

# ACS Guidelines for Chemistry in Two-Year College Programs

The following is an excerpt from the *ACS Guidelines for Chemistry in Two-Year College Programs*. American Chemical Society: Washington, DC. 2015.

The complete electronic version of the *ACS Guidelines for Chemistry in Two-Year College Programs* and additional information are available at [www.acs.org/2YGuidelines](http://www.acs.org/2YGuidelines).

Requests for hardcopies or additional information should be directed to

Undergraduate Programs Office  
American Chemical Society  
1155 Sixteenth Street, N.W.  
Washington, DC 20036  
Phone: 202-872-6108  
Email: [2YColleges@acs.org](mailto:2YColleges@acs.org)

## 6. Undergraduate Research, Internships, and Other Experiential Activities

Engaging two-year college students in original research and other scholarly activities has many benefits. It allows students and faculty members to integrate and reinforce chemistry knowledge, develop their scientific and professional skills, enhance their safety and risk assessment skills, create new scientific knowledge, and add new contributions to other knowledge bases.

To prepare students for the workplace, two-year colleges should include some type of internship, research, cooperative learning, or long-term project; for chemistry-based technology programs, which focus on immediate employment, internships and co-ops are especially important. These types of experiences are best provided by the program partners who will ultimately hire the program graduates. If such experiences cannot be arranged, on-campus internships and research projects may be suitable alternatives.

**6.1 Research.** Student-centered research fosters interactions among students and faculty members and enhances student interest in science. Research activities are also effective in keeping faculty members current in chemistry fields and in a position to enrich contemporaneous course content. Such activities help students, faculty members, and administrators develop an understanding and appreciation of the importance of scientific research in maintaining competitiveness in the global workforce. In addition, experimental work can provide a basis and rationale for acquiring modern instrumentation.

Well-structured research experiences include the following components:

- Defined topic and achievable goals
- Access to and use of appropriate chemical literature and equipment
- Methodologies appropriate for potential publication in a peer-reviewed journal
- Appropriate safety practices
- Supervision by an experienced chemist or instructor
- Written report at the conclusion of the project

If a college is unable to support research on-campus, collaborations with other institutions may yield valuable research opportunities (see Section 10).

**6.2 Internships and cooperative learning experiences.** Independent work opportunities should parallel experiences one would expect in the workplace. Valuable internships or co-op experiences include the following components:<sup>10</sup>

- Hands-on, independent work that applies the skills and knowledge learned in the classroom
- Use of skills that transfer to other forms of employment, such as critical thinking, verbal and written communication, and workplace ethics
- Specific goals and objectives that apply to the hiring organization and the college (organization's goals and college's goals may be separate, as long as they are defined)
- Supervision by a qualified professional
- Tangible contribution to the work of the group
- Conditions similar to those that interns will experience upon full-time employment
- Routine feedback from experienced supervisor
- Appropriate resources, equipment, and facilities provided by employer
- Appropriate financial compensation, academic credit, or both

As a result of the experience, a written or verbal report, or both, should be submitted to the academic institution.

**6.3 Long-term projects.** Student-centered research projects can be pursued independently or integrated into the curriculum. Projects can be conducted on campus, in the facilities of partnering institutions, or in other scientific facilities. Developing group or interdisciplinary projects can help broaden the applicability and relevance of chemistry in allied fields.

A suitable project includes the following characteristics:

- It is well-defined, with clear goals and objectives.
- The plan has a reasonable chance of completion in the available time.
- Students develop and apply an understanding of in-depth concepts.

---

<sup>10</sup> National Association of Colleges and Employers. Position Statement: *U.S. Internships—A Definition and Criteria to Assess Opportunities And Determine the Implications for Compensation*, July 2011. <http://www.naceweb.org/advocacy/position-statements/united-states-internships.aspx> (accessed Sept 11, 2015)

- The research uses a variety of methods and instrumentation.
- The topic is grounded in the chemical literature.

Implementing a student-centered research, internship, or long-term project program requires resources, including faculty time, laboratory space, instrumentation, chemical literature, supplies, and student stipends. The investment is justified by its impact on student learning and the richness it adds to students' and faculty members' scientific experiences.