Association and Virginia Department of Education listed below.

a) Understand the legal and ethical responsibilities of science teachers for the welfare of their students, the proper treatment of animals, and the maintenance and disposal of materials.

Teachers are legally and ethically responsible for their classroom, including all living and non-living things therein. Teachers are also liable for any negative events that occur outside the school that were directly related to classroom activities, including student injuries from attempted experiment replication or environmental hazards due to improper disposal. Teachers should constantly remind students of the safety procedures and explain that replication of potentially dangerous experiments outside of class is prohibited.

The entire process of investigative learning requires attention to safety from the instructor. This begins with always keeping the science room locked when you are not in the room, storing hazardous materials securely away from students, keeping student to teacher ratios low for

effective monitoring, and knowing student allergy and medical information. The classroom needs to be a safe environment that is constantly clean, organized and labeled.

The instructor should set high expectations for their students and begin to build a reputation in the classroom for excellence. All students have different learning styles, backgrounds, abilities, and aspirations. The instructor needs to create a sense of community, a respect for all living things, and an appreciation for diversity. With the increasing diversity in the classroom, teachers need to make sure that rules, regulations, and protocols are thoroughly and clearly understood by everyone.

b) Know and practice safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used in science instruction.

Once a chemical arrives on school property, the school is legally responsible for its care, use, and disposal. Schools and teachers should only order chemicals from certified companies, and never accept new or used solutions from other sources. All chemicals must be kept in sealed containers that are labeled with the product identification, ingredients, hazard potentials, proper protective attire needed, expiration date, and safe disposal information. Students must learn to habitually read labels, understand what they mean, and take the necessary precautions when handling them. All chemicals and equipment must be stored in designated cabinetry, and precautions must be taken in how these materials are stored.

All chemicals have a specific disposal protocol based on the ingredients, quantity used, fire hazard, etc. These generally range from simply pouring down the sink to throwing away in a designated hazard labeled bin. Failure to abide by these guidelines may result in injuries to people or the environment.

c) Know and follow emergency procedures, maintain safety equipment, and ensure safety procedures appropriate for the activities and the abilities of students.

Despite best efforts, mistakes and accidents happen. It is imperative that teachers prepare themselves, their students, and their classroom for such events and emergencies. Students must be required to inform the teacher immediately when a mishap occurs, no matter how small it may seem. All science classrooms must have an eyewash station, emergency shower, first-aid fire extinguisher, fume hood (if applicable), sharps box, and an emergency evacuation plan by law. All of these must be kept in working order and students must be informed on how to use them.

All classrooms should ideally have excess space, plenty of water faucets and light, an emergency number list, and a hazard sign/symbol poster. There are several pieces of laboratory equipment that will also enhance the safety of the classroom including tongs and specialized pads to remove hot objects, heating blocks instead of open flame bunsen burners, and droppers to remove dangerous chemicals instead of pouring are some examples. Student's should be required to wear their safety goggles, lab coat and gloves when appropriate, and always be wearing closed-toed shoes and have long hair secured.

Teachers need to teach students how to be safe before the lab begins and constantly remind them during experimentation. Sometimes students become lackadaisical about safety because they get comfortable or just because they do not understand why certain precautions are taken. Student's need to be told the consequences of not following safety protocol and any infraction should be followed by punishment. Students should always have a copy of their safety contract in their laboratory notebooks, and protocols need to clearly address any special safety instructions needed for a particular lab.

d) Treat all living organisms used in the classroom or found in the field in a safe, humane, and ethical manner and respect legal restrictions on their collection, keeping, and use.

Biology is the study of life, and so live organisms are an integral part of investigative learning in the field. Some organisms are kept as pets in the classroom, and others may be used in experimentation. Whatever their role, and whatever their complexity, they must be treated safely, humanly, and respectfully. Teachers may not keep endangered animals, and should refrain from keeping high maintenance or large organisms in the classroom. It is the teacher's responsibility to set a precedent for the care of classroom animals, and so these animals should be happy and healthy at all times. Anytime a student interacts with organisms, teachers need to carefully monitor them.

All organisms possess some level of danger and students should be aware of these when handling them. These can include allergenic and toxic properties, microbial infections, bites, scratches, and zoonotic diseases. When studying in the field, the teacher needs to assess the environment first, checking for poisonous plants and other unsafe landscape features. Students cannot disturb natural habitats, organisms taken out of their natural habitat need to be returned to the same location in the same condition, and no foreign animal can be introduced to the environment.

References:

Texley, Juliana, T. Kwan, and J. Summers. 2004. Investigating Safely: A Guide for High School Teachers. NSTA press. ISBN: 978-0-87355-202-8.