

SERP Institute 2014

Abstracts for Concurrent Workshop Sessions

Note: All Workshops take place on Thursday (Sessions I - III) and Friday (Sessions IV - V). Please refer to the SERP Institute Schedule for workshop times and plenary sessions.

I-A: Motivating Students to Use Metacognitive Strategies: It Might Be Easier than You Think! - Dr. Sandra McGuire (Gottwald A201)

Many of today's students seem more focused on acquiring credentials, and less concerned with gaining a deep understanding of the concepts and principles taught in their courses. Faculty may find it challenging to motivate students to spend the time and energy required for developing higher order cognitive skills. Creating a plan for motivating students to employ effective learning strategies and reflect upon their use so as to continuously improve them, requires understanding general principles of motivation and implementing strategies that have proven to be effective in increasing student motivation. James Raffini reports in *150 Ways to Increase Intrinsic Motivation in the Classroom* that when the psycho-academic needs of students are met in creative ways, student motivation soars. This workshop will engage faculty in a discussion of addressing student needs for autonomy, competence, relatedness, self-esteem, and enjoyment in order to significantly increase student motivation. Participants will learn concrete strategies that have proven successful in motivating individuals and entire classes of students.

I-B: Using Vision and Change to Map and Plan Your Department's Curriculum - Nitya Jacob (Gottwald E303)

The *Vision and Change in Undergraduate Biology Education: A Call to Action* report provides guidelines for transforming undergraduate biology education to prepare students for 21st century science and to equip them to understand current world challenges. This transformation requires biologists to work together as a community within their departments, at their institutions, and even beyond their institutions. Department curriculum reform is an important starting point, but may feel like a daunting task. This workshop will provide tools to first examine the current use of recommended key concepts and competencies in individual courses taught by participants at their institutions. Participants will use information of practices in individual courses to create a preliminary picture of the alignment of their department's curriculum with *Vision and Change*. Participants will work towards their action plan as they review strengths and areas for improvement within the current curriculum at their institutions. Strategies and tools for creating a curriculum map for a department and plans for strengthening alignment with Vision and Change recommendations will be explored.

I-C: Matching Your Department's Goals with General Education Goals Makes for Good Science -- and is One Path to Departmental Transformation! - Ellen Goldey and Karen Aguirre (Gottwald C114)

Most General Education/Core Curriculum (GE) programs seek to develop student competencies, which often include reading, written and oral communication, ethical decision-making, use of technology, critical thinking, creative expression, numerical reasoning, problem solving, and collaborative and independent learning. The sciences represent an important learning area within the GE requirements at all institutions, but too often science courses (especially those for majors) tend to be developed around coverage of content, rather than intentional focus on competency development, even though such competencies are essential to scientific excellence. These competencies are also essential for responsible citizenship, which is the mission of most Institutions. Using examples of life-sciences reform at two very different types of institutions, participants will come away with an understanding of how science courses can embrace core competencies (in major and non-major courses) without sacrificing rigor or content knowledge, and how assessments can measure achievement of learning goals fundamental to the mission of each participant's institution.

II-D: Recruitment and Retention of Future Health Professionals: How Life Sciences Departments can Work with Regional Agencies to Bridge a Gap in the Education Pipeline - Angelica Christie and Karen Aguirre (Gottwald A201)

African-Americans remain severely underrepresented in the health profession education programs, comprising less than 12% of the state's health care workforce compared to 30% representation in the population (Office of Workforce Analysis and Planning, 2012). In 2012, South Carolina's Area Health Education Consortium (AHEC) implemented an intercollegiate initiative to provide personal and professional development activities using communication technology to reduce barriers to training and resources. Supported by a three-year grant from The Duke Endowment, the SC AHEC anticipates a matriculation of at least 50% of the South Carolina URM undergraduate participants involved in our "Bench to Bedside: Bridging a Gap in the Education Pipeline" program into health professions training programs within four years. Participants will explore the strategies and tools used by AHEC to develop, implement, and sustain the program.

II-E: Undergraduate Research as your next SACS QEP; Why Only Transform a Department When You Can Transform an Institution? - Beth Ambos (Gottwald E303)

Undergraduate research has been identified for several decades as a preeminent practice for increasing student success, particularly in STEM disciplines. Yet for many departments, undergraduate research is expressed as a set of disconnected silos, and is often reserved for a small subset of upper-division students. What are the barriers to expanding undergraduate research, and how can colleges and universities overcome those barriers to expand and interconnect disparate undergraduate research strengths? What are the best strategies to scale-up and scaffold undergraduate research, not only throughout

the curriculum, but through changes in institutional *culture(s)*? How can the role of the faculty research mentor be better-defined and supported by the institution? Using the lessons learned from experts associated with the Council on Undergraduate Research, as well as SERP participants' insights, we will reflect on these questions, progressing through our discussions to initiate blueprints for action.

II-F: Integrated and Interdisciplinary 1st year course models - April Hill, Laura Runyen-Jenecky, Will Case, Kathy Hoke, and Students (Gottwald C114)

This session will focus on why and how taking an integrated, interdisciplinary approach in 1st year science courses can help facilitate learning of core concepts and core competencies (as outlined in Vision and Change). We will discuss two different course models (<http://smart.richmond.edu/Why/>; <http://iqscience.richmond.edu/why/index.html>) that incorporate authentic course embedded research and active learning pedagogies while helping students connect to real world biological problems through courses taught by faculty from multiple STEM disciplines. Current University of Richmond students and faculty will be facilitating the workshop. Teams that are interested can obtain curricular materials and/or laboratory research module ideas centered on topics such as antibiotic resistance, HIV, or challenges to a changing climate.

III-G: Course-based undergraduate research experiences (CUREs): Definition, Outcomes, and Assessment - Sara Brownell and Erin Dolan (Gottwald A201)

Course-based undergraduate research experiences (CUREs) are emerging as a way to engage large numbers of students in the process of doing science research in the context of a course. In this workshop, we will present an overview of what constitutes a CURE, what outcomes students and faculty may realize from CUREs, and how these outcomes can be assessed to determine the impact of CUREs. Participants will also have the opportunity to brainstorm ideas about how they could develop and assess their own CUREs.

III-H: Implementing High-Impact Practices to Improve Minority Student Achievement in the Sciences - Heather Belmont and Judy Awong-Taylor (Gottwald E303)

This interactive session will focus on promoting incorporation of the principles of *Vision and Change in Undergraduate Life Sciences: A Call to Action* and high impact practices at your institution, regardless of institution type or barriers such as slim budgets, commuting students, and few full-time faculty members. Facilitators will discuss a multi-pronged, high-impact approach to engaging the K-16 community in STEM engagement opportunities, designed to attract and retain underrepresented minorities, while building a highly-trained STEM workforce. The model and how it can be adapted to other settings and incorporated into future funding opportunities will be explored.

III-I: Building Grassroots Leadership for Departmental Change - Susan Musante, Ellen Goldey, April Hill, and Byron McCane (Gottwald C114)

Our shared vision of improving undergraduate life sciences education requires several kinds of leadership. Yet most of us in the Life Sciences have little knowledge or experience with leadership training and development. But the growing field of leadership studies can help. In this workshop we will get to know this research as we: 1) identify the traits of effective leaders; 2) evaluate the types of leaders in our departments and on our campuses; 3) reflect upon our own leadership skills; and 4) consider tactics for improvement. There are many types of effective and positive leaders in higher education, but all share a strong commitment to their campus community and students and a willingness to do the hard but satisfying work of helping their community continuously improve.

IV-J: Embedding Research and Discovery into all Levels of the Curriculum: Strategies, tools, and models for biology and beyond- Nitya Jacob, Judy Awong-Taylor, and Alix Fink (Gottwald A201).

Skills in inquiry and analysis, written and oral communication, and information literacy are recommended as key competencies in the *Vision and Change in Undergraduate Biology Education: A Call to Action* report, and also are listed as essential outcomes of a liberal education by the Association of American Colleges and Universities. Embedding scaffolded research experiences into the biology curriculum introduces students to scientific discovery and inquiry at an early stage and continues their development as scientists through intentional practice in upper-level courses. Similarly meaningful and authentic experiences for non-science majors can be developed by using challenging issues of local importance as the context for exploration and discovery. Developing scientific information literacy skills through use of primary literature and practice of oral and written communication is a powerful way to deepen students' engagement in discovery and inquiry in any course. In this workshop participants will discuss the embedding of research into any type of course, review models from several institutions, and work through examples of, and tools for, the use of primary literature and writing in courses and the subsequent assessment of student work. Participants also will brainstorm ideas for their own courses.

IV-K: Developing faculty expertise for improved STEM education - Michelle Withers (Gottwald E303)

This workshop will model the National Academies Summer Institute format for training faculty in reformed pedagogies and highlight resources and strategies for building capacity for faculty development. The summer institutes use interactive workshops to train faculty in effective use of active learning and assessment in the context of backward design to engage a diversity of students in courses that facilitate achievement of explicit, intended learning outcomes. Participants will develop a plan for implementing the strategies on their home campuses.

IV-L: Using Assessment Evidence to Inform, Transform, and Inspire Your Department (it's not just for SACS!) - Ellen Goldey (Gottwald C114)

Just as we expect our students to revise, continuously improve, and reflect upon their progress in a quest for excellence, we must expect the same, aspirational commitment from our department. However, assessment too often is used punitively -- a sure way to create a risk-averse faculty and to undermine support for any new initiative. The word itself has taken on very negative connotations in many institutions (e.g., a colleague of mine used to call it the “*Ass -word*”), but that can change quickly with good leadership.

It is crucial to use assessment in ways that informs our actions, inspires continuous improvement of our programs, stimulates faculty creativity, and fosters “safe” dialogue with our colleagues about our successes and challenges. Participants in this workshop will work with real assessment evidence from various tools at various levels, including the institution (e.g., NSSE, CIRP), department (e.g., NSSE, MFT, senior exit interviews), and course (e.g., CURE, SALG, exams, research posters), in formats that inspire discussion, action, and on-going reform. Participants will depart with a better understanding of how to build a comprehensive assessment strategy, which integrates different types of evidence, to inspire curiosity, creativity, and action towards achieving the best-possible outcomes for our students.

V-M: Exploring Sources of Extramural Funding for Departmental Transformation - Chuck Sullivan (Gottwald A201)

The Division of Biological Infrastructure (DBI) at the National Science Foundation supports the science that is carried out by molecular, cellular, organismal, and environmental biologists. This presentation will highlight some of the funding opportunities in the Research Resources Cluster (instrumentation, collections, and cyberinfrastructure) and the Human Resources Cluster (undergraduate research, postdoctoral fellowship, and faculty development networks) in DBI. We will attempt to answer your questions about programs at NSF that will help faculty transform undergraduate biology education at their home institutions.

V-N: Scientific Teaching and Engaging Pedagogies: "OK, We Know We Should, but How?" - Ellen Goldey (Gottwald E303)

Lectures have a role to play in effectively disseminating information (e.g., the plenary addresses at this Institute). However, there is irrefutable evidence that active learning increases student performance and reduces failure rates compared to lecture-only STEM courses (e.g., Freeman et al., PNAS, 2014). In addition, scientific teaching (Handelsman et al., Science, 2004) requires that we give students practice in the habits of mind and skills of professional scientists. But changing our traditional teaching practices is difficult, even frightening (it was for me), but with a little time, support, practice, and persistence, engaging pedagogies make teaching much more intellectually stimulating - for us and for our students. And you *don't* have to give up content coverage to do it.

Participants will engage in several activities that push first year students to practice higher-order cognitive skills and that are adaptable to the classroom, laboratory, or peer-mentored study sessions. Depending on the interests of the group, activities may include a guided inquiry (e.g., POGIL) exercise on malaria that requires students to apply textbook reading and primary literature to a real-world problem, fun ways to introduce students to primary articles that problematize the "facts" in their textbook, using snap beads to model meiosis and mitosis, sharing guidelines and assignments to promote effective teamwork and scientific writing/reporting, role-play discussions of cellular metabolism, and more. We will also discuss how to overcome student resistance to active learning situations and share resources that can support your department's ongoing efforts to diversify pedagogical practices.

V-O: Defining and Assessing Interdisciplinary Knowledge Across Science and Mathematics - Ellis Bell, Cheryl Sensibaugh, Suzanne Barbour (Gottwald C114)

The molecular life sciences integrate concepts from multiple disciplines with information, data, techniques, tools, and perspectives to solve research questions. To mirror the reality that science is interdisciplinary in nature and to prepare students for this type of scientific thinking, it is essential that their undergraduate science education contain components that are truly interdisciplinary with a focus on topics such as energy, change over time, structure/function relationships, modularity, stochastic vs. deterministic processes, and modeling scientific phenomena integrated into their coursework. Pedagogical resources essential to the educator include packages that explicitly define overall learning goals, more specific learning objectives, assessments to measure achievement of the objectives, and strategies to support learning of the objectives. This workshop aims to initiate the process of defining interdisciplinary learning goals and objectives by illustrating a) compilation of diverse educator perspectives regarding knowledge that should be assessed, b) reverse design creation of alignment tables of assessments, objectives and teaching strategies, and c) developing a network of educators committed to implementing pedagogical practices that both complement and transcend traditional institutional norms.