



# Update on Guidelines Revision

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## CPT Open Meeting

We invite you to attend the CPT open meeting at the 248th ACS National Meeting in San Francisco, California, from 4:00pm to 5:00pm on Sunday, August 10, 2014, in the Davidson Room at the Parc 55 Wyndham Hotel.

The Committee on Professional Training (CPT) continues to make progress on the 2014 revision of the ACS guidelines for bachelor's degree programs. At present, we expect the revised guidelines to be adopted shortly after the 2014 Fall ACS National Meeting. Although some details remain to be finalized, significant progress has been made since we distributed a white paper of proposed changes in February 2013. CPT thoroughly appreciates the feedback we have received during the past year from departments, individual faculty, and the committees and divisions of the American Chemical Society. A summary of the status of some of the proposed changes follows.

Several recommendations that were proposed in the white paper are no longer under consideration for inclusion in the revised document. One was a requirement that the majority of the classes that lead to certification be taught by long-term full-time faculty. CPT also decided not to require a *Capstone Experience* as part of the certified degree. CPT values capstone experiences in the development and reinforcement of student skills. However, feedback from the community indicated that there was some confusion about what would constitute a suitable capstone experience. CPT also became concerned that the requirement might detract from the goal that students develop professional skills throughout the curriculum and not solely in a designated *Capstone Experience*. We continue to explore models for a *Capstone Experience* and will be hosting a symposium on this topic at the upcoming Biennial Conference on Chemical Education (BCCE) in Grand Rapids (Monday

morning August 4). Additional details about the symposium can be found on page 7 in the newsletter.

Changes to the maximum number of allowable contact hours for faculty and instructional staff were also discussed in the revision process. The maximum number of contact hours for faculty and instructional staff will remain limited to 15 total hours per week. However, to accommodate occasional fluctuations in instructional responsibilities, up to two individuals may have as many as 18 contact hours in one semester or quarter, provided that the average for each individual during the academic year does not exceed 15 contact hours per week. (In the current guidelines, no individual can exceed 17 contact hours in a semester).

In addition, the proposal to increase the time between a program's submission of periodic reports from five to six years found broad support and will be implemented. As with the 2008 Guidelines, the committee may elect to ask a department for a shorter period between periodic reports if they feel it appropriate. This would be determined on a case-by-case basis and programs with shorter deadlines will be notified at the time they receive feedback on their periodic report.

The Committee also approved a requirement that there be a significant hands-on component in the introductory laboratory experience for certified graduates. This requirement will be introduced with the understanding that there will be cases where certified graduates complete their introductory chemistry courses prior to enrolling in the institution from which they

will ultimately receive a degree (e.g., transfer from another institution or AP credit for classes taken while students are still in high school). In such cases, the department is responsible for determining whether those students are eligible for certification.

Finally, CPT has been discussing the inclusion of a requirement that certified graduates be exposed to the principles of polymer chemistry. Two acceptable models for how a department could meet such a requirement are being proposed: (1) distribution of topics on polymers throughout the course work required of certified graduates or (2) a stand-alone course on polymers that is required for the certified degree.

The discussion of a polymer requirement began after the white paper was released. CPT communicated this possible change to the community for comment last fall through letters to department chairs and a comment column in C&EN as well as an article in the Fall 2013 CPT Newsletter. The Committee also conducted a short survey that was sent to chairs of approved programs that do not grant a PhD in chemistry. The results of the survey indicate that departments have some concern and confusion about the implications of a polymer requirement. Would departments be required to offer a stand-alone course? If the content were distributed, would departments need to teach the equivalent of a semester of polymer-related topics? Questions were also raised about the topics that would need to be covered. A summary of some of the responses to the survey can be found elsewhere in this newsletter.

CPT spent significant time at our most recent meeting in Dallas discussing a polymer chemistry requirement, and a final decision has yet to be made. A subcommittee is working on developing materials to help programs understand the important learning objectives that justify the inclusion of polymers in the curriculum and appreciate how polymer topics might be included in courses in the five foundation areas (analytical, biological, inorganic, organic, and physical chemistry).

If this change were adopted as part of the revised guidelines, approved programs would be given a full review cycle (6 years) before the requirement would be enforced. Programs seeking approval would need to demonstrate that their curriculum already meets this requirement. During the intervening years, the Committee would communicate with programs on where additional coverage would be needed to satisfy the polymer requirement. ■

## Summary of Polymer Chemistry Survey Results

In late February, CPT sent a survey on the impacts of a requirement for coverage of polymers in the curriculum for certified graduates on approved programs that do not grant PhD degrees in chemistry. We received responses from 228 of the 468 programs that were contacted. Some of the responses are summarized below:

- 20% of the programs offer a stand-alone course in polymer chemistry, and only two programs currently require their students to take the class as part of a certified degree.
- 10% of the programs that do not currently offer a dedicated polymers course plan to teach such a class in the near future.
- The majority of the programs indicate that they include coverage of polymers and polymeric materials in the foundation classes.
  - The majority indicated one or fewer lectures in analytical, inorganic, and physical chemistry.
  - Organic foundation courses typically included two to three lectures.
  - More than three lectures were included in the biochemistry classes.

Against this background, it was not surprising that many programs were concerned about the introduction of a requirement for a dedicated course in polymer chemistry. Although the majority of programs indicated that the impact of the requirement would be significant, it would be manageable. Some reasons for concern included:

- Limitations on the number of courses the department can currently staff.
- Limitations in the number of classes that students can be required to take as part of their major program.
- Recent curricular changes made in response to the 2008 Guidelines.

## CPT Symposium in San Francisco

Please join CPT for the symposium, "**An International View on Chemistry Education**", at the 248th ACS National Meeting in San Francisco, California, from 8:30am to 11:45am, on Tuesday, August 12, in Room 121 at the Moscone Center, North Building.

# Increasing Safety Awareness: An Academic Imperative

**W**hy do we assert the “imperative” with regard to safety awareness? Certainly, the prospect of legal action of a civil or even criminal nature in the academic setting is an increasing concern - and safety should fall quite high on the list of important considerations. Beyond the legal requirements that proscribe an unsafe workplace for an institution’s faculty and staff there are moral and ethical obligations that must be considered by us as chemical educators. For example, whatever safety training is appropriate for employees, by extension, should necessarily be appropriate for students. Indeed, the safety training for students should likely be more overt since they are inherent novices as they conduct experiments. Also, academic institutions have a professional obligation for prepare students for their future careers so that they can conduct experiments in a safe fashion and to learn to supervise others doing such work. Employers will be expecting such preparation in hiring conditions. The increasing expectation is that professional career preparation includes detailed knowledge of safety in addition to the foundation areas of chemistry. We have an obvious responsibility to help our students develop the critical thinking skills associated with risk assessment and risk management. To do anything less is to place dangerous processes and chemicals in their hands without the knowledge of how to safely use them. Safety awareness is more than just knowing how to use a fire extinguisher or the proper procedure for handling highly reactive materials, it also entails being able to recognize unsafe situations, since the ultimate goal is to reduce the risk of potential hazards.

An oft-raised question in academia is “whose responsibility” is safety? The practical reality is, of course, it is everyone’s responsibility, involving senior administrators, departmental leaders, faculty, staff, and students. It is a shared responsibility, and different parties can and should play different roles. Where present in an institution we should consider calling upon the proper help and guidance of EHS professionals to shape the safety facets of our educational program. See also the report “*Creating Safety Cultures in Academic Institutions*”<sup>(1)</sup> generated by a multifaceted ACS Taskforce at the request of the Society’s President and precipitated by an appeal to the Society from the Chair of the US Chemical Safety Board.

In an academic setting, the key component of any practical solution towards increasing safety awareness will be a combined effort of administrative leadership and faculty and student engagement where each group recognizes its role and responsibility in fostering a safe work environment and creating a culture of safety from “top to bottom.”

Safety professionals refer to a three-part hierarchy in developing a safety program: engineering controls, administrative controls, and personal protective equipment (PPE). In an academic chemistry environment this translates into ensuring there are well-designed and maintained laboratories (both an institutional and departmental responsibility), and proper handling and disposal of chemical wastes. In addition faculty and students must be engaged in the process of integrating safety into their educational materials and laboratory rules, and that requirements for wearing appropriate clothing and employing personal protective equipment such as safety goggles/glasses, lab coats, and gloves are noted in class syllabi; they are available, being properly selected, and used.

## The Department Safety Committee

It is understood that the statutory responsibility for compliance with State and Federal regulations concerning laboratory safety lies with an institutional entity. This may be an Office of Environmental Health and Safety, or an individual appointed by the institution’s administration.

As an ethical obligation, the chemistry department must collectively assume active responsibility for creating safety awareness - meaning that everyone is thinking about safety. The Departmental Safety Committee (DSC) can promote active engagement by involving everyone affected by laboratory safety including faculty, staff, students, and administrative representatives. A DSC does not necessarily replace any broader campus level committees and it wouldn’t have to be large, but it should receive appropriate backing from the departmental leadership and its membership should be dynamic to further promote a shared ownership of accountability and to gain benefits from a broader experience base. A department safety committee should

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be responsible for 1) integrating safety training throughout the program at both the undergraduate and graduate levels, 2) coordinating safety inspections of laboratories, 3) receiving and analyzing accident reports, 4) reviewing the Chemical Hygiene Plan to assure that it properly reflects current teaching and research activities, and 5) working with the faculty at large, and individually, to assure that appropriate safety instruction occurs within the undergraduate curriculum. As safety instruction emerges as a more important feature of undergraduate education, it will be helpful to have a “guiding hand” to assist faculty in developing this distributed responsibility. The Committee should be responsible for seeing that the Chemical Hygiene Plan and other documents relevant to safety should be readily available on the department web site. Although responsibility is spread out across an educational institution, the creation of sustainable safety awareness is only possible if students see faculty practicing safety awareness. For this reason, departments will have to take more direct responsibility than in the past.

## Models for Expanding Safety Instruction

Safety instruction needs more attention in both teaching and research laboratories. The University of Minnesota, Twin Cities Chemistry Department has, in collaboration with the Department of Chemical Engineering and Materials Science and with Dow Chemical has established a joint Safety Team (JST). This is comprised primarily of Lab Safety Officers (LSO), about 7-8 post docs and graduate students, from their various respective research groups, who provide leadership and direction to promotion of safety culture as an adjunct of the Departmental Safety Committee. An initial assessment of this culture suggested that safety training was focused on “what is required” rather than what is “practical and useful.” This new program, called the Joint Safety Team, is evolving, but it has made significant progress. For further information see <http://www.jst.umn.edu>; McGarry, KA., et al, *J. Chem. Educ.*, 2013, 90:1414-1417. Dow is working with its other university partners to establish safety culture programs. Clearly, this approach is geared to PhD granting institutions, but there it stands to reason that undergraduates could be part of a departmental committee at BA/BS- or MS-granting institution. Undergraduate instruction can appear in the undergraduate curriculum through stand-alone courses about laboratory safety and/or by embedding enhanced safety instruction across the chemistry curriculum (Hendrix College, Bradley, S., *J. Chem. Health and Safety*, 2011, 18:4-10) and Wittenberg University

(<http://labsafetylscs.weebly.com/>). Good printed and online resources exist to support these models. The Committee on Professional Training (CPT) has produced a Laboratory Safety Supplement<sup>(2)</sup> that suggests an integrated approach to teaching this subject. This approach emphasizes Recognizing hazards, Assessing the risk of hazards, Minimizing the risk of hazards, and Preparing for emergencies, i.e., **RAMP**. The ACS Committee on Chemical Safety has just completed a resource document on risk assessment and it is available on the CCS website.

Some institutions have initiated a full semester, one credit hour safety course either at the post-freshman level or as part of a capstone course. These approaches, however, generally suffer from being offered either too soon or too late. It is possible to have a coherent safety curriculum that spans the entire undergraduate curriculum; however, this requires a level of coordination that is a challenge to achieve. Noteworthy alternatives are employed at a few institutions: A safety course offered via the internet where the student is then required to take an exam. Failure to pass the exam may result in not being allowed to take the laboratory. Another possibility involves including a discussion of laboratory safety as part of an introductory lecture course. It is even more useful if a requirement for an oral presentation or report involving safety and risk analysis as integral components can be included. Developing a practicum with hands-on activities, and where safety is an embedded element, allows for both interactive mentorship and evaluation.

## Experiment Design

A key to student understanding of laboratory safety is engaging them in thinking about the laboratory manipulations they are making and to what extent procedures represent a safety risk. This can be

### Certificates Available for ACS-Certified Graduates

Chemistry majors who receive a baccalaureate degree from an ACS-approved program and complete a curriculum described in the ACS Guidelines may be certified to the Society for membership purposes by the head or chair of the approved program. If you would like to have certificates available for presentation to your certified graduates, please contact the office by email at [cpt@acs.org](mailto:cpt@acs.org).

accomplished in laboratories associated with traditional courses by asking students to review safety concerns in pre-lab sessions while also teaching about resources to determine chemical and health hazards associated with various chemicals (from Safety Data Sheets and other readily available sources). The sophistication of this process can be increased in upper-level courses, and the research laboratory is the most obvious place to help educate students about risk assessment and management.

An appealing link to safety is also through the emergence of green chemistry, which shares the objectives of using less and safer materials in carrying out a synthesis. One such approach is the *Green Chemistry Assistant*<sup>(3)</sup> developed at St. Olaf College, which aids students in Organic chemistry to design suitable synthetic reactions while keeping in mind the hazards of both the reactants and products.

Safety considerations frequently align along with environmental stewardship in the process of experimental design. An extensive green chemistry program at the University of Oregon also promotes laboratory safety from this perspective (<http://greenchem.uoregon.edu>). Some examples of how green chemistry is safer chemistry include principles 3, 5 and 12 that recommend the use of inherently safer chemicals and conditions that will also then protect lab students and employees better. Principle 5 calls for waste reduction and since wastes can pose hazards less waste is safer for employees and students.

## Testing

Assessing the effectiveness of any educational program involves development of appropriate testing and feedback measures. Traditional educational measures can be employed, such as quizzes and exam questions, and they can be augmented by designing pre-lab exercises that require risk analysis. These activities send the message to students that “safety is important” and also provide the opportunities for departments to document their safety efforts.

## Supporting Educational Materials

As is usually the case in education, finding sources of background information can be a dynamic and fluid landscape. However, the breadth and availability of resource materials are rapidly expanding. Videos, “Power-Point” or “pdf” slide presentations, immersive online and in-person workshops, social media, and blogs on safety, and other web-based resources can be exploited. The

American Chemical Society’s Committee on Chemical Safety provides materials, such as SACL, 7th edition (*Safety in Academic Chemistry Laboratories – available in 3 languages*)<sup>(4)</sup>, the aforementioned ACS Joint Taskforce report (Creating Safety Cultures in Academic Institutions), and the Journal of the ACS Division of Chemical Health and Safety is a further source of useful material, references, and practical guidance in developing a safety inclusive chemical education program. There are recognized tomes on laboratory and chemical safety, including an oft noted and very useful reference produced by the National

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## Preparing for Life After Graduate School

A career development workshop from ACS  
This two-day workshop is designed to inform chemistry graduate students and postdocs about their career options and how to prepare for them:

- Examining careers for PhD chemists
- Describing careers in business and industry
- Knowing critical non-technical skills
- Finding employment opportunities

To bring this workshop to your department, see [www.acs.org/gradworkshop](http://www.acs.org/gradworkshop) or contact [GradEd@acs.org](mailto:GradEd@acs.org); 202-872-6864.

This program is supported by the Graduate Education Advisory Board, with members appointed by CPT, SOCED, and YCC.

Research Council via the National Academies Press (*Prudent Practices in The Laboratory*),<sup>(5)</sup> and a textbook (Laboratory Safety for Chemistry Students) on the subject developed specifically to help educators fill that need. *Institutions with award winning safety programs*<sup>(6)</sup> (as exemplified by those receiving recognition from the ACS Division of Chemical Health and Safety often provide extensive online resources that can be mined for supportive educational resources and tools. As with any educational process videos or other such presentations should complement learning by serving as a means for engaging students into discussing and understanding a particular topic.

Recent prominent incidents in academic laboratories stand in antithesis to the goals of our profession. It is clear that safety has to be a more prominent component in the undergraduate curricula. We note again in closing that a truly effective safety culture is created only if everyone assumes responsibility for laboratory safety.

*This report is a collaborative effort between CPT and two individuals who have devoted considerable thought to safety in the academic environment: David C. Finster, Wittenberg University, ACS Committee on Chemical Safety, and co-author of a book, "Laboratory Safety for Chemistry Students." John G. Palmer, University of California, San Diego, liaison from the Women Chemists Committee to the ACS Committee on Chemical Safety and a past chair of the Division of Chemical Health and Safety (CHAS). ■*

References (for easy access, use the hyperlinks in the newsletter posted at [www.acs.org/cpt](http://www.acs.org/cpt), select "CPT Newsletter" in the navigation bar):

- (1) *Creating Safety Cultures in Academic Institutions*, <http://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/academic-safety-culture-report-final-v2.pdf>, accessed 7/11/2014
- (2) *Laboratory Safety Supplement*, <http://www.acs.org/content/dam/acsorg/about/governance/committees/training/acsapproved/degreeprogram/laboratory-safety.pdf>, accessed 7/11/2014
- (3) Green Chemistry Assistant, [http://www.powershow.com/view/7fb86-MTE40/The\\_Green\\_Chemistry\\_Assistant\\_Expanding\\_the\\_horizons\\_of\\_green\\_chemistry\\_in\\_chemical\\_education\\_powerpoint\\_ppt\\_presentation](http://www.powershow.com/view/7fb86-MTE40/The_Green_Chemistry_Assistant_Expanding_the_horizons_of_green_chemistry_in_chemical_education_powerpoint_ppt_presentation), accessed 7/11/2014
- (4) *Safety in Academic Chemistry Laboratories*, <http://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/publications/safety-in-academic-chemistry-laboratories-faculty.pdf>, accessed 7/11/2014
- (5) *Prudent Practices in The Laboratory*, <http://ucanr.org/sites/ucehs/files/133892.pdf>, accessed 7/11/2014
- (6) *Institutions with award winning safety programs*, <http://www.dchas.org/about-us/awards/8-college-university-health-safety-award>, accessed 7/11/2014

# Announcements

## ACS Directory of Graduate Research - DGRweb (Searchable Online Database)



*DGRweb* is a *free* searchable, online database that is a unique and comprehensive compilation of information

on graduate study in the chemical sciences at universities in North America. Now updated annually, the 2014 edition of *DGRweb* will be released in September with improved searching capabilities, expanded spreadsheets with statistical data, and printer friendly (PDF) search results.

- Facilitates research collaborations in the chemical sciences
- Enables networking across chemical subdisciplines
- Helps students with selecting a graduate program
- Identifies NSF Research Experiences for Undergraduates (REUs)

Conduct free online searches at [www.acs.org/dgrweb](http://www.acs.org/dgrweb)!

## Congratulations!

The Committee congratulates the following schools on their newly ACS-approved bachelor's degree program in chemistry:

**California University of Pennsylvania**  
**Linfield College**  
**Saint Francis University**

The current number of ACS-approved programs is 676.

## CPT Symposium at the Biennial Conference on Chemical Education

CPT has organized a symposium on "Enriching Professional Preparation of Students: Vertical Skill Integration and Capstone Experiences" at the Biennial Conference on Chemical Education at Grand Valley State University on Monday, August 4, 2014, from 9:30am to 12:30pm, in Mackinac Hall, A Wing, in Room 2117. The 2014 edition of the ACS Guidelines will encourage approved programs to offer their certified chemistry majors a capstone experience that provides opportunities to integrate knowledge and skills acquired through foundation and in-depth course work. The symposium is a combination of presentations and discussion among the participants.

For more information, visit [www.bcce2014.org](http://www.bcce2014.org).

## Thank You! We Could Not Have Done It Without You!

The Committee would like to express its very special appreciation for the contributions that the following Visiting Associates made to the approval process from 2009-2013. These volunteers play a critical role in the evaluation of programs that are applying for ACS approval. The Committee also would like to announce the transition from one-person to two-person teams for these site visits.

Samuel A. Abrash – University of Richmond  
Frank Blum – Oklahoma State University  
Ronald L. Christensen - Bowdoin College  
Paul J. Dagdigian – The Johns Hopkins University  
Richard Dallinger – Wabash College  
Kenneth Doxsee – University of Oregon  
Mel Druelinger - Colorado State University-Pueblo  
Robert Grossman – University of Kentucky  
Tim Hanks – Furman University  
Bert Holmes – University of North Carolina at Asheville  
Lisa Lewis - Albion College  
Mitch Malachowski – University of San Diego  
Michael B. McGinnis – Norwich University  
Nancy Mills – Trinity University  
Daniel Quinn – University of Iowa  
Philip Reid – University of Washington  
Miriam Rossi – Vassar College  
Kevin Shea – Smith College  
Eileen Spain – Occidental College  
Conrad Stanitski - Franklin & Marshall University (retired)  
Erland Stevens – Davidson College  
John W. Thoman – Williams College  
Robert Q. Thompson – Oberlin College  
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