CHAPTER 7

Making AP Chemistry Inclusive for All Learners

As a teacher, you should anticipate having students with special needs in your course, and should plan to meet the individual needs of those students in order to support them in being successful in the course. This chapter provides guidance regarding issues that are particularly pertinent to special-needs students in the guided-inquiry chemistry laboratory.

SAFETY

The most important consideration for teachers is always the safety of their students in the laboratory. Teachers may need to make special efforts in order to ensure that students with special needs can work effectively and safely in the lab. The inclusion of students with special needs can be successful when teachers have sufficient information about students' needs, have the proper materials to assist students in the lab (as needed), and receive support from professionals who specialize in the special needs of particular students.

In some cases, the teacher will need to spend more time with special-needs students in the laboratory. Thus, the total number of students the teacher can adequately supervise may be smaller, so teacher/studio ratio is particularly important. Teachers may need to have additional professionals in the laboratory to be able to guide and manage all students safely. Special-needs students may need specialized equipment or other aids to support their work in the lab. A team of professionals (counselors, science teachers, special-education teachers, and school administrators) should discuss class size, specialized equipment, and other issues pertinent to the requirements of the special-needs student prior to laboratory work, and the teacher must ensure that recommendations are followed. The teacher can help the team to identify risks that might arise from a student's special needs in the specific context of the chemistry laboratory.

ACCOMMODATIONS

Both physical and nonphysical accommodations that enhance learning can be made for students with special needs. The most common special needs relate to (1) vision, (2) mobility, (3) autism spectrum, (4) learning and attention, (5) hearing, and (6) health. Consultation with educational professionals who specialize in the particular special needs of the student is important. Awareness of organizations such as DO-IT (Disabilities, Opportunities, Internetworking, and Technology) can

provide teachers with information about working in the laboratory/classroom with students with special needs. Many students with learning issues have individualized education programs (IEPs) that can guide the accommodations.

You may want to consider including the following suggestions:

- **Students with vision impairments** might benefit greatly from enhanced verbal descriptions and demonstrations. Lab equipment can be purchased with Braille instructions, promoting independent participation for visually impaired students. Students with visual challenges might also benefit from preferential seating that allows them to see demonstrations more easily. If possible, you should provide students with raised-line drawings and tactile models for illustrations. You might also consider using technology to increase accessibility to the lab experience. For example, video cameras attached to a computer or television monitor can be used to enlarge images.
- **Students who have mobility challenges** may need a wheelchair-accessible laboratory. You should keep the lab uncluttered and make sure that aisles are wide enough for wheelchair movement. Students often can see a demonstration better if a mirror is placed above the instructor. Lab adaptations are available for students with mobility problems to assist them in most lab activities. You will need to know a student's limitations before planning a successful lab experience.
- **Students with autism spectrum disorders** (including Asperger's syndrome and pervasive developmental disorder) may have a range of communication and impulsive behavior challenges requiring accommodations and close monitoring in the laboratory setting to ensure a safe and supportive learning environment. These students' particular challenges and needs are highly individualized. Guidance and support from appropriate professionals is particularly important for preparing teachers to meet their needs. An educational aide or support staff member working with the student in the lab is sometimes helpful, as a lower student–educator ratio is often beneficial and may, in some cases, be called for in the student's IEP.
- **Students with hearing difficulty** might benefit from preferential seating near you when demonstrations are given. It is also helpful to provide hearing-impaired students with written instructions prior to the lab, and to use instructor captioning when showing videos and DVDs.
- **Students who have learning and attention special needs** may require a combination of oral, written, and pictorial instruction. Scaffolding instruction increases learning, and safety issues and procedural instructions may need to be repeated. Having audiotaped instructions may be helpful to allow students to hear them as often as needed for comprehension. Some students who have special needs related to attention need frequent breaks to allow them to move around and refocus. Providing students with preferential seating to avoid distractions is also helpful. Students with reading and writing challenges often require more time to prepare for lessons and to complete the follow-up activities. Students with learning and attention challenges sometimes benefit greatly from the use of technology, such as scanning and speaking pens that help with reading. Other students might benefit from using laptops to take notes during class.

- **Students with health issues,** such as asthma, allergies, or insulin-dependent diabetes, may benefit from certain accommodations. Care should be taken to avoid risking a student's health because of exposure to chemicals or allergens such as noxious gases or vapors, latex gloves, or food components (e.g., milk or egg proteins, peanuts) while conducting laboratory investigations. Students with asthma or allergies may benefit from wearing a mask designed for chemical laboratory use. Teachers should be aware of any student requiring epinephrine administration (e.g., an Epi-Pen) in the case of an allergic reaction.

UNIVERSAL DESIGN

Creating a laboratory environment that is universal in design means creating one that is accessible to students both with and without special needs. By creating such an environment, you should address most concerns and accommodations for students with special needs and, at the same time, improve learning opportunities for *all* students in the lab. The teacher should be proactive whenever possible in implementing accommodations, including the following:

- Providing both written and oral directions
- Giving students adequate time to prepare for labs and to complete follow-up activities
- Making the aisles wide enough for wheelchairs
- Installing a mirror above the area where demonstrations are performed
- Using tables that can be adjusted for height

SUPPORTING ENGLISH LANGUAGE LEARNER STUDENTS

AP Chemistry teachers should be prepared to accommodate English language learner (ELL) students in their courses. Teachers can employ a number of strategies to support such students; many of these strategies will benefit all students, not just ELL students. Examples include:

- Using printed pictures and graphics (e.g., pictures of lab glassware) to support English text in curricular materials and lab handouts;
- Teacher demonstrations of basic procedures and techniques;
- Video clips showing laboratory techniques; and
- Multimedia simulations of chemical phenomena.

Another idea to consider is pairing students with less developed English language skills with another student who speaks their first language and has more developed English language skills, though of course this is not a substitute for teacher supervision and support. Close teacher monitoring and prompting in the lab will further help students who appear confused or "on the wrong track" during inquiry activities, and will prevent any potential safety hazards from arising.

DEVELOPING A COMMUNITY OF LEARNERS

Teachers must foster the creation of a learning environment that includes and respects *all* students. For example, creating cooperative learning groups provides students with the opportunity to share their knowledge and skills and to learn from each other. This is particularly advantageous for special-needs students.

Teachers may find it helpful to talk with students to discover firsthand what accommodations they need to implement to make their students' lab experience successful. By modeling attitudes and behaviors expected from students, teachers can develop activities that help *all* students build meaningful academic and personal relationships.

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