



ENGAGING SCIENCE, ADVANCING LEARNING: General Education, Majors, and the New Global Century

**The Westin Providence | Rhode Island
November 6-8, 2008**

There is strong agreement that the United States must make science achievement a top priority. We need more successful science graduates, and we need many more graduates—whatever their major—who can evaluate and use scientific information in making decisions. But fostering these capacities remains an elusive goal. And for undergraduate education, the problem is exacerbated by disconnects between how science is actually done and how it is portrayed in high school science education, by culturally negative stereotypes, and often by the routine practices of general or introductory courses.

In response, this conference asks: What works? With decades of innovation in science teaching behind us, what are the most promising avenues for raising the quality and level of students' engagement and achievement in science and scientific research?

How can we move beyond menu-driven general education requirements to more integrative designs for learning? How can colleges and universities provide early—and recurrent—experiences with science research and problem-based science studies? How do we build science students' competence in learning how experiments are done, how data are analyzed and tested for statistical validity, and how scientific findings are modeled mathematically? What are we learning through widespread efforts to connect science and related disciplines to large global, health, and policy challenges such as environmental degradation and health pandemics? What are we learning from projects that use technology to involve students in global investigations, multi-national teams and creative projects? What is the role of cross-disciplinary learning for science majors and for general education?

Too often, breakthroughs in science and technology teaching—both in general education and in the majors—are limited to individual courses or to special programs that reach only a few students. *Engaging Science, Advancing Learning* will explore the place and practice of science in college learning for the twenty-first century. Participants will probe ways to scale up the pace of change and to better support faculty leadership in curricular and pedagogical innovation. It will take systemic change to reverse the long-term pattern of American students' under-achievement in science. This conference offers the opportunity to consider how colleges and universities—working together—can create a positive climate for engaging science within far-reaching educational change.

PLANNING COMMITTEE

AMERICAN PSYCHOLOGICAL ASSOCIATION

Robin J. Hailstorks
Director of Precollege and Undergraduate Programs

AMHERST COLLEGE

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Professor of Chemistry

BABSON COLLEGE

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BENTLEY COLLEGE

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Professor and Chair, Department of Natural and Applied Sciences

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Geeta Jain Chougule
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CLARK UNIVERSITY

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KEENE STATE COLLEGE

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KEENE STATE COLLEGE

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Kathy N. Morgan
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CONCEPT ADVISOR

COLUMBIA UNIVERSITY

Darcy B. Kelley
Co-director, Doctoral Subcommittee in Neurobiology and Behavior, and Professor, Biological Sciences

FUTURE NETWORK FOR ACADEMIC RENEWAL CONFERENCES

General Education, Assessment, and the Learning Students Need	February 26-28, 2009	<i>Baltimore, MD</i>
Shaping Faculty Roles in a Time of Change	April 2-4, 2009	<i>San Diego, CA</i>
Educating for Personal and Social Responsibility	October 1-3, 2009	<i>Minneapolis, MN</i>
Integrative Learning	October 22-24, 2009	<i>Atlanta, GA</i>
General Education and Assessment	February 18-20, 2010	<i>Seattle, WA</i>

NETWORK FOR ACADEMIC RENEWAL STAFF

ASSOCIATION OF AMERICAN COLLEGES AND UNIVERSITIES 1818 R STREET, NW, WASHINGTON, DC 20009

Please contact us at your convenience to learn more about our conferences and the ways in which you can be involved. Phone: 202.387.3760

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LIBERAL EDUCATION AND AMERICA'S PROMISE (LEAP) CAMPUS ACTION NETWORK EXEMPLARS

The conference sessions listed below are designated as *LEAP Campus Action Network Exemplars*. LEAP brings together campuses and organizations that are committed to liberal education, helps them to improve their efforts to ensure all students achieve essential liberal education outcomes, and highlights campus practices that work. The campus-action component of AAC&U's LEAP campaign builds the capacity of campus and organizational partners to advocate effectively for liberal education. By recognizing Campus Action Network exemplars, AAC&U aims to share promising practices that help students achieve the essential learning outcomes outlined in the AAC&U report, *College Learning for the New Global Century*. Stop by the registration desk for information about becoming a LEAP/CAN member or visit www.aacu.org/leap.

LEAP Campus Action Network Exemplars

DESIGN

POSTER 4: Scientific Inquiry and Global Awareness for Non-science Majors

Drury University

Thursday, 8:30 p.m.— Waterplace Ballroom

DESIGN

POSTER 7: Advancing Understanding of Science and Its Connection to Other Aspects of Life through Service Learning

Mitchell College

Thursday, 8:30 p.m.— Waterplace Ballroom

DESIGN

POSTER 8: Designing Effective Upper Level Science Experiences for Non-Science Majors

Keene State College

Thursday, 8:30 p.m.— Waterplace Ballroom

DESIGN

POSTER 9: Engaging Students in Science across the Curriculum: Bridging Local to Global Perspectives in Environmental Science Learning

Eastern Connecticut State University

Thursday, 8:30 p.m.— Waterplace Ballroom

DESIGN

ROUNDTABLE 2: The Use of Peer Learning Models to Enhance Undergraduate Science Education

University of Michigan

Friday, 7:45 a.m.—Providence II

VISION

CS 1: Scholarly Evidence, Exemplars, and a Vision for Integrative Learning

Carleton College, Indiana University, Saint Vincent College

Friday, 11:00 a.m.—Narragansett Ballroom C

DESIGN

CS 3: Learning Communities and Growing a Science Major

Wagner College

Friday, 11:00 a.m.—Providence II

DESIGN

CS 4: Critical Thinking for Civic Thinking

Central Connecticut State University, Wagner College, University of Akron

Friday, 11:00 a.m.—Newport/Washington

VISION

CS 11: Using Impossible Problems to Build Engagement in Science and Engineering

Worcester Polytechnic Institute

Friday, 2:15 p.m.—Narragansett Ballroom C

ASSESSMENT

CS 14: Using Formative and Summative Assessment to Systematically Develop Scientific Thinking

North Central College

Friday, 2:15 p.m.—Bristol

DESIGN

CS 20: From Scientific Inquiry to Global Applications—Development of a Two-course Sequence in Integrative Sciences

Otterbein College

Friday, 4:15 p.m.—Providence III

VISION

CS 26: A Politicoscientific Approach to Civic Scientific Literacy and Public Engagement

Portland State University

Saturday, 9:15 a.m.—Providence II

VISION

CS 27: The Importance of Faculty Development in Designing Effective Science Experiences for Non-science Majors

Keene State College

Saturday, 9:15 a.m.—Narragansett Ballroom C

SCHEDULE AT A GLANCE

Thursday, November 6, 2008

- 10:00 A.M. – 7:00 P.M. **Conference Registration and Membership Information**
- 2:00 – 5:00 P.M. **Pre-conference Workshops** (separate registration and fee required)
- 7:00 – 8:30 P.M. **Keynote: Envisioning the Place and Practice of Science Education**
James Gentile—Research Corporation
- 8:30 – 9:30 P.M. **Poster Sessions and Reception**

Friday, November 7, 2008

- 7:45 – 9:00 A.M. **Roundtable Discussions and Continental Breakfast**
- 9:15 – 10:45 A.M. **Plenary: Teaching and Learning Science: Why Change and How?**
Kathleen N. Morgan—Wheaton College; Jeanne Narum—Project Kaleidoscope; and David Targan—Brown University
- 11:00 A.M. – 12:15 P.M. **Concurrent Sessions**
- 12:30 – 2:00 P.M. **Plenary: Teaching and Learning for Sustainability: Imperative or Option?**
(Separate registration and fee required; lunch included)
Eleanor Sterling—American Museum of Natural History and Columbia University
- 2:15 – 3:45 P.M. **Concurrent Sessions**
- 4:15 – 5:30 P.M. **Concurrent Sessions**

Saturday, November 8, 2008

- 7:45 – 9:00 A.M. **Roundtable Discussions and Continental Breakfast**
- 9:15 – 10:45 A.M. **Concurrent Sessions**
- 11:00 A.M. – NOON **Plenary: Raising the Quality and Level of Science Learning for All Students**
Darcy B. Kelley—Columbia University and Linda L. Slakey—National Science Foundation

SAVE THE DATES

- May 29 – June 3, 2009 **AAC&U Institute on General Education** University of Minnesota, Minneapolis
- June 17 – 21, 2009 **AAC&U Greater Expectations Institute** University of Vermont, Burlington

For more information, visit www.aacu.org/meetings or call 202.387.3760.

PROGRAM OF EVENTS

THURSDAY, NOVEMBER 6, 2008

10:00 A.M. – 7:00 P.M.

CONFERENCE REGISTRATION AND MEMBERSHIP INFORMATION

Narrangansett Lobby, Ground Floor

2:00 – 5:00 P.M.

PRE-CONFERENCE WORKSHOPS *(Separate registration and fee required)*

WORKSHOP 1: Designing and Implementing Rich Science Learning Outcomes for All Students

Providence I, Third Floor

Workshop leaders will facilitate discussion about the kinds of knowledge, skills, and abilities that all students should acquire to effectively evaluate and use scientific information. Participants will address how historical foundations might be balanced with current research findings and how teaching science can change to engage students more deeply along a set of essential outcomes. Workshop participants will consider how to articulate and assess these outcomes and incorporate them across the undergraduate experience of all students.

Donald Deeds, Professor of Biology—Drury University and **Barry Stein**, Professor of Psychology, PI: NSF CAT National Dissemination Project, Director of Planning—Tennessee Technological University

WORKSHOP 2: Designing Collaborative Institutional Supports that Expand Creative Science Learning Opportunities

Providence II, Third Floor

Workshop facilitators will address institutional strategies that support new forms of science learning and strategies for sustaining successful programs in college. The facilitators will discuss in- and out-of-classroom learning experiences that advance science learning, including engaging students early in research opportunities and developing research-rich curricula. They will also discuss student learning and retention of historically underrepresented students in all fields as well as the role undergraduate research plays in graduate and professional school aspirations for all students. Participants will examine different models of in- and out-of-classroom programs.

Sandra R. Gregerman, Director, Undergraduate Research Opportunity Program—University of Michigan and **James E. Swartz**, Professor of Chemistry—Grinnell College

WORKSHOP 3: Integrating Research Activity in the Undergraduate Curriculum

Providence III, Third Floor

Workshop facilitators will share pedagogical practices and principles of teaching science that work across the curriculum. Specifically, they will address how to more effectively integrate research—including course-embedded research projects, independent research projects (during the academic year and the summer), community-based research, and early professional research—into a first-year to capstone curriculum. Participants will receive advance reading materials and work in groups comprised of various institutional types to generate different perspectives on challenges and barriers, as well as ways to overcome them.

Lori Bettison-Varga, Provost and Dean of the Faculty—Whitman College and **Doug Hamilton**, Associate Dean of the College of Liberal Arts and Sciences and Professor of Physics—University of Connecticut

WORKSHOP 4: Science for All: Fostering Faculty Efforts and Institutional Transformation

Providence IV, Third Floor

All students, not just science majors, need to develop scientific understanding and a conception of how science is done. In order to engage all students in science, science faculty will need to build collaborations across and beyond their institutions. Workshop participants will consider models for science-rich education and multiple pathways to accomplish it. Facilitators will focus on examples of gaining momentum from the bottom up, starting

with small alterations in course design and pedagogy and eventually influencing whole programs, departments, administrations, and communities. Participants will explore examples of what works, including research-proven teaching methods, ways to link humanities and the sciences, faculty incentives and leadership development, learning and teaching centers, publication on the scholarship of teaching and learning, undergraduate research, and ways to surmount institutional barriers.

Adele J. Wolfson, Associate Dean of the College, Professor of Chemistry—Wellesley College; and **Beth Weatherby**, Provost and **Elizabeth Desy**, Dean of Arts, Letters, & Sciences—Southwest Minnesota State University

WORKSHOP 5: Assessing Students' Science Learning

Bristol, Third Floor

Workshop leaders will provide models and effective practices for assessing science learning, cross-disciplinary knowledge, and scientific “habits of mind.” Participants will explore several types of assessment strategies and strengthen their ability to both evaluate and create authentic assessment instruments. Participants are encouraged to bring to the workshop examples of assessment instruments that they or their colleagues have used to assess science learning—especially cross-disciplinary knowledge and/or scientific “habits of mind”—in field experiences, undergraduate research, service learning, and other engaged learning practices. During the workshop, participants will have an opportunity to identify and share effective practices gleaned from the assessment instruments that they bring to the workshop.

David Lopatto, Professor of Psychology—Grinnell College and **Rolf Enger**, Director of Education—United States Air Force Academy

7:00 – 8:30 P.M.

KEYNOTE: Envisioning the Place and Practice of Science Education

Narrangansett Ballroom ABC, Ground Floor

Science faculty more and more are reshaping their courses to connect key concepts and questions with students' early and active involvement in systematic investigation and research—in “doing science as science is done”—in the classroom, laboratory, and community. Dr. Gentile will address the kinds of knowledge, skills, and abilities that today's students should possess to effectively evaluate and use scientific information and to be innovators and leaders in a variety of career fields. He will also discuss strategies for teaching science “scientifically”—in ways that deepen students' understanding of the physical and natural world and that prepare them to successfully navigate the scientific complexities of the twenty-first century.

James Gentile, President—Research Corporation

8:30 – 9:30 P.M.

POSTERS AND RECEPTION

Waterplace Ballroom, Second Floor

Participants are invited to visit the poster displays while connecting with colleagues to share their work and plan activities throughout the conference.

VISION

POSTER 1: Community College Research Experience to Strengthen the Science Pipeline

This poster will feature the Community College Genomics Research Initiative (ComGen), a design to provide community college students in lower level biology courses a chance to experience various aspects of being a scientist, including: trouble shooting experiments, lab meetings, journal clubs, and being part of a scientific community. This initiative is part of a multidimensional approach to connect community college students with high schools and middle schools as well as universities and research organizations to address failures in the “pipeline” of preparation and degree completion in the sciences. Data and experiences from ComGen will be presented.

Gita Bangera, Life Sciences Instructor—Bellevue Community College

VISION

POSTER 2: Generating Enthusiasm for Mathematics and Sciences via Interdisciplinary Freshmen Seminars

This poster will highlight three novel, inter-disciplinary freshmen seminars that were developed at the University of West Georgia as part of a NSF-STEP grant to introduce STEM students to various skills and strategies used in scientific inquiry. Presenters will discuss how instruction and hands-on activities occurring simultaneously allow students to work collaboratively to seek solutions to problems set in real-world contexts and see the inter-dependence of the sciences and the relevance of scientific principles.

Sharmistha Basu-Dutt, Director of Engineering Studies and Associate Professor of Chemistry—University of West Georgia, Carrollton

VISION

POSTER 3: Where is Information Literacy in Life Sciences Outcome Assessment?

The information literate student is one who can critically and efficiently interact with a variety of information sources to address a specific goal. This poster will analyze how information literacy is being addressed in the assessment plans of life sciences departments at a variety of colleges and universities. By looking at life sciences learning outcomes and determining to what extent information literacy skills are being addressed, librarians and faculty members can begin a conversation about how to ensure that students have the full range of information skills they will need to succeed not only in their life sciences coursework but also in their professional careers.

Thomas Harrod, Biology Librarian—University of Maryland College Park

DESIGN

POSTER 4: Scientific Inquiry and Global Awareness for Non-science Majors

This poster will share the development and implementation of a series of interdisciplinary team taught courses that use case studies and examples from current scientific literature to present and explain the nature of science to non-science majors. Information will include how course topics are selected, how the courses are integrated into the general education curriculum, and how they have been modified to address other student learning outcomes, particularly global awareness.

Roger Young, Associate Professor of Biology and General Education Coordinator—Drury University

DESIGN

POSTER 5: Integrating Science Process and Discovery into Major and Non-major Biology Curricula

This poster will demonstrate how biology curricula for majors and non-majors were updated to incorporate changes within the discipline and evolving understandings of how students should be prepared for the challenges of the 21st century. These new approaches include inquiry-based activities and independent research opportunities. The presenter will share the project goals, implementation process, challenges, and assessment results.

Christine Broussard, Associate Professor of Biology--University of La Verne

DESIGN

POSTER 6: Promoting Active Learning and Social Responsibility in Undergraduate Biology Curricula

Many non-major biology students fail to see the importance and relevance of biology in their everyday lives. In this poster facilitators will: (a) illustrate the difficulty of making connections between students and the biology curriculum; (b) present an innovative design to promote active learning and social responsibility by integrating the United Nations Millennium Development Goals (MDG), global health targets, service learning projects and campus wide co-curricular events into semester long projects in multiple biology classes; (c) share student experiences and projects using this design; (d) provide recommendations for the successful development of this design; and, (e) encourage participants to actively explore the application of the MDG in their institutions by using a MDG Resource Website designed for faculty and student research.

Participants can use this unique design to enhance student appreciation of the relevance of biology in the world.

Mary Flannery, Instructor of Biological Sciences and **Barbara Downes Davis**, Associate Professor of Biological Sciences—both of Bergen Community College

DESIGN

POSTER 7: Advancing Understanding of Science and Its Connection to Other Aspects of Life through Service Learning

To engage non-science majors in the study of science and to ensure that they meet the general education requirement of developing an understanding of the natural world by applying the scientific method, faculty redesigned non-major science courses to help students make the connection between the study of science and other aspects of their lives. Non-major science courses, both life and physical science, now include a service-learning, research component dealing with the impact of human civilization on the global environment and the responsibilities of humans in preserving their environments. This poster will share projects students have participated in, program features that allow faculty to work with the large number of students participating in research each semester, and student evaluations of the program.

Victoria E. Brennan, Chair and Associate Professor, Science and Mathematics Department, **Kimberly Blake**, Associate Professor of Life Sciences, and **Kristen Lester**, Assistant Professor of Life Sciences—all of Mitchell College

DESIGN

POSTER 8: Designing Effective Upper Level Science Experiences for Non-Science Majors

Keene State College's Integrative Studies Program requires that all students complete a Natural Science component which many non-science majors delay until their junior or senior year. While students at these upper-levels bring higher level skills in many areas, including reading, writing, critical thinking and information literacy, they usually enroll in an introductory level science course and often put in an effort just good enough for a "passing grade." At best, their attitude about science remains unchanged, at worst they learn to hate science. Under the new program, these students take a course designed to engage their upper-level skills. Early indications include increased participation in class discussions, increased use of primary sources in written work and a greater awareness of science related items that students ask about during or after class. Anecdotal evidence suggests the students completing these courses have a much greater appreciation of the role of science in their lives. This poster session will share a collection of courses that integrate science with other areas of knowledge (e.g., social sciences, public policy, history, philosophy, literature, and art) to advance understanding of the place of science in all aspects of life.

Peter A. Nielsen, Faculty Co-Chair, Integrative Studies Program and Professor of Geology—Keene State College

DESIGN

POSTER 9: Engaging Students in Science across the Curriculum: Bridging Local to Global Perspectives in Environmental Science Learning

Solving today's major societal problems requires cross-disciplinary communication and collaboration. In the recently developed Sustainable Energy Studies program at Eastern Connecticut State University students learn that their actions affect the global environment, that science can help them choose actions that promote a sustainable society, and that sustainable development and sustainable economies are not only possible but are necessary. The interdisciplinary program gathers information from the sciences, the social sciences, business and economics in preparing students for careers that involve helping society make the transition to a global economy, based on renewable energy and sustainable policies and practices. The poster will showcase multimedia products produced by students and faculty to gain better understanding of environmental issues and innovative ways to engage students in sustainable energy matters.

James Drew Hyatt, Professor of Environmental Earth Science and **Fred Loxsom**, Endowed Chair in Sustainable Energy Studies—both of Eastern Connecticut State University

DESIGN

POSTER 10: An Interdisciplinary Model of General Science Education

For the past decade, Mercer University has required students to take an interdisciplinary, case-based general education course designed to introduce the key characteristics and philosophy of the empirical disciplines. This poster will share (a) a brief history and rationale for our program; (b) results of student learning and assessment; and (c) an overall appraisal of the challenges and rewards of this approach to general science education. Presenters will demonstrate some examples of the interactive cases that form the building blocks of the course.

Linda Hensel, Associate Professor of Biology and Tanya Sharon, Associate Professor of Psychology and Director of Scientific Inquiry—both of Mercer University

DESIGN

POSTER 11: Supporting Student Research and Innovation: Conductance Measurement of Cell Lysis as a Reporter of Toxin Presence

Around the world, contamination of drinking water is an immense problem that is difficult and expensive to detect with current technology. There is a need for an economically feasible, transportable, and user-friendly detection system for water contamination that can reliably be used in the field. This poster will focus on how students are designing a novel biosensor that reports information in a simple electric signal. This biosensor will have the ability to detect the presence of certain water toxins and report that information back via a change in the conductance of a bacterial solution. Learn how students are making a difference for the future and about experiences that are advancing and supporting student innovation in the sciences.

Rima Shah, Neil Parikh, and Katherine Jacobs—all Students attending Brown University

STRUCTURES

POSTER 12: Online Science Courses for Non-Majors and Adult Learners

This poster will share the work of a curricular design team including faculty, instructional designers, and staff to make science relevant to non-majors who may initially have anxiety about general education science courses. With support from the Charitable Leadership Foundation, the team designed courses using authentic learning experiences to promote course relevancy to students' lives. The courses include case studies and problem-based learning that deepen understanding and community-based components that inspire civic engagement. The presenter will showcase engaging topics and detail special learning activities in four diverse online courses. Attendees will learn about a resource website for science educators who are working with student populations that increasingly include adult learners.

William J. Ehmann, Associate Dean, Center for Distance Learning—Empire State College

STRUCTURES

POSTER 13: Preparing Successful Women Scientists and Engineers: A Collaborative Initiative

Women, who now earn half of all bachelors' degrees in science and engineering, continue to be underrepresented in almost all science and engineering faculty at four-year colleges and universities. This poster introduces a recent collaborative initiative designed to encourage eligible women graduate students in STEM disciplines to take a proactive and involved approach to their own academic success, degree completion, future career planning, and professional development. The poster will share the initiative's conceptual frameworks—empirical, feminist, multicultural—including its program goals, some key research data that informs its priorities, and the role of women graduate students in program design, research, and assessment. Attendees will be provided with ideas for designing and implementing similar programs.

Derina S. Samuel, Associate Director of Professional Development Programs—Syracuse University

FRIDAY, NOVEMBER 7, 2008
7:45 – 9:00 A.M.

CONTINENTAL BREAKFAST AND ROUNDTABLE DISCUSSIONS

Please visit the continental breakfast buffet and then select the room that features the discussion of your choice.
Providence Foyer, Third Floor

VISION

ROUNDTABLE 1: Science, Evolution, and Creationism: The Critical Need for Science as a Liberal Art in the 21st Century

Providence I, Third Floor

In January 2008 the National Academy of Sciences and the Institute of Medicine co-published *Science, Evolution, and Creationism*. The third edition of a series, this book differs from its predecessors in that it was shaped by a careful program of audience research initiated to bring about a better understanding of the frames of reference that the book's intended audiences bring to these issues. The findings from this research have important messages for undergraduate science faculty and the ways in which science is taught, especially at the introductory level. Dr. Jay Labov, who directed the preparation of this book, will discuss this research and its highlights. He and Dr. Kenneth Miller (a key witness at the Dover, PA. trial on intelligent design) will then discuss the implications of this book for teaching and learning science from the perspective of the liberal arts.

Jay Labov, Senior Advisor for Education and Communications—National Research Council; and **Kenneth R. Miller**, Professor of Biology and Royce Family Professor for Teaching Excellence—Brown University

DESIGN

ROUNDTABLE 2: The Use of Peer Learning Models to Enhance Undergraduate Science Education

Providence II, Third Floor

Participants will have the opportunity to discuss a variety of peer-learning models that are used to support undergraduate science learning including: peer-led study groups, peer tutoring, peer mentoring, and peer advising. They will address the challenges associated with offering successful programs and will be encouraged to share "lessons learned" related to obtaining and maintaining sufficient funding; training and supervising students to serve as peer leaders, tutors, mentors or advisors; gaining and maintaining the support of faculty and administrators; and the role of peer-based programs in enhancing student engagement. The facilitators will guide the discussion to cover the specific interests of the participants and to include methods of assessment that participants have found particularly useful when attempting to determine the effectiveness of peer-based programs.

Claire Sandler, Director of Science Learning Center and **Joe Salvatore**, Assistant Director of Science Learning Center—both of University of Michigan

DESIGN

ROUNDTABLE 3: Demonstrating Interactive, Cross-disciplinary Learning and Teaching Models

Kent, Third Floor

Interactive visualizations and simulations provide novel ways to augment learning and teaching in science by providing rich representations of scientific phenomena and opportunities to manipulate them. This presentation will show how molecular visualizations and molecular dynamics simulations can support learning and teaching abstract scientific concepts. Simulations calculate the motion of atoms, molecules, and other objects such as electrons and photons, in real time. Users can interact with existing simulations and observe the changes right away on the screen; advanced users can create new simulations. Session facilitators will demonstrate interactive models across disciplines (including biotechnology and engineering) and how to create new ones. In addition, they will discuss the pedagogical support that enables users to customize existing simulations and activities and provides embedded assessment tools.

Amy Pallant, Molecular Workbench Project Manager and **Qian Xie**, Senior Scientist and Developer—The Concord Consortium

STRUCTURES

ROUNDTABLE 4: Defining Institutional Design Function to Facilitate Development of Science and Math Skills in Students

Providence III, Third Floor

Do high school experiences nurture interest in science and math? Do classroom pedagogies offer students meaningful engagement in solving students' science and math problems? Do assessments contribute to the demonstration of students' full potential? Participants in this discussion will: (a) review factors that led one urban minority-serving institution to develop a holistic design approach in reforming the science and math general education curriculum; (b) examine the applicability of the concepts of affordances (Tagg, 2003) and organizational design to align often disjointed institutional efforts to improve students' scientific and quantitative reasoning skills; and (c) identify design indicators for the institution-wide process of engaging students in meaningful science and math educational experiences.

Alexei G. Matveev, Associate Director, *Institutional Effectiveness and Assessment* and **Larry Mattix**, Associate Dean of Science and Technology—both of Norfolk State University

STRUCTURES

ROUNDTABLE 5: A Framework for Examining and Creating Successful Global Research Partnerships

Providence IV, Third Floor

Global partnerships with multi-national teams are increasingly referenced as a means to approach the world's most pressing problems. This discussion offers an empirically derived conceptual framework that describes five distinct types of inter-institutional, multi-national research partnerships along a continuum of increasing interaction costs and individual risk assumption. Participants will discuss applications and implications of the model in reference to: liberal education and undergraduate experiential learning; undergraduate research; student understanding of global issues; and incentives and implications for faculty, including review, promotion, and tenure. Participants will explore the potential of the framework to guide such partnerships in undergraduate and liberal education settings.

Betty Rambur, Professor and Dean of Nursing and Life Science—University of Vermont

9:15 – 10:45 A.M.

PLENARY: Teaching and Learning Science: Why Change and How?

Narrangansett Ballroom AB, Ground Floor

Change in science learning comes with understanding the synergy between contemporary goals for student learning in the fields of science, technology, engineering and mathematics and contemporary and historic goals for liberal education. The process of educational change involves institution-wide attention to this synergy and to the contextual issues that influence the work of agents of change. These include: mental images that faculty have about how students learn; institutional policies for supporting leadership for change; institutional expectations of what students should know; and broader societal calls to action regarding what American college graduates should know and be able to do. Opening remarks will be followed by participant discussion of case studies addressing specific "how to" questions; report-outs and reflections will conclude the session.

Kathleen N. Morgan, Associate Professor of Psychology and Williams Chair of Social Sciences—Wheaton College; **Jeanne Narum**, President—Project Kaleidoscope; and **David Targan**, Dean for Science Education and Adjunct Associate Professor of Physics—Brown University

11:00 A.M. – 12:15 P.M.

CONCURRENT SESSIONS

VISION

CS 1: Scholarly Evidence, Exemplars, and a Vision for Integrative Learning

Narrangansett Ballroom C, Ground Floor

For over a decade, scientists and educators have called for faculty in higher education to engage their students in "connected science" that integrates the content and processes of science with other

perspectives and disciplinary ways of knowing to address real-world problems. A group of international STEM faculty, supported by the Carnegie Foundation for the Advancement of Teaching and their complementary Integrative Learning Project with AAC&U, has focused on connected science within and across courses, programs and institutions. Session facilitators will share, discuss and critique the exemplars and scholarly evidence of student learning from this collective. They will elaborate on learning outcomes and pedagogies necessary for a 21st century citizenry to engage with complex, science-rich problems facing our global society. This session will actively engage faculty and administrators in envisioning the educational goals, challenges and institutional responses related to connected science. **Tricia A. Ferrett**, Professor of Chemistry—Carleton College; **Whitney M. Schlegel**, Professor of Biology and Director of the Human Biology Program—Indiana University; and **Matthew A. Fisher**, Professor of Chemistry—Saint Vincent College

DESIGN

CS 2: Connecting Science to the "Real" World: General Education for Non-Science Majors

Providence I, Third Floor

Innovative approaches to science education for non-majors can revitalize General Education and when integrated throughout the students undergraduate years, help students develop the skills necessary to survive in a complex, global society. This session will share different models that foster students' integrative learning and making connections between the scientific lecture, laboratory, and their world outside of the campus. Participants will examine and discuss specific examples from a series of courses including (1) Scientific Ethics; (2) Visualizing Sustainability: Contemporary Art and Environmental Science; and (3) Night Skies of Pennsylvania.

Lauren Howard, Assistant Professor of Biology and **Julia Plummer**, Assistant Professor and Coordinator of Science Education—Arcadia University

DESIGN

CS 3: Learning Communities and Growing a Science Major

Providence II, Third Floor

Ten years ago Wagner College adopted The Wagner Plan for the Practical Liberal Arts, a new curriculum that emphasized learning communities. Since that time, faculty members in the department of chemistry have incorporated several general chemistry courses into first-year learning communities. Since this change in the curriculum, the department has seen a significant growth in the number of majors in the discipline, particularly in the number of female students within the major. Session facilitators will describe the details of the Wagner Plan, address questions about how this curriculum can be adopted by science departments at similar institutions, and present assessment data from students within the major.

Wendy deProphetis Driscoll, Assistant Professor of Chemistry and **Nicholas Richardson**, Associate Professor of Chemistry—both of Wagner College

DESIGN

CS 4: Critical Thinking for Civic Thinking

Newport/Washington, Third Floor

Session facilitators will present results from a two-year study assessing the effectiveness of situating scientific problems in civic contexts, evaluating a variety of pedagogical strategies based on measured student outcomes, and investigating associations between students' abilities in critical and civic thinking. The Critical Thinking for Civic Thinking (CT²) study has taken place on four campuses and involved more than twenty faculty and a thousand students, who have responded to open-ended scenarios that require the application of scientific reasoning and the development of a civic action plan. Participants will leave with a set of CT² exercises and two taxonomies for assessing students' abilities in critical and civic thinking. Participants will be expected to discuss the challenges and benefits of situating scientific problems in real world contexts in light of the results of the study.

Stephen D. Adair, Professor of Sociology—Central Connecticut State University and **Donald E. Stearns**, Professor of Biology—Wagner College

DESIGN

CS 5: Attracting and Retaining STEM Majors: A Creative Scientific Inquiry Experience Program

Providence III, Third Floor

STEM programs that attract and sustain student interest feature learning that is experiential, investigative, hands-on, personally significant to both students and faculty, connected to other inquiries, and suggestive of practical application to students' lives. Such learning flourishes in a community in which faculty are committed equally to teaching, to maintaining their own intellectual vitality, and to partnering with students in learning, and in which institutional support for such a community exists. The Creative Scientific Inquiry Experience Program at Eastern Michigan University is involved in increasing and retaining the number of STEM graduates by including faculty professional development, student connections to the sciences and mathematics through academic service learning, and curricular reform. Participants will share their own institutional experiences and strategies for recruiting and retaining their STEM majors, and will explore ways for implementing such a program on their campuses.

Ellene Tratras Contis, Professor of Chemistry and **Joanne Caniglia**, Professor of Mathematics—Eastern Michigan University

DESIGN

CS 6: Successful Strategies for Attracting Liberal Arts Students to the Natural Sciences

Providence IV, Third Floor

Session facilitators will describe a variety of approaches that have been successful in attracting and retaining liberal arts students to the sciences. Pedagogical techniques include case-studies, writing-intensive explorations of primary sources, laboratory based modules, and courses that focus on social, political, or artistic connections with the natural sciences. Discussion will focus on the diverse approaches of the faculty in an interdisciplinary science program and the unique challenges faced by the various scientific disciplines (biology, chemistry, physics, and mathematics) in balancing technical rigor with the themes and approaches that appeal to students.

Bhawani Venkataraman, Associate Professor of Chemistry and Chair of Interdisciplinary Science Program and **Alan McGowan**, Professor of Science, Technology and Society—both of City University of New York - Eugene Lang College

STRUCTURES

CS 7: Shifting Institutional Infrastructure and Culture to Support Faculty-Student Collaborative Research

Bristol, Third Floor

Participants will explore models, strategies and issues associated with transforming undergraduate science programs to affect powerful learning through faculty-student collaborative research. As a case study, session facilitators will summarize how The College of New Jersey (TCNJ) implemented a series of initiatives aimed at fostering an institutional culture of inquiry, deep student engagement, and the teacher-scholar faculty model. This effort was initiated and led by the faculty, with strong administrative support, and resulted in comprehensive “academic transformation.” This transformation encompassed college-wide adoption of: (a) a new curriculum providing students with greater rigor, more flexibility, and full credit for experiential endeavors, especially undergraduate research; and (b) a new faculty work load system providing in-load credit for engagement in experiential pedagogies, mentoring, advising, scholarship, and course/curriculum design. Session facilitators will discuss what has worked, what has not, ongoing implementation issues, and lessons-learned. Participants will then share their own experiences and best-practices.

Jeffrey M. Osborn, Dean, School of Science and **Janet A. Morrison**, Associate Professor of Biology and Director of Faculty-Student Collaborative Activity—both of The College of New Jersey

STRUCTURES

CS 8: Promoting the Learning Focused Science Course

Kent, Third Floor

The United States Air Force Academy (USFA) refers to deliberate and intentional emphasis on student learning as the “learning focus.” Session facilitators will describe how the learning focus has transformed

courses at USAFA and introduce a learning focused classroom observation form and the results of its use. They will show what learning focused teaching looks like in a science classroom by showcasing a lesson from a completely redesigned biology course while session participants employ the observation form. Session participants will learn how a campus culture is encouraging faculty to design creative science courses and the feedback mechanisms that are being used to assist faculty in designing better, more learning focused courses. Finally, participants will reflect on how the form could be used at their own institutions to improve science learning.

Kenneth S. Sagendorf, Director of Faculty Development and **Robert K. Noyd**, Professor of Biology—both of United States Air Force Academy

12:30 – 2:00 P.M.

FEATURED ADDRESS

(Separate registration and \$50 fee required; lunch included)

Teaching and Learning for Sustainability: Imperative or Option?

Narrangansett Ballroom AB, Ground Floor

As the human population grows and consumption of nature's resources threatens the survival of species and ecosystems around the world, how is higher education helping students to understand the ways in which biodiversity, ecological integrity, and sustainability relate to the quality of their everyday lives? Dr. Sterling will address the imperative of connecting science learning to the natural world and nurturing personal and social responsibility for the health and conservation of Earth's resources.

Eleanor Sterling, Director, Center for Biodiversity and Conservation, American Museum of Natural History, and Director, Graduate Studies, Department of Ecology, Evolution, and Environmental Biology—Columbia University

2:15 – 3:45 P.M.

CONCURRENT SESSIONS

VISION

CS 9: Critical Thinking: A Foundation for Science and Liberal Education

Providence I, Third Floor

This conference asks the question "What analytical skills should all students acquire during their college education that will enable them to evaluate and use scientific information effectively?" One response is the skill set known as critical thinking. Science and science courses are uniquely positioned to develop critical thinking by their emphasis on analysis, synthesis, and evaluation of information, while the acquisition of critical thinking skills in a liberal education will enhance science education. Participants will learn both fundamental critical thinking principles and how to infuse their science curriculum with elements that enhance critical thinking. Participants will perform critical thinking and learning activities and will be assisted in tailoring these to their existing programs.

Judith Krauss, Associate Professor of Psychology and **Marybeth Ruscica**, Director of University Learning and Support Services—both of St. John's University

VISION

CS 10: Advancing Learning Content in the Sciences: A Vision for Developing Rich Scientific Literacy

Providence II, Third Floor

Many science courses, especially at the introductory level, focus on covering the content and helping students build a disciplinary knowledge base and not on developing scientific literacy. Session facilitators will present a model for teaching scientific literacy based upon a system for teaching content. This system considers different strategies, such as using concept maps and organizing schemes for teaching content so that students develop scientific habits of the mind. Participants will consider how they can use content to promote critical inquiry and foster the application of content in the future. Participants will begin to re-

envision courses that involve active student engagement and hands-on activities to help students use scientific concepts to address real challenges. This session will apply to all types of institutions of higher education and all levels of participants and focus primarily on general education or introductory courses. **Phyllis Blumberg**, Director of the Teaching and Learning Center and **Lois H. Peck**, Director of the Science Teacher Certification Program—both of University of the Sciences in Philadelphia

VISION

CS 11: Using Impossible Problems to Build Engagement in Science and Engineering

Narrangansett Ballroom C, Ground Floor

The Great Problems Seminars are a new program designed to engage Worcester Polytechnic Institute's (WPI) first-year students with current events, societal problems and human needs. Faculty representing Chemistry, Mechanical Engineering and Humanities developed and offered two seminars in 2007: *Feed the World* explored chemical, ethical, physiological and economic dimensions of food; and *Power the World* focused on the physics, history, and the environmental and economic impact of energy technologies. Each seminar carried credit for one course in science and one course in humanities, with a focus on the problem and not the discipline. Participants will review assignments used at WPI, students' final projects, and lessons learned to help them develop new assignments for engaging students in science learning.

Arthur C. Heinricher, Associate Dean for First Year Programs, **Kristin Wobbe**, Professor and Head of Chemistry and Biochemistry, and **David Spanagel**, Professor of History—all of Worcester Polytechnic Institute

DESIGN

CS 12: Science as Method: Engaging Undergraduate Students through Research

Providence IV, Third Floor

Improving scientific literacy for all students is an important goal of undergraduate education, particularly in regards to women and minorities in the Science, Technology, Engineering, and Mathematical (STEM) disciplines. Session facilitators will examine models developed in the Department of Biological Sciences at Meredith College, a comprehensive liberal arts women's college, which address curriculum design to enhance student engagement in STEM courses. Methods that engage both majors and non-majors in the scientific process will be discussed. Participants will have opportunities to develop ideas for research projects in non-major introductory courses and to construct syllabi for major research courses that address issues of their home institution's general education curriculum.

Francie S. Cuffney, Associate Professor of Biological Sciences and **Erin Lindquist**, Assistant Professor of Biological Sciences—both of Meredith College

ASSESSMENT

CS 13: Using Formative and Summative Assessment to Systematically Develop Scientific Thinking

Bristol, Third Floor

How can students be helped to develop the scientific thinking skills and abilities to evaluate claims and the evidence used to support them? As Willingham (2007) has found, efforts to teach critical thinking skills independent of disciplinary content often achieve limited benefits. Rather, learning to effectively apply and generalize critical thinking strategies requires background knowledge within an area of academic content. Session participants will examine a plan implementing a more coherent curriculum for teaching these scientific thinking skills in conjunction with the scientific content. Participants will learn how this plan: (1) identified a clear sequence of skills that build upon each other; (2) developed a series of mini-lessons for presenting and modeling the skills; (3) designed specific opportunities for systematic practice of the skills; and (4) developed regular checks for understanding (formative assessments) and feedback throughout the process. Examples of the assessments and their use will be shared in the session and online.

Jon Mueller, Professor of Psychology—North Central College

STRUCTURES

CS 14: Engaging Business Majors in General Education Science Courses

Newport/Washington, Third Floor

More students major in business disciplines than in any other field of study. Participants will consider how general education science courses can best meet the needs of this population of undergraduate students. Two introductory presentations will describe the science component of general education programs that have been developed at business-focused colleges. Facilitated discussions will engage participants in considering the quality and impact of the undergraduate science experience for business majors and how to best structure and deliver a general education science curriculum to intersect with the unique interests, abilities and goals of business students. Key questions and ideas arising from the discussions will be collected for discussion and distribution. Participants will be encouraged to continue these discussions in their departments and to consider how their respective curricula meet the needs of business students.

Fred D. Ledley, *Professor and Chair of Natural and Applied Sciences—Bentley College*; and **Stephen S. Holt**, *Professor and Director of Natural Sciences—Babson College*

STRUCTURES

CS 15: Creating a Cross-Campus Dialogue about Scientific Literacy

Kent, Third Floor

Over the past several decades, a diverse group of organizations have repeatedly called for improving the scientific literacy of American students. Yet, efforts at many educational institutions have failed to produce meaningful change. Improvement in student scientific literacy will only come when post-secondary educational institutions make a concerted effort to address these topics across all their introductory science classes and for all students. Participants will receive specific guidelines for initiating campus-wide, cross-disciplinary discussions aimed at improving scientific literacy. Session facilitators will describe how they started such a project, obtained administrative buy-in and selected participants. Session participants will receive a packet containing: reading lists, seminar tasks, discussion questions, pre- and post-meeting surveys and group activities.

James D. Myers, *Professor of Geology and Geophysics*, **Alan R. Buss**, *Department Head, Elementary and Early Childhood Development*, and **Mark E. Lyford**, *Director, Biology Program—all of University of Wyoming*

4:15 – 5:30 P.M.

CONCURRENT SESSIONS

VISION

CS 16: Redesigning Course Activities with Student Input to Promote Greater Engagement

Narrangansett Ballroom C, Ground Floor

Session facilitators will share the approach and outcomes of an NSF funded project using student perspectives to guide course improvement. For the project, course materials were developed with student input around an expanded case study format designed to make a greater connection to real world applications of the course material. Facilitators will share videos of equipment and facilities that reflect student requests. Student perspectives that helped guide course improvements—and often challenged assumptions about what students know and understand—will also be presented through short videos. The resulting application and assessment methods are applicable across science and engineering curricula and address issues related to re-envisioning the way courses are taught in higher education. The benefits of collaboration between faculty and teaching and learning centers will also be addressed.

Stewart L. Ross, *Director of the Center for Excellence in Teaching and Learning* and **Patrick Tebbe**, *Associate Professor of Mechanical Engineering—both of Minnesota State University*

DESIGN

CS 17: Faculty Research Projects and Course-based Laboratory Work

Providence I, Third Floor

Simmons College has undertaken a fundamental reengineering of the laboratory science programs in chemistry, biology and physics. This redesign utilizes ongoing faculty research projects as the basis for course-based laboratory work. Student teams in most chemistry courses and in selected courses in biology and physics participate in various aspects of nine faculty research projects as a major part of the course-based laboratory work. Session facilitators will explain the concept, design, implementation, and assessment of this approach to science laboratory instruction. Both the benefits and the challenges of this program will be explored.

Richard W. Gurney, Assistant Professor of Chemistry, **Nancy E. Lee**, Associate Professor of Chemistry, and **Leonard J. Soltzberg**, Professor of Chemistry—all of Simmons College

DESIGN

CS 18: Examining Science Writing Through a Literary Lens

Providence II, Third Floor

This session invites participants to consider a 2008 English course at the University of Idaho, an experiment in engaging undergraduates in science through investigating the aesthetic qualities of writing about science. The session will begin with an overview of recent studies of “science anxiety” and other barriers to effective science instruction, followed by an argument for the power of narrative in constructing public understanding of scientific issues. Students will then model an aesthetic approach to science writing. Participants will be provided with short passages from peer-reviewed scientific journals aimed at other scientists in the field and, after discussion, are asked to propose ways in which the information might be re-written for a general audience. Participants will also collaborate in developing a list of texts that might be included in a humanities-based course on the model of “Imagining Science” to be taught at their own institutions.

Gary Williams, Professor of English, **Jonathan Karg**, Undergraduate Student, and **Joe Dahlquist**, Undergraduate Student—all of University of Idaho

DESIGN

CS 19: From Scientific Inquiry to Global Applications—Development of a Two-course Sequence in Integrative Sciences

Providence III, Third Floor

Session facilitators will describe the development and implementation of a two-course sequence in integrative sciences. Designed to move beyond introductory offerings and increase scientific literacy, these courses focus on science as a way of knowing and offer opportunities to practice scientific reasoning that addresses global problems and results in a stronger understanding of the role of science in society. Facilitators will: (a) describe the process of creating a developmental model of science education; (b) share examples of integrative team-taught science courses, including assessment on the effectiveness of understanding scientific inquiry; (c) discuss the learning objectives of courses that focus on the application of science to global problems; and (d) recommend strategies for navigating institutional implementation. Participants will explore opportunities for innovative science curriculum development including how to encourage and reward creative and collaborative course design.

Amy Jessen-Marshall, Chair of Integrative Studies Program and Associate Professor of Life Sciences, **Lisa Marr**, Academic Teaching Staff for Life Sciences, and **Wendy Sherman-Heckler**, Associate Professor of Education—all of Otterbein College

DESIGN

CS 20: Enhancing Student Engagement in Collaborative Inquiry by Mapping Student Learning

Providence IV, Third Floor

The need to authenticate the research-teaching nexus in science education has been addressed at departmental, institutional, national and international levels. Yet, student perception of science education remains predominantly “content-centric,” focused on skills acquisition in prescribed activities with little flexibility or autonomy. While this may be partly attributable to courses where pedagogies have remained stagnant in comparison to the dynamics of research, are we indeed teaching students how to think like

scientists—i.e., is the pedagogy of the discipline aligned with the practice of the discipline? This seminar will address how to create successful collaborative learning communities from a crucial starting point: “thinking about thinking,” to enhance learning through reflection and analysis of the inquiry process. This metacognitive approach is applied to an online e-poster format to make the inquiry process visible to students. Participants will learn how the feasibility of such an approach can be demonstrated in the context of a large, introductory microbiology course of 280 students.

Kathy Takayama, Associate Director for Life and Physical Sciences, Sheridan Center for Teaching and Learning; and Adjunct Associate Professor of Molecular Biology, Cell Biology and Biochemistry—Brown University

DESIGN

CS 21: A New Science Core: Engaging Contemporary Scientific Debates

Newport/Washington, Third Floor

General education college science requirements are typically “menu-driven” (e.g., Chem 100) with courses that follow a “from the ground up” approach. Unfortunately, “non-science” students tend to see these courses as unrelated to their studies and their lives. Alternately, colleges may offer terminal non-major science courses that segregate non-science students from the more science-oriented students. Faculty members at Bard College-Simon’s Rock are in the process of developing and implementing a new general education science curriculum—one that presents science in the context of contemporary issues and concerns relevant to students throughout the college. In this session facilitators will: (a) introduce the basis for such a curriculum; (b) review possibilities and challenges of offering such courses to first- and second-year students; and (c) share recent experiences piloting a general education course on global warming. Participants will explore the possibilities of implementing such a curriculum at their institution.

Anne O’Dwyer, Associate Professor of Psychology, **Michael I. Bergman**, Associate Professor of Physics, and **Samuel Ruhmkorff**, Dean of Academic Affairs—all of Bard College at Simon’s Rock

STRUCTURES

CS 22: Preparing Future Faculty for the Science of Tomorrow

Bristol, Third Floor

Despite the ever-rising popularity of interdisciplinary undergraduate programs, little attention has been paid to explicitly preparing doctoral students to be effective interdisciplinary teachers and learners, skills they will need to be successful as faculty members. Session facilitators will report on two models for structuring such interdisciplinary preparation opportunities within traditional graduate education. Both of these models contribute to the development of doctoral students i.e., future faculty who engage readily with interdisciplinary issues, with professionals outside of their discipline, and pursue interdisciplinary investigations. This session will include: (a) a brief description of both models, including quantitatively and qualitatively derived outcomes and actual activities drawn from the two approaches; and (b) group discussions to develop concrete strategies for developing appropriate structures for meaningful interdisciplinary student experiences. This seminar will be of interest to representatives of all institutional types looking to shape scientific learning via interdisciplinary efforts.

Kathryne M. Drezek, University Academic Assessment Coordinator and **Barbara Bekken**, Director, Earth Sustainability Series and Assistant Professor of Geosciences—Virginia Polytechnic Institute and State University

STRUCTURES

CS 23: Facilitating Change in Science Instruction by Improving Communication between Administrators, Educational Researchers, and Faculty Developers

Kent, Third Floor

Although decades of research have identified effective instructional practices for improving science instruction in colleges and universities, these practices are not widely implemented. Scholars in several distinct fields are interested in promoting these practices and have engaged in research on pedagogical change. Results from analyzing over 250 journal articles related to instructional change suggest that approaches to change differ by fields in important ways and have implications for the success of the change effort. This session will provide an overview of the literature and implications for future practice.

Participants will engage in discussions about how to combine the strengths of these different approaches towards promoting change as well as how to work towards an interdisciplinary research and practice agenda that can lead to improved communication and practice related to promoting change in undergraduate science instruction.

Charles Henderson, Associate Professor of Physics and Science Education—Western Michigan University

6:00 P.M.

DINNER GROUPS MEET IN LOBBY

Sign up sheets for forming dinner groups will be available throughout the day at conference registration.

SATURDAY, NOVEMBER 8, 2008

7:45 – 9:00 A.M.

CONTINENTAL BREAKFAST AND ROUNDTABLE DISCUSSIONS

Providence Foyer, Third Floor

Please visit the continental breakfast buffet and then select the room that features the discussion of your choice.

VISION

ROUNDTABLE 6: Environmental Justice Education: Empowering Students to Become Environmental Citizens

Providence I, Third Floor

This discussion will begin with a brief presentation reviewing the history and important concepts of the environmental justice movement, particularly addressing the connection between environmental justice education and scientific literacy. Discussion will focus on examples of how educators can incorporate environmental justice issues into their courses.

Jeanne M. Peloso, Assistant Professor of Education—City University of New York, Herbert H. Lehman College

VISION

ROUNDTABLE 7: Liberal Education and America's Promise

Narrangansett Ballroom C, Ground Floor

Liberal Education and America's Promise (LEAP) is AAC&U's campus action and public advocacy initiative designed to engage campus colleagues and the larger public in meaningful conversations about what really matters in college. Facilitators will provide an overview of LEAP resources, principles, and practices guiding the campus action component of the campaign. Participants will discuss LEAP's goals and activities, with particular attention to efforts to ensure that *all* students—including those historically underserved by higher education—achieve essential liberal learning outcomes. They will also address how their institutions can use the campaign and the emerging national consensus around important liberal education outcomes to guide educational planning and practice.

Ronald Crutcher, President—Wheaton College; Co-chair, National Leadership Council for Liberal Education and America's Promise and **Carol Geary Schneider**, President—AAC&U

DESIGN

ROUNDTABLE 8: Bridging the Gap between Content and Issues of Educational Equity: Insights from a Secondary Mathematics Methods Course

Providence II, Third Floor

In this session, the presenter will discuss findings from a case study conducted in a secondary mathematics methods course aimed at deepening content knowledge and confronting issues of educational equity. The research study was particularly aimed at investigating pre-service secondary mathematics teachers' conceptions of equity, expectations for diverse students, and reactions to the mathematical tasks. Course assignments included mathematical tasks contextualized by social issues. These assignments, a focus survey, three interviews, and reflections served as the data sources for this semester long inquiry. Course

materials will be provided and discussion will share insights on the strengths of the assignments and implications for the improvement of teacher preparation and mathematics education.

Lecretia A. Buckley, Associate Professor of Mathematics Education, Jackson State University

STRUCTURES

ROUNDTABLE 9: Engaging Science Faculty through Learning Communities

Providence III, Third Floor

Faculty Learning Communities (FLCs) are an effective method for developing and sharing strategies for teaching science. FLCs allow faculty members and other stakeholders, including students, to work together or in teams to design, implement and evaluate projects that are related to their courses or to departmental goals. Other activities in learning communities may include seminars on learning and teaching, retreats and conferences. Following a brief presentation of two examples of the structure and implementation of faculty learning communities, participants will be engaged in an interactive format to explore the design of a similar model at their own institutions/departments. Examples of issues that will be explored include curricular structure, co-curricular opportunities to enhance learning and mentoring programs.

Joyce J. Fernandes, Associate Professor of Zoology and **Jerry L. Sarquis**, Professor of Chemistry and Biochemistry—Miami University

9:15 – 10:45 A.M.

CONCURRENT SESSIONS

VISION

CS 24: Undergraduate Research and the Two-Year College: Opportunities and Challenges

Providence I, Third Floor

As four-year universities increase their efforts to provide undergraduate research experiences for students in STEM disciplines, two-year colleges should take steps to offer similar opportunities to their students. The recruitment and retention of underrepresented groups in STEM, the fostering of a citizenry that understands the relevance of science in today's world, and the preparedness of students transferring to four-year universities will be enhanced when students at two-year colleges are able to participate in research. This interactive session will encourage participants from two-year colleges and four-year universities to share their insights and experiences. Participants will identify the challenges to productive collaboration among two-year institutions, and between two-year colleges and four-year universities. The opportunities afforded by such cooperative efforts will also be discussed and the viewpoints of faculty and administration included.

Craig Longtine, Professor of Biology, **Megan Jones**, Professor of Geology, and **Elaina Bleifield**, Dean of Math, Science, and Health Careers—all of North Hennepin Community College

VISION

CS 25: A Politicoscientific Approach to Civic Scientific Literacy and Public Engagement

Providence II, Third Floor

This session will employ a theoretical perspective to define a politicoscientific approach to civic scientific literacy and public engagement. Session facilitators will begin with the claim that it is important to take seriously the interdisciplinary work of science studies, work produced by colleagues in the social sciences and humanities. Session participants will have opportunity to discuss the theoretical framework put forward and will be provided an extensive annotated bibliography of the scholarly work that underpins this civic scientific literacy approach. Because politicoscientific controversies take place in a great many places (from laboratories to congressional hearings to journalistic portrayals), participants will consider a number of Web 2.0 tools as part of the apparatus needed for proper student investigation and engage in an exercise approximating such a line of inquiry.

Michael J. Flower, Professor of Interdisciplinary Science Studies and **Jeff Gerwing**, Associate Professor of University Studies—both of Portland State University

VISION

CS 26: The Importance of Faculty Development in Designing Effective Science Experiences for Non-science Majors

Narrangansett Ballroom C, Ground Floor

In this session, the facilitators will: (a) highlight emerging practices at Keene State College designed to provide non-science majors with a science experience that engages the student in the practice of science; (b) recommend strategies that provide students with a more engaging science experience; and (c) share a set of processes for developing a cohort of faculty teaching to a shared set of non-content based outcomes that contribute to students' understanding of the role of science in society. Participants will explore implications for creating a scientifically literate campus culture that validates the importance of different ways of thinking and learning and share their own experiences for developing science literacy outcomes.

Peter A. Nielsen, Faculty Co-Chair of the Integrative Studies Program and Professor of Geology, **Ann M. Rancourt**, Associate Vice President for Academic Affairs, and **Melinda D. Treadwell**, Dean of Professional and Graduate Studies—all of Keene State College

VISION

CS 27: The Teaching of Research: Research as Teaching

Providence III, Third Floor

For good reason, undergraduate student–faculty collaborative research opportunities are firmly embedded in the landscape of the new academy. Collaborative research speaks to some of our most fundamental educational objectives by providing a personalized education, exemplifying engaged pedagogy, and promoting students' intellectual independence and maturation. Challenges remain for faculty and institutions seeking to initiate and sustain successful undergraduate research programs. These challenges exist at the individual, departmental, and institutional levels. One of the most important lessons learned from the undergraduate research movement is that highly successful undergraduate research programs have found ways to use the curriculum to help prepare students for the independence required for a successful research experience. This session will explore some of these challenges and a variety of creative strategies employed by a wide range of institutions to overcome them.

Timothy Elgren, Professor of Chemistry—Hamilton College and **Rachel Narehood Austin**, Associate Professor of Chemistry—Bates College

DESIGN

CS 28: Facilitating Critical Inquiry Centered Introductory Science Laboratories

Providence IV, Third Floor

This workshop will provide new approaches to facilitating problem based learning in open-ended laboratories for introductory general education sciences. The facilitators will share a series of modules—general frameworks that can be populated with discipline specific content or with less traditional sources of observations and data collection—designed to help students learn to think like scientists. Facilitators will provide background information and share recent results of ongoing research on critical thinking centered laboratory instruction. Participants will test one module and evaluate each other's effort with a rubric specifically designed to assess the outcomes in terms of critical thinking skills. Participants will brainstorm strategies for helping laboratory instructors embrace the role of facilitators of inquiry based science.

Giuseppina Kysar Mattiotti, Assistant Professor of Earth Science and Science Education and Center for Teaching Excellence Faculty Fellow and **Rebecca Ericson**, Instructor of Physics and Astronomy—George Mason University

DESIGN

CS 29: Implementing and Assessing New Curricula

Bristol, Third Floor

Session facilitators will provide an overview of effective science initiatives applicable to an undergraduate liberal arts college campus. Participants will then consider how these initiatives might help advance their own ideas and work. The facilitators will then share their long, direct experiences with the successes and failures in the implementation and assessment of new curricula and best practices in the teaching and learning of science. They will help participants examine questions that arise as the session progresses.

The session will close with participants sharing their goals vis-à-vis more engaging science education and exploring the steps they might take to begin achieving those goals.

Susan M. Mooney, Associate Professor of Biology and Environmental Studies Program Director, **Maura G. Tyrrell**, Professor of Biology, and **Cheryl Schnitzer**, Assistant Professor of Chemistry—all of Stonehill College

DESIGN

CS 30: The Educated Citizen and Public Health

Newport/Washington, Third Floor

The Educated Citizen and Public Health initiative serves the broader higher education community, exploring the many ways to infuse the study and work of public health throughout liberal education. The initiative simultaneously aims to fulfill the Institute of Medicine's recommendation that "... all undergraduates should have access to education in public health." This session will present promising models for program development, one geared to larger institutions (often including an array of health professional programs), and one geared to smaller institutions (often including community health and nursing). The University of Massachusetts's new interdisciplinary major in Public Health Sciences provides one model. An integrative model emerging from nursing and community health presents a set of possibilities for smaller institutions. Facilitators will explore models and practices that may be adapted by any institution and address the challenges and promise of collaboration in an emerging field of undergraduate education.

Susan Albertine, Senior Director for LEAP State Initiatives—AAC&U; **Daniel S. Gerber**, Director, Public Health Sciences Program, School of Public Health and Health Sciences—University of Massachusetts at Amherst; **Shari Goldberg**, Assistant Professor, Department of Nursing—Colby-Sawyer College; and **Denise Koo**, Director, Career Development Division—Centers for Disease Control and Prevention

ASSESSMENT

CS 31: Identifying and Assessing Higher-Level Thinking in Innovative Science Curricula

Kent, Third Floor

As indicated by several studies and reports, the community of science scholars agrees that undergraduate science education is best served by inquiry-based approaches. Identifying the complex learning processes that occur in discovery-based laboratory courses is a challenging task using traditional assessment formats. Isolating the development of higher level thinking skills is even more difficult. Though universities are responsible for conducting rigorous assessment, resource challenges often prohibit successful collaboration. Session facilitators will discuss collaborative efforts with faculty, and insights and challenges in designing assessment strategies that specifically identify positive changes in knowledge, practical and cognitive skill development, and engagement in undergraduate science education. The implementation of a new discovery-based learning lab in Microbiology, Immunology, and Molecular Genetics will be examined. Participants will be asked to share successful practices from their own experiences and work in groups to problem solve and develop innovative assessment strategies.

Marc Levis-Fitzgerald, Director of Office of Undergraduate Evaluation and Research and **Erin Sanders-Lorenz**, Lecturer and Academic Coordinator in the Department of Microbiology, Immunology, and Molecular Genetics—University of California-Los Angeles

11:00 A.M. – 12:00 P.M.

PLENARY: Raising the Quality and Level of Science Learning for All Students

Narragansett Ballroom AB, Ground Floor

Drs. Kelley and Slakey will summarize the compelling insights, models, and practices presented at the conference and share their own strategies for what participants can do to integrate these new ideas into their work upon return to campus.

Darcy B. Kelley, Co-director, Doctoral Subcommittee in Neurobiology and Behavior and Professor, Biological Sciences—Columbia University and **Linda L. Slakey**, Division Director, Division of Undergraduate Education—National Science Foundation

