Online Resources for Teachers and Students from the American Chemical Society
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The American Chemical Society (ACS) Education Division offers a wealth of resources for learners and educators from kindergarten through graduate school. The Division is developing a new strategic plan, which provides a framework for current and future programs, products, and services. The draft goals of the evolving plan are

1. To provide unique and high quality educational resources that set the standard for chemistry education in both content and instructional approach.
2. To connect learners and educators in ways that lead to personal and professional growth, exchange of knowledge, and interaction with the broader scientific community.
3. To improve the teaching and learning of chemistry by supporting professional development activities for educators based on the highest quality standards and practices.
4. To ensure the quality of education in chemistry and chemistry-related fields by supporting the development, dissemination, and adoption of guidelines, policies, and standards.
5. To provide diverse experiences that inspire student learning.

These goals serve as a useful scaffolding to highlight the educational resources available from the ACS Education Division.

Goal 1: To provide unique and high quality educational resources that set the standard for chemistry education in both content and instructional approach.
The ACS seeks opportunities to develop novel science education resources, ones that do not replicate what is already in the marketplace. An excellent example of this approach is the ACS high school text *Chemistry in the Community*, now in its fifth edition. Chemistry concepts are presented on a need-to-know basis in the context of societal issues. This approach served as a model for *Chemistry in Context*, a text designed for non-science major undergraduates, which presents the chemistry behind global issues, such as climate change and air pollution. A third ACS textbook, *Chemistry*, is targeted toward undergraduate science majors and advanced high school chemistry students. This text offers an activity-based approach to general chemistry in the context of biologically important molecules.

Since 1983, *ChemMatters* magazine has been “demystifying everyday chemistry” for high school students. Recent issues have featured articles on removing arsenic from drinking water, the forensics of blood, and fuel cell chemistry. Educators who wish to introduce green chemistry to their students can take advantage of a variety of green chemistry resources, developed by the Education Division and the ACS Green Chemistry Institute, including case studies and laboratory experiments.
Inquiry in Action supports inquiry-based learning at the middle school level. This resource for middle school teachers emphasizes the process of scientific inquiry through activities that, for example, investigate the chemical properties of similar-looking powders and the nature of the color coatings on M&Ms. The Best of Wonderscience is a compilation of more than 600 hands-on activities appropriate for children in grades 3-6. Apples, Bubbles, and Crystals and Sunlight, Skyscrapers, and Soda Pop nurture scientific curiosity in younger students.

A number of resources are designed to help students make career and education choices and promote their professional development. The directory of Experiential Programs in Chemistry (EPiC) is an online database listing internship, co-op, and fellowship opportunities. A series of career briefs features different aspects of chemistry and chemistry-related careers, including environmental chemistry, polymer chemistry, and science writing. Planning for Graduate Work in Chemistry and the ACS Directory of Graduate Research are invaluable tools for students who wish to pursue an advanced degree in chemistry.

ChemTechLinks supports technician education with tools that help educators prepare a highly skilled technical workforce. These resources include a database of job skill standards and mini-grants that support new technician education activities.

The Committee on Professional Training (CPT) compiles reports and conducts surveys in order to monitor trends, developments, and issues in chemistry education. Recent reports include the CPT Survey of 2001-2004 Enrollments in Selected Chemistry Courses and the report on the Workshop on HBCUs and African American-Serving Institutions.

Goal 2: To connect learners and educators in ways that lead to personal and professional growth, exchange of knowledge, and interaction with the broader scientific community.

A strength of the American Chemical Society is its power to convene, as evidenced by its national meetings, which attract thousands of chemists twice a year. Building specialized communities provides a forum for the exchange of ideas and a network for advancing scientific collaborations and professional development.

The Student Affiliates program engages approximately 10,000 undergraduates annually in developing the skills needed to succeed as a professional chemist; raising awareness of and appreciation for chemistry on their campuses and within their local communities; and organizing community service projects. Over 1,000 undergraduates presented their research during the ACS National Meeting in New Orleans in April 2008.

A recently formed community within ACS is the High School Chemistry Clubs program, which began in 2005. ChemClubs have been formed at 120 high schools, many of which are engaging with their local sections and Student Affiliates chapters in experiencing chemistry beyond the classroom.
ACS members volunteer their time to visit classrooms and mentor students working on science projects through the Kids & Chemistry program. This program brings together scientists and children to conduct hands-on activities. Online resources provide volunteers with these activities, safety guidelines, and presentation tips to ensure a successful classroom visit.

**Goal 3: To improve the teaching and learning of chemistry by supporting professional development activities for educators based on the highest quality standards and practices.**

Teachers impact hundreds, if not thousands, of students over the course of their career, and ACS offers a wide range of professional development activities designed to strengthen the content and pedagogy knowledge of educators. For example, *A Guide to Classroom Instruction for Adjunct Faculty*, while originally developed for industrial chemists entering the college classroom, provides essential information on developing and organizing a college-level course that is applicable to all college and university faculty.

Workshops are an important mechanism for enhancing classroom instruction, and ACS workshops enable educators to use resources more effectively, as well as develop expertise in new areas of chemistry. *Inquiry in Action* workshops are presented in a variety of venues, such as National Science Teacher Association conventions. In July 2008, ACS offered a week-long, multidisciplinary workshop for upper elementary and middle school science teachers in cooperation with the American Physical Society, the American Geological Institute, and the National Association of Biology Teachers.

The ACS textbooks *Chemistry in the Community* and *Chemistry in Context* are supported by workshops that assist educators in effectively using these texts in the classroom. New in 2008 are green chemistry workshops for high school teachers, a faculty development workshop for post-doctoral scholars planning an academic career, and summer research opportunities for high school chemistry teachers. For the first time in 2008, ACS hosted a Summer Institute, with four concurrent workshops held at Duquesne University the week of July 6.

Graduate students and post-doctoral scholars are guided along the professional path through the Academic Employment Initiative (AEI), *And Gladly Teach*, and *Preparing for Life After Graduate School* (PfLAGS). AEI gives academic candidates the opportunity to present their teaching and research goals to academic recruiters during the Sci-Mix poster session at the ACS Fall National Meeting. *And Gladly Teach* provides guidance in preparing for an academic career, while PfLAGS workshops present tips for making the transition from graduate school to the work place and highlight career options, with a focus on industrial careers.

**Goal 4: To ensure the quality of education in chemistry and chemistry-related fields by supporting the development, dissemination, and adoption of guidelines, policies, and standards.**
Guidelines, policies, and standards provide a framework for excellence in chemistry education. The most well-known of ACS resources in this area are the newly revised *ACS Guidelines and Evaluation Procedures for Bachelor’s Degree Programs*. A total of 646 colleges and universities offer ACS-approved baccalaureate programs. Schools engage in a rigorous evaluation process, conducted by the Committee on Professional Training, in order to receive and retain approval.

The Chemical Technology Program Approval Service (CTPAS) recognizes chemistry-based technology programs with high standards of excellence and strong industry partnerships. Twelve associate-level, chemistry-based technology programs have earned this distinction.

The ACS Guidelines for Chemistry Programs in Two-Year Colleges help faculty and administrators provide students with the best possible education in the fundamental areas of modern chemistry. The guidelines cover such topics as curriculum, facilities, staffing requirements, advising, and articulation.

ACS offers guidance at the high school level through *Guidelines and Recommendations for the Teaching of High School Chemistry* and *Chemistry in the National Science Education Standards*. The guidelines are currently being revised and updated, while the second edition of *Chemistry in the National Science Education Standards* was released in August 2008.

**Goal 5: To provide diverse experiences that inspire student learning.**

Diverse audiences benefit from diverse experiences, both intellectually and professionally, and ACS offers several programs that expand the horizons of learners and educators. *Project SEED* has provided more than 8,000 research experiences to high school students from economically disadvantaged backgrounds over the past 40 years. The *ACS Scholars Program* offers scholarships to African-American, Hispanic/Latino, and American Indian students pursuing undergraduate degrees in the chemical sciences and chemical technology.

The *Chemistry Olympiad* engages the top U.S. chemistry students in international competition each summer. The U.S. team earned one silver and three bronze medals at the 2008 International Chemistry Olympiad. Undergraduates can gain international experience by participating in the *International Research Experiences for Undergraduates (IREU)* program, sponsored by the National Science Foundation. Students can spend the summer doing research in Germany, France, Italy, or the U.K. And graduate students and post-doctoral scholars across the Americas gain in-depth knowledge of green chemistry through the *ACS Summer School on Sustainability and Green Chemistry*, which was held at the Colorado School of Mines in July 2008.

**Conclusion**

Learners and educators often find it challenging to identify and locate high-quality resources, and the Chemical Education Digital Library (ChemEd DLib) will make it easier for these constituencies to access digital resources. ACS programs, products, and
services will be fully integrated into the ChemEd DLib, providing one-stop-shopping for chemistry education resources. The American Chemical Society welcomes ideas for new opportunities in the area of chemistry education; please email education@acs.org with your ideas for new initiatives.

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