ACS Committee
Professional Training

Volume 16, No.2 Fall 2018

In This Issue

You are cordially invited to attend the CPT Open Meeting at the 257th ACS National Meeting in Orlando, Florida from 4:00 – 5:00 p.m. on Sunday, March 31, 2019. The location is currently not available.

Please check the CPT website (www.acs.org/cpt) for updates on the location.

CPT Department Chairs Luncheon

The Committee on Professional Training (CPT) met with department chairs from more than 60 approved programs during the 256th National Meeting of the American Chemical Society (ACS) in Boston, MA. Traditionally, CPT has held a luncheon for chairs of Ph.D. granting departments, but in an effort to reach out to the broader community, department chairs from all approved programs were invited to participate in this year's event. CPT will be embarking on a journey to revise and update the 2015 ACS Guidelines for bachelor's degree programs and obtaining feedback from department chairs is the first leg of that journey.

Professor Elvin Aleman from California State University-Stanislaus speaks with CPT member Professor Lisa McElwee-White at the CPT Chair's Luncheon

Table conversations at the luncheon were quite lively and focused on the following questions:

- As the chairperson of an approved chemistry program, what do you value about ACS approval, how does it impact your students, and what is the value added for students if they choose to earn a certified degree?
- There have been multiple discussions within CPT to move from a knowledge-based to an outcome-based approval process, which would result in a focus on student outcomes rather than on "required courses." There are several arguments for moving in this direction including accreditation issues, home institution mandates for outcome assessment as part of the self-evaluation process, and allowing increased flexibility, creativity, and sustainability for chemistry programs.
  - Would your department be interested this option?
  - How would such a change impact your program?
  - Describe your department's learning outcomes for chemistry majors and for your overall program.
- Does your department engage in ongoing interactions and conversations with scientists and management outside of academe, and, if so, to what degree does the substance of those interactions and conversations influence development of the undergraduate and graduate curricula?
- What additional issues would chairs from graduate programs and chairs from primarily undergraduate program like to share or ask of one another?

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CPT Luncheon, *continues from page 1*

Value of an ACS Approved Program

Many of the attendees used the ACS approval process as leverage to help them obtain the academic and faculty support that they need to sustain and improve their programs. ACS approval guides the university by mandating available resources, faculty training, and workload. It guides the curriculum of the department in mandating the nature of the courses and course content offered while keeping departments aware of changes in the educational landscape. It provides graduates with a standardized background, which is advantageous to students from lesser known institutions as they strive to be competitive in finding post graduate employment.

Lively conversations between department chairs and CPT members during the CPT Chairs Luncheon at the ACS National Meeting in Boston, MA

There was also feedback on the ACS approval process that will be extremely helpful as we move forward with streamlined processes for initial approval and for periodic and annual reporting. For example, participants were interested in "less checkboxes" and guidelines that did not limit them in their ability to be creative. There was also a call for more examples and rubrics that could be used to assist in the reporting process.

Outcomes Based Assessment

While most of the participants agreed on the value of ACS approval, there was less consensus on the second question, moving toward an outcome based assessment process for approval. Because CPT is currently exploring options for curricular and skill assessment as part of the guidelines revision process, feedback from this question will be extremely helpful in moving forward.

Several groups mentioned that institutions currently mandate outcome assessment as part of a larger accreditation process and suggested that ACS work with those agencies to develop assessment plans and rubrics for chemistry. There was also much discussion of the support that would have to be in place if outcome assessment was part of the approval process. For example, developing supplements describing the anchoring concepts and how to assess them would be helpful in moving in this direction. It was also clear from the input that a shift to this form of assessment would require that ACS provide a more defined framework that is consistent with current reporting processes.

Outcomes or concept based assessment could also provide more flexibility in the design of programs or, as one participant noted, "it would allow us to be more creative." It would also, "drive a more evidence-based practice" and "provide alignment with other accrediting bodies."

There were multiple concerns raised about outcome based assessment that primarily focused on the process, citing that the outcomes that are the most meaningful are the toughest to measure. Others were concerned that outcomes for one institution may not align well with another.

Creating Connections Outside of Academia

Participants shared their best practices for providing students with experiences outside of the academy. Many cited co-ops and internships as a way that students can get experience in careers outside of academia and that the career development offices on campus are integral in creating these opportunities. Some institutions have external advisory boards that are made up of representatives from industry, often utilizing their alumni in this role. A number of programs also include speakers from industry as part of their seminar series or course, but find that it can be difficult to make connections and identify available speakers. Schools that have a heavy emphasis on experiential learning have mandated that students do either research or an internship as part of their undergraduate curriculum and have created the connections to make this work. Given that many early career chemists speak to the importance of these types of experiences, giving students access to internships and co-ops in addition to research experiences seems to have a positive effect on their post graduate career success.

Challenges of Being a Chairperson

The venue gave the chairs in attendance a chance to share some of their concerns with one another and, especially, for chairs at primarily undergraduate institutions and chairs at Ph.D. granting institutions to dialogue with one another. These conversations focused, in part, on transitioning students from undergraduate to graduate school. For example, there was a discussion on the value of the GRE as an evaluative tool for admission to graduate school. Although there was some difference of opinion on this, there was consensus that it can be used comparatively but not predictively. What does matter, according to the participants, are the letters from research advisors and, specifically, letters that address the following:

- The student's ability to make an argument,
- What makes that student stand out from other applicants,
- How the applicant deals with challenges, and
- Whether they are able to work effectively in a lab.

And, lastly, to provide a context for the graduate admissions committee, it is helpful to include an explanation of the grading system (e.g. what an "A" means).

Conclusions

Overall, the department chairs luncheon was a huge success with more participants than seats! Members of CPT were able to get a good overview of the issues that are being explored during the early stages of the guideline revision process. Additionally, the attendees comprised quite a diverse group in terms of gender, stage in career, and being reflective of the actual institutional variation exhibited in both the PUI and Ph.D. settings. If you are interested in being part of this conversation, we will be providing an opportunity to do so on our website **www.acs.org/cpt** or through focus groups (contact us at **cpt@acs.org**). CPT

A Report on the CPT Symposium at the Biennial Conference on Chemical Education

The ACS Committee on Professional Training (CPT) sponsored a symposium entitled "Updating the American Chemical Society's Guidelines for Programs that Offer the Bachelor's Degree" at the **Biennial Conference on Chemical Education** held this summer at the University of Notre Dame. Four CPT members presented talks that aligned with the committee's 2018-2021 Strategic Plan. Thank you to all attendees who made time during this very busy conference to share their thoughts and ideas with us.

Talks included the following:

- Dr. Edgar Arriaga (University of Minnesota-Twin Cities and CPT Chairperson) presented a talk focused on curricular assessment and how it could be used as part of the revised ACS Guidelines. This talk aligns perfectly with the first goal of the strategic plan, which is to **explore the value of outcome-based assessments in defining curricular requirements.**
- Dr. Richard Schwenz (University of Northern Colorado) followed up Dr. Arriaga's talk with a presentation focusing on the assessment and development of skills. The ideas presented correlate to the second goal of the strategic plan to **promote and assess skills and competencies needed in training students for successful careers in chemistry and related fields.**
- The third presentation, from Dr. Barbara Reisner (James Madison University) addressed the third goal of the strategic plan and discussed the **value of ACS approval and the certified degree.**

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Be part of the conversation on ACS Guidelines Revision:

- **How do your responses match up to those from department chairs to the questions discussed at the CPT Department Chairs luncheon? Give us feedback on those questions here.**
- **Share your thoughts on faculty workloads here.**
- **What skills do YOU think are essential for bachelor's degree chemists? Comment here.**

Thank you for your participation and feedback.

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- The final talk, by Dr. Scott Reid (Marquette University) invited a conversation around the upcoming revision of the ACS Guidelines. This is the final goal of the CPT Strategic Plan: **to identify, evaluate, and refine criteria used in the ACS-approval process so that these respond to the emerging trends in Chemical Education.** This meeting provided the first venue for receiving input from the community.

Interspersed between these talks were open sessions that invited members of the larger ACS community to comment on and discuss the ideas presented by the speakers. There were several suggestions to reach out to accrediting bodies like ABET or ASBMB to explore the world of outcome based assessment as well as suggestions for the committee to embrace Green Chemistry and sustainability in the curriculum. There was also discussion on how to reach to potential employers to gain an added perspective on the value of ACS-approved programs.

At both the discussion sessions participants voiced concerns about the assessment and evaluation of faculty workloads. Although the ACS currently utilizes contact hours as a barometer for the faculty workload, there was much discussion on how that might not be a good fit. The need to explore options was clear, so look for surveys in your future to determine how to simultaneously protect faculty members from mandated overloads and allow those primarily interested in instruction the latitude for additional contact hours. If you'd like to add your voice to the workload discussion, please feel free to contact us at **cpt@acs.org** or send your thoughts to us via **this short feedback form**.

Participants also used this opportunity to chat with CPT members about the general process associated with both applying for and maintaining ACS approval. Several requested information about best practices (especially with respect to in-depth coursework), access to newsletters, availability of comparative data, and strategies for institutions seeking approval. Since the symposium, the ACS Office of Professional Development has been addressing thes issues. Comparative data based on Carnegie classification, institution size, number of faculty, geographical region, or other metrics in the periodic report is available upon request (contact us at **cpt@acs.org** or at 202-872-4589). Coming later this fall, we'll have a short tutorial on best practices regarding in-depth coursework (**www.acs.org/cpt**). CPT

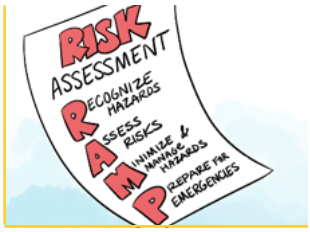
ACS Support for Teaching of Safety Skills

Chemistry faculty report an ongoing challenge in finding modern educational materials that help them teach risk-based laboratory safety skills to their students. To help address this problem, new training materials are currently available from the ACS Division of Chemical Health and Safety (CHAS).

One of these resources is a 2-minute video introducing Laboratory Risk Assessment in the context of the RAMP system. Faculty members may use this video to start a discussion about chemical safety in a classroom or training session. In addition, an accompanying PowerPoint file elaborates on the content of the video and is designed to be adapted to the needs of a particular educational setting. Both are available at no charge on the CHAS website.

RAMP Overview

The RAMP system, which first appeared in the 2010 text Laboratory Safety for Chemistry Students , organizes key components of chemical safety management in the laboratory into a format that applies across a wide variety of hazards and settings. Many different ACS publications and webpages, including the Laboratory Safety Supplement to the 2015 ACS Guidelines for Bachelor's Degree Programs have leveraged this approach to organizing safety information and educational materials.



RAMP helps help educators and students keep science safety in the forefront as they work in laboratory environments and stands for Recognizing hazards, Assessing risks from hazards, Managing these risks and Preparing for Emergencies.

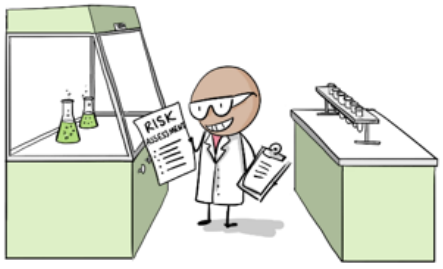
1. **Recognize:** the first step of RAMP is to recognize the hazards associated with a laboratory process. The adoption of the Globally Harmonized System by OSHA in 2013 has made this step significantly simpler

for chemical hazards. GHS information for more than 100,000 chemicals is available at the National Library of Medicine's PubChem website. In addition to those physical and health concerns associated with specific chemicals, hazards such as non-ambient temperature and pressure conditions should be identified in this step.

2. **Assess:** the second step of RAMP is to assess the risks presented by the hazards in order to prioritize those that need to be addressed. This is an interesting challenge because both the frequency and the magnitude of the risks need to be considered in this assessment step. This balance between frequency and magnitude is dependent on the specific situation and somewhat subjective. For students, making these judgments is a critical thinking exercise and such analyses present an excellent teaching moment for several of the skills identified by the ACS Committee on Professional Training.

3. **Minimize and Manage:** Once the risks are prioritized, steps to minimize and manage them can be identified. The steps must be considered as part of a larger protection strategy and changes in one element of this strategy can affect the requirements for another element. For example, changes in ventilation can then change the requirements for respiratory protection.

4. **Prepare:** A key reason that RAMP is a significant step ahead in safety education is that it includes emergency planning as a key part of the safety plan. More traditional approaches to chemical safety, such as the "hierarchy of controls" described by OSHA, neglect emergency plans, assuming that engineering, management and personal protective equipment will obviate the need for emergency plans. RAMP includes emergency plans as a conscious element in the safety plans for the chemistry laboratory.



Another advantage of the RAMP system is that helps address the increasing interest in the connection between chemical safety and green chemistry education. These two considerations incorporate the assessment step, so the RAMP process can also be used to include experimental review through a green chemistry lens.

Video and PowerPoint Presentations

To serve both chemistry faculty and Environmental Health and Safety staff in instructing and training laboratory workers at all educational levels, the video has two goals:

1. To remind the audience of the importance of maintaining their safety awareness as they work with hazardous chemicals and
2. To explain the phases of the RAMP paradigm.

One of the most interesting challenges we encountered in developing this video was deciding the level of detail necessary to meet the many different chemical safety teaching needs in academia. After considering the different teaching and research environments where hazardous chemicals are used in academia, we developed a short video accompanied by a variety of teaching tools that can be used to provide the flexibility necessary for these different environments. These tools include real-life events and a list of web references for further information.

The video presentation focuses on the academic research laboratory and includes specific examples from real-life chemical research laboratories where unfortunate incidents occurred as a result of overlooking steps in the RAMP paradigm. Additional information and references are provided in the PowerPoint presentations. The files were developed with the intention that they will be edited to fit the content needs and time constraints available for a particular academic setting.

The video was produced by the CHAS, in partnership with the School of Chemistry at the University of Bristol in the United Kingdom, and Blue Seat Studios. Production of the video was supported by an Innovative Project Grant from the ACS Divisional Affairs Committee. The video and PowerPoint file are available for free download on the CHAS website under a non-commercial, by attribution, Creative Commons license. CPT

Written by Ralph Stuart
Chair, ACS Committee on Chemical Safety
Membership Chair, Division of Chemical Health and Safety

[1]Dr. Robert H. Hill Jr. and Dr. David C. Finster, Laboratory Safety for Chemistry Students, ISBN: 978-0-470-34428-6, July, 2010

A Conversation with the Younger Chemists Committee

At the 256th National Meeting of the American Chemical Society (ACS) in Boston, MA, members of the Committee on Professional Training (CPT) and the **Younger Chemists Committee (YCC**) met to discuss the skills needed to be successful chemistry professionals. The YCC's mission includes being an advocate and providing resources to early-career chemists and to professionals in the chemical sciences and related fields. YCC members present at the luncheon meeting represented a wide breadth of careers, including academics (undergraduates, graduate students, post-docs, and faculty), industry (both bench and non-bench careers), government, publishing, and law. Tables were arranged according to career path and a set of discussion questions pertinent to each path were used as a starting point for the discussions with CPT members.

Younger Chemists Committee, 2018. Chairperson: Dr. Natalie LaFranzo. Follow YCC on Twitter (@ycc_acs)

CPT's vision is to maintain and lead excellence in the training of chemistry professionals, which they accomplish through the development of guidelines and standards for the ACS approval program. The conversations between CPT and the early career professional from YCC are helpful in developing these standards and are especially relevant now, as CPT will begin the process of revising the 2015 ACS Guidelines starting in 2019.

Pre-Meeting Survey

Prior to this luncheon meeting, members of YCC were asked to complete a short survey focused on their undergraduate experiences and how those experiences prepared them for their post graduate careers.

Figure 1: Responses to the pre-meeting survey question: What skills do you learn as an undergraduate that prepared you for graduate school

For the most part, attendees felt that, compared to their peers, their undergraduate program did an excellent or above average job of preparing them for their post graduate careers. They cited opportunities for research, internships, campus/department career development resources, supportive faculty mentors, and courses that emphasized writing and critical thinking as being the reason for this preparedness. The availability of internships, co-ops, and REU experiences as being essential to a successful industrial career was re-iterated in the table discussions. For attendees that did not feel that they were prepared, lack of access to modern instrumentation, graduate courses, or career development resources were most often cited as reasons why they did not feel as prepared as their peers.

Many of the attendees earned advanced degrees, so the first question in the survey asked them about the skills they learned as undergraduates and whether those skills prepared them for graduate study. Both skills learned while doing research and communication skills learned in coursework were the most useful in preparing them for graduate study (see Figure 1). The current ACS guidelines also emphasize the importance of learning both oral and written commu-

nication as they require that programs report how and when these skills are introduced as well as a description of how they are assessed. Although research experiences are not required by the ACS guidelines, many approved programs choose to include research to fulfill the 400 lab hours requirement. In these cases, programs must submit examples of research reports. Interestingly, many the skills cited as contributing to graduate school success (Figure 1) are not associated with a single set of courses, but instead are often included in all coursework as part of the student's overall education.

Attendees were also asked about the skills that they either lacked or wished they had developed prior to graduate school. The most common response focused on organization and time management (Figure 2). Respondents also felt that a broader knowledge of scientific research or scientific literacy would have helped them be more successful. Respondents also indicated that the availability of graduate coursework at their undergraduate institution would have been helpful, even if they could "just sit in on the courses." Many of the skills cited are ones that are not typically associated with coursework (e.g. leadership, mentoring, asking for help, savvy, etc.). These so-called "soft" skills are clearly essential to success, but are not formally included in typical college curricula nor mandated by the ACS Guidelines.

Figure 2 Responses to the pre-meeting survey question: What skills do you feel you were lacking, or wish you had, to prepare you better for graduate school?

Table Conversations

The discussions at the tables also focused on the connection between the undergraduate experience and future career success, but also included more specific questions based on chosen careers. Here is a sampling of questions from the table discussions:

- How did you choose an industrial career path? (Industrial R&D/Laboratory Professionals table)
- What non-laboratory skills were most helpful for you in transitioning into industry? (Industrial R&D/Laboratory Professionals table)
- How does your institution provide reinforcement on skills that were insufficient prior to the start of graduate school? (Grad Students table)
- What is the institutional support for additional professional development? What other support is needed? (Faculty/PostDocs/Academia table)
- What skills do you need in your current job and how it would have been helpful to have be prepared? (Other Careers table)

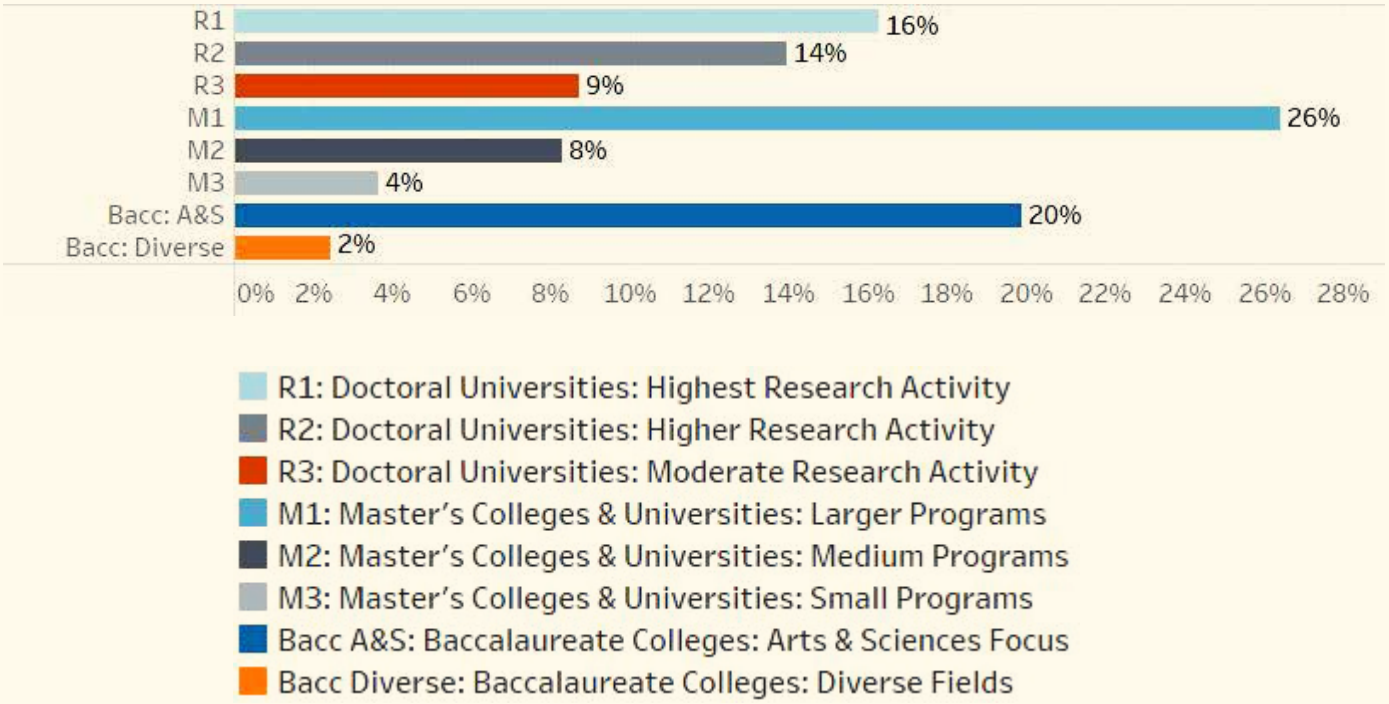
The responses to these questions generated a lot of animated conversations. There was a clear consensus that research and internships/co-ops were invaluable for preparing students for their future careers and that this effect was amplified by the presence of engaged mentors. Echoed, too, was the need for the development of broad communication skills including skills in presentations, in scientific writing, and in the use of social media. Many of the conversations focused on the need for more business and project management skills, including management, budgeting, developing action plans, and overall administration.

Overall these discussions were lively and provided an excellent overview of the skills needed for success and the areas where early career chemists struggle.

The information from these questions and conversations came from a small group and may not represent comprehensive views of the larger chemistry community. If you would like to contribute to this conversation, please feel free to share your thoughts **here** or volunteer to participate in virtual focus groups (contact us at **cpt@acs.org**). CPT

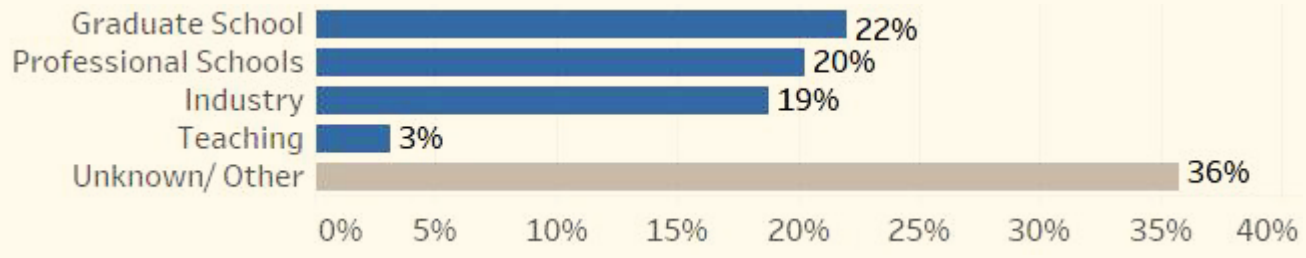
Approved Programs: By the Numbers

ACS Approved Programs: Distribution by Carnegie Classification*



*Please note that Carnegie classifications are based, in part, on the highest degree offered at the institution, not in the chemistry department.

Placements 2013-2017: Graduates from ACS Approved Programs



Data used for this plot were collected from program periodic reports submitted 2013-2017.

Announcements

Congratulations!

Congratulations to the following institutions on their newly ACS-approved bachelor's degree programs in chemistry:

Concordia University Wisconsin

Christian Brothers University

There are currently 693 ACS-approved programs!

CPT Open Meeting

We invite you to attend the CPT open meeting at the 257th ACS National Meeting in Orlando, Florida, from 4:00 pm to 5:00 pm on Sunday, March 31, 2019. The location is not yet available. Please check our website early in 2019 for details.

Certificates Available

The head or chair of ACS-approved chemistry programs presents ACS certificates to students that receive a baccalaureate degree and complete a curriculum consistent with the ACS Guidelines. If you would like to have certificates available for presentation to your graduates, please contact the Office of Professional Training at **cpt@acs.org**.

Join ACS in Changing Perceptions of STEM Teaching

Your department is invited to participate in a new NSF project, Get the Facts Out: Changing the conversation around STEM teacher recruitment.

The Colorado School of Mines, the American Association of Physics Teachers, the American Physical Society, the American Chemical Society, and the Mathematical Association of America are partnering on an NSF Improving Undergraduate STEM Education (IUSE) Development and Implementation project that seeks to dispel misperceptions associated with being a teacher of physics, chemistry, and mathematics at the middle and high school level. About half of STEM majors report some level of interest in grade 7-12 teaching, but very small numbers enroll in teacher certification programs. Get the Facts Out will change this by providing faculty with well-developed strategies and materials designed to dispel negative misperceptions and offer accurate and positive information about the teaching profession.

The project team hope to engage chemistry departments in this important work.

Requests of chemistry departments include:

- Consider implementing Get the Facts Out strategies and materials in your department
- Contact students and faculty annually to complete brief online surveys about their perceptions of grade 7-12 teaching as a profession
- Provide an annual count of majors who enroll in a teacher preparation program

Benefits to chemistry departments include:

- Research-based, user-tested strategies and materials to aid your teacher recruitment efforts
- An annual report analyzing the data from your department, which can inform teacher recruitment efforts
- Consultation with experts on the above, as requested

Interested in learning more or getting involved? Please complete the short form found at: **https://www.surveymonkey.com/r/GFOQuantitativeSites**

Thanks for all that you do to support teacher education! CPT

Help your students plan their career with ACS's new career planning tool ChemIDP™

Now with a brand new design and enhancements, **ChemIDP™** (ChemIDP.org) is a free career planning tool designed for gradu-ate students and postdoctoral scholars in the chemical scienc-es. Through immersive, self-paced activities, **ChemIDP™** helps users self-assess, strengthen their skills, set goals, and develop a plan that identifies their career objectives. If you are inter-ested in bringing a workshop to your campus, please contact **ChemIDP@acs.org** and follow us on Twitter **@ACSChemidp**.

New Approved Program Logo Available to Departments

Use the new ACS approved program logo to let everyone know that your depart-ment has a robust and rigorous curriculum consistent with the ACS Guide-lines. The logo can be used on department or program web-sites or when giving talks or poster presen-tations. The logo was emailed to all chairs of ap-proved programs in the fall. If you're a student in an approved program, ask your depart-ment chairperson for a copy of the file to include on your posters or slides. The logo can also be requested from the ACS Office of Professional Training at **cpt@acs.org**.

David Shirley, a senior in Dr. Greg Caputo's research group at Rowan University shows off the ACS Approved Program Logo during the undergradu-ate poster session in Boston.

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** or contact **Graded@acs.org**; 202-833-7707.

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

Distilling Down the ACS Guidelines: In-Depth Courses

Each CPT Newsletter will feature a short article focusing on the finer points of the current 2015 ACS Guidelines. In this first article, we'll explore the requirements for in-depth courses.

While foundation courses provide students with a breadth of chemistry knowledge, the in-depth courses offer students a more detailed knowledge of the content areas. And because of this, they typically have either a foundation course or another in-depth course as a pre-requisite.

Requirements:

- Semester: Four in-depth courses that total a minimum of 12 credits. Must teach 4 in each academic year.
- Quarter: Six in-depth courses that total a minimum of 18 credits. Must teach 6 in each academic year.

Common misconceptions for in-depth coursework:

- Inclusion of a component lab as an in-depth course. For example, while the second semester of organic chemistry is considered an in-depth course, the accompanying lab is not, even if they have separate course numbers.
- While undergraduate research credits can be used by students to fulfill the in-depth requirements for the certified degrees, but cannot be counted by a program toward the requirement of teaching four in-depth courses a year
- In-depth courses do not have to be required for the certified degree; if a course is an elective and meets the other criteria for an in-depth course, it can be included in the listing of in-depth courses.
- In-depth courses do not have to cover all 5 sub-disciplines of chemistry
- Special topics courses that focus on topical areas of chemistry do count as in-depth courses, but those that focus on professional development activities or general skills development do not. CPT

ACS Committee on Professional Training 2018

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