



Co-sponsored by the Committee on Professional Training and the Society Committee on Education

21<sup>st</sup> BCCE Symposium

## Practices and Policies that Foster Excellence in the First Two Years

The first two years of chemistry education involve much more than learning the facts. As described in the *ACS Guidelines and Evaluation Procedures for Bachelor's Degree Programs* and the *ACS Guidelines for Chemistry in Two-Year College Programs*, students need to gain intellectual, experimental, and professional skills, developing the ability to apply knowledge and skills to new situations and transfer knowledge from one context to another. This full day session will explore practices and policies that can advance a chemistry program to the next level of excellence. Presentations and discussions will focus on the programmatic aspects of the curriculum, pedagogical approaches, and the development and assessment of student skills. The importance of faculty development, involvement, and interactions with students will be highlighted. Mechanisms for continuous evaluation and improvement will also be shared.

### Session I: Introduction

#### [Slides from Presentation](#)

9:05 – 9:40 am

#### **Student Excellence – What Does it Mean?**

Cindy Larive, John Clevenger

The goal of all courses and programs for the first two years of chemistry instruction is student excellence. This interactive session will begin to explore some of the many ways to achieve this. We will present questions and threads to consider throughout the symposium. What does student excellence mean? What fosters it? The discussion will consider aspects of the ACS guidelines for two-year and bachelor's degree programs that facilitate the pursuit of excellence.

#### [Slides from Presentation](#)

Session II:  
9:40 – 9:55 am

#### **Engaging the Next Generation of Scientists: Making the First Chemistry Course Relevant**

Scott Donnelly

Learning starts with engagement. The undergraduate chemistry curriculum needs to connect the chemistry covered in the classroom and laboratory to students' lives and experiences. Consumer products readily found in grocery, auto supply, and big box Do-It-Yourself home stores can be used to illustrate the complementary relationship between chemical theory as taught in the classroom and laboratory and application as practiced in the material

world. This approach, which can be applied to topics ranging from physical properties to visible spectroscopy, sparks student interest and motivates further learning.

[Slides from Presentation](#)

9:55 – 10:10 am

**Engaging the Next Generation of Scientists: Making the First Organic Chemistry Course Relevant**

Bob A. Howell

A prerequisite for excellence in any course is gaining student interest. Students often come to the first semester of the organic chemistry sequence with a great deal of apprehension and, sometimes, with less interest in the subject than in getting a good grade to support admission into professional school. They become much more meaningfully engaged if they can appreciate that the material to be learned impacts their daily lives in significant ways. An opportunity to establish such an appreciation comes early in the organic chemistry course, with a discussion of alkene chemistry. From a societal or economic perspective, polymerization is the single most important reaction that alkenes undergo. A discussion of vinyl polymerization provides a wonderful opportunity for the students to make the connection between what they are studying and their daily lives. Examples abound – from the classroom itself to student housing to student purchases. This discussion also permits the introduction of a bit of history and green chemistry.

[Slides from Presentation](#)

10:10 – 10:25 am

**Developing Higher-Order Thinking Skills in the First Two Years of Chemistry**

Tom Holme

Excellent chemistry curricula not only teach content, but also develop students' thinking skills. At the lowest levels of learning, students know terms and definitions and can demonstrate basic skills. At the highest levels, they apply critical-thinking and problem-solving skills in new contexts. The principles of how people learn can be used to design courses that effectively convey chemistry content knowledge and develop students' thinking skills from lower to higher levels. The application of research-based learning principles to chemistry courses will be discussed.

[Slides from Presentation](#)

**10:40 – 11:10 am**

**Strategies For Increasing Participation And Fostering Excellence**

Cindy Larive

Addressing the world's challenges requires that the chemistry community tap into the talents and insights of the entire population. Strategies for increasing the participation of undergraduate students were explored in a series of ACS workshops held with representatives from institutions that enroll significant numbers of African Americans, Hispanics, and Native Americans. Recommendations for fostering interest in chemistry, facilitating transitions, and retaining students will be discussed, while highlighting strategies for providing the support that individual students need to succeed in their chosen career paths.

[Slides from Presentation](#)

**Session III:**

**11:10 am – noon**

**Active Learning In The First Two Years Of Chemistry**

Lee Park, Susan Shih, Hongqiu Zhao

This session will briefly present examples of active learning practices that can be particularly effective during the first two years of an undergraduate curriculum. In particular, Peer Lead Team Learning, POGIL (or group work) and undergraduate research activities that can be implemented within the first two years (within general and organic chemistry courses, as well as in research labs) will be discussed. This will be followed by an interactive panel discussion with the presenters including questions and contributions from the audience.

[Slides from Presentation](#)

**Session IV:**

**2:00 – 2:55 pm**

**Development Of Student Skills In The First Two Years Of The Chemistry Curriculum**

Mary T. Berry, Miles Koppang, Barbara Sawrey

High-order skills, which students use in purposeful implementation of their knowledge of chemical principles, are distinguished from pure content knowledge, though the two are generally delivered in parallel. An interactive discussion on development of student skills is planned. Several questions will be explored including: How well do the skill sets listed in the two-year and four-year ACS guidelines align with skills identified as critical by faculty? From the perspective of faculty working in the trenches, how is the training generally delivered, how is the effectiveness of the delivery determined, and what particular practices lead to excellence? Also included in the discussion will be a consideration of the extent to which these practices that foster excellence in one environment are exportable to other chemistry programs.

[Slides from Presentation](#)

**Session V:**

**2:55 – 3:25 pm**

**Having Your Cake And Eating It Too: Taking Advantage Of Professional Development Opportunities**

Lee Park, Scott Donnelly, Larry Kaplan

An energetic and accomplished faculty is essential to an excellent undergraduate program. Professional (and personal) experience gained outside one's formal training and regular academic routines can be a major factor in the continued development of an effective chemistry faculty. Taking advantage of professional development opportunities can foster innovation in undergraduate chemical education and in teaching the next generation of technological problem-solvers. In addition, such experiences can be used to bolster a faculty member's research program, as well as to enhance one's ability to communicate the context and scope of modern chemistry within the classroom. This session will describe a variety of professional development opportunities, including sabbaticals, National Science Foundation-sponsored workshops, and research field experiences, and discuss the ways in which these experiences impact student learning and the educational missions of institutions.

[Slides from Presentation](#)

**Session VI:  
3:40 – 4:30 pm**

**Anecdotes Are Not Enough: Demonstrating Excellence Through Assessment**

Lucy Eubanks, Tom Holme, Barbara Sawrey (Panel)

How do we provide evidence of excellence in the first two years of the chemistry curriculum, and particularly of the more elusive student skills that are the topic of this symposium? Accrediting organizations, funding agencies, and our own campuses expect us to be able to point to evidence of ongoing assessment. Excellent programs have both knowledge (content) goals and process (non-content) goals that require assessment in order to prove to yourself and others that outcomes match these goals and are derived from the program's practices. Strategies that include direct and indirect measurements will be discussed by the panel members. Some guiding questions will be provided to assist in self-reflection and to aid in consideration of whether a program already carries out some components of assessment that go beyond course exams and final grades.

[Slides from Presentation](#)

**Session VII:  
4:30 – 5:00 pm**

**Student Excellence – Where To Next?**

**John Clevenger, Cindy Larive**

There is no formula for excellence. Each program must take into account its special strengths and needs in designing a curriculum that leads to student excellence. With this in mind, ideas and concepts for student excellence presented throughout the symposium will be discussed. We will consider questions such as: what are the attributes of excellence, what fosters excellence, and what might an individual or program do to improve?

[Slides from Presentation](#)