The Association of American Colleges and Universities (AAC&U) and Project Kaleidoscope (PKAL) welcome you to the Network for Academic Renewal conference Transforming STEM Higher Education. Over the next few days, we invite you to join with colleagues to examine strategies and practices for increasing the number of STEM baccalaureate degree earners who master complex STEM content and competencies, and enhancing STEM literacy for all students. Specifically, the conference will address several dimensions of STEM higher education reform: research, development and assessment of undergraduate STEM teaching and learning; inclusive excellence; recruiting, supporting, and rewarding STEM faculty; and advancing institutional change strategies for STEM reform.

Overall, the potential for discovery and innovation to successfully address society’s most significant challenges is enhanced by the synergy that exists between rapidly advancing technologies, deepening scientific knowledge, and liberal education. In order for the U.S. to fully realize this potential and remain globally competitive, 20% more STEM baccalaureates per year are needed (President’s Council of Advisors on Science and Technology, 2012; National Science Foundation, 2013). As noted in the 2013 AAC&U Survey It Takes More Than a Major, STEM graduates will also need to possess capacities to think critically, communicate effectively, and solve complex problems as part of a broad portfolio of learning that is required for graduate/professional school persistence, successful employment, and societal contribution.

Because this achievement is not possible without the commitment of STEM faculty, we thank you for exploring with us the inextricable links among STEM higher education, inclusive excellence, a competitive workforce, and a scientifically-literate citizenry.

Susan Albertine  
Vice President,  
Diversity, Equity, Student Success  

Kelly Mack  
Vice President,  
Undergraduate STEM Education and Executive Director, PKAL  

Karen Kalla  
Director,  
Network for Academic Renewal
AAC&U extends a special note of appreciation to the individuals and campuses listed below for their many contributions to the conference program.

**Agnes Scott College**
Lília Harvey  
*Professor of Chemistry*

Molly Smith  
*Director, Science Center for Women*

**Albany State University**
Joyce Johnson  
*Dean, College of Sciences and Health Professions*

Rhonda Porter  
*Associate Professor, Mathematics*

**Clemson University**
Barbara Speziale  
*Associate Dean, Undergraduate Studies*

**Dalton State College**
Marina Smitherman  
*Associate Professor of Biology*

**Duke University**
Donna Hall  
*Director, Academic Resource Center*

Alyssa Perz-Edwards  
*Assistant Dean, Trinity College and Lecturer, Department of Biology*

**Elon University**
Alison Morrison-Shetlar  
*Dean of the College of Arts and Sciences, Professor of Biology*

**Emory University**
Patricia Marsteller  
*Director, Center for Science Education*

J. Lynn Zimmerman  
*Senior Vice Provost for Undergraduate and Continuing Education*

**Florida A&M University**
Mark Howse  
*Mathematics and Mathematics Education Professor*

**Florida International University**
Laird Kramer  
*Director of STEM Institute and Professor of Physics*

**Georgia College and State University**
Rosalie Richards  
*Director of Science Education Center*

**Georgia Gwinnett College**
Judy Awong-Taylor  
*Associate Dean and Professor of Biology*

**Georgia Institute of Technology**
Donna Llewellyn  
*Director of the Center for the Enhancement of Teaching and Learning*

**Georgia Perimeter College**
Pamela Gore  
*Professor of Geology*

Pamela Leggett-Robinson  
*Department Chair – Science*

**Georgia State University**
Sarah Cook  
*Associate Dean of the Honors College*

**Guilford College**
Melanie Lee-Brown  
*Associate Professor of Biology and Director, Undergraduate Research*

**High Point University**
Robert Harger  
*Chair of Mathematics*

**Jacksonville University**
Lee Ann Clements  
*Professor and Chair, Division of Science and Mathematics*
FEATURED SESSIONS

Liberal Education and America’s Promise

Throughout the conference program, sessions noted with the Liberal Education and America’s Promise (LEAP) designation highlight the innovative work of colleges and universities that are members of AAC&U’s LEAP Campus Action Network. The LEAP Campus Action Network brings together campuses and organizations committed to liberal education; helps them to improve their efforts to ensure that all students achieve essential liberal education outcomes; and shines a spotlight on educational practices that work. Participants in these sessions will learn how members of the network are using the LEAP framework and resources to advance their educational improvement efforts. For information about LEAP visit www.aacu.org/LEAP.

Join the conversation on Twitter at hashtag #stem14
AAC&U thanks the sponsors below for their generous contributions. Conference sponsors are colleges, universities, associations, nonprofit organizations, and businesses that participate in the program and/or provide financial or in-kind support. Through their contributions, sponsors enhance the conference experience for everyone.

**CONTRIBUTING SPONSOR**

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**FRIENDS**

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**FUTURE NETWORK FOR ACADEMIC RENEWAL CONFERENCES**

February 19-21, 2015 ♦ Kansas City, Missouri
FROM MISSION TO ACTION TO EVIDENCE: Empowering and Inclusive General Education Programs

March 26-28, 2015 ♦ San Diego, California
DIVERSITY, LEARNING, AND STUDENT SUCCESS: Assessing and Advancing Inclusive Excellence

October 8-10, 2015 ♦ Fort Lauderdale, Florida
GLOBAL LEARNING IN COLLEGE

November 12-14, 2015 ♦ Seattle, Washington
TRANSFORMING STEM EDUCATION

For information about Network for Academic Renewal conferences, please see www.aacu.org/events/network-for-academic-renewal or contact Karen Kalla or Siah Annand at 202.387.3760.
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<td>Pre-conference Workshops <em>(separate registration and fee required)</em></td>
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<td>Keynote Address CREATING A POWERFUL ECO-SYSTEM OF STEM SUCCESS Jamie Maatkare Bracey, Temple University</td>
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<td><strong>Friday, November 7, 2014</strong></td>
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<td>Plenary ASSESSING STEM EDUCATION: Advancing Student and Faculty Success Anthony L. DePass, Long Island University Brooklyn Campus</td>
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<td>Plenary CELEBRATING 25 YEARS OF PKAL: Re-Focusing the Kaleidoscope Elizabeth McCormack, Bryn Mawr College; Kelly Mack, AAC&amp;U</td>
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<td>Closing Plenary TRANSFORMING STEM EDUCATION: Evidence Based Research on STEM Teaching and Learning Susan Rundell Singer, National Science Foundation</td>
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PRELIMINARY PROGRAM OF EVENTS

THURSDAY, NOVEMBER 6, 2014

10:00 am – 7:00 pm CONFERENCE REGISTRATION AND MEMBERSHIP INFORMATION
Second Floor Please stop by the conference registration desk for your program, badge, and membership information.

2:00 pm – 5:00 pm PRE-CONFERENCE WORKSHOPS
Separate registration and fee required. Seating is limited.
$100 members; $150 non-members

Room 202 Workshop 1: Applying Insights from the Social Sciences to Help Guide and Support Students in STEM
Efforts to increase persistence of undergraduates and graduate students in STEM typically emphasize enhanced academic success, experiences doing authentic research, and increased knowledge of STEM careers. Yet, faculty and program leaders often scratch their heads when, despite their best efforts, students don’t complete STEM majors or seek STEM careers. Our current research and experimental interventions are drawing on well-established social science theories and models to explain STEM career choices and intercede to enhance STEM persistence, particularly among underrepresented minorities and women. This workshop will introduce these social sciences theories and provide the opportunity for participants to apply them to their own teaching and leadership roles. The workshop will also share research findings from a large-scale longitudinal qualitative study of more than 250 life scientists in training, and introduce a novel coaching model from the Academy for Future Science Faculty.
Richard McGee, Associate Dean for Faculty Recruitment and Professional Development—Northwestern University

Room 214 Workshop 2: Digital and Blended Learning: Evolving Practices in STEM Education
With technology breaking traditional barriers to research and knowledge formation, what are the implications for STEM teaching and learning in particular? How can digital and blended learning be designed in ways that enhance the quality of learning and lead to advances in discovery, research, and development in college and beyond? Dr. Bier will examine the intersections of teaching, learning, and technology and share the latest evidence-based approaches to digital and blended learning designs.
Norman Bier, Director, Open Learning Initiative and Core Collaborations—Carnegie Mellon University

Room 205 Workshop 3: Collaborative E-Portfolios to Foster Metacognitive Inquiry Thinking
How can metacognitive approaches foster collaborative learning? Workshop participants, applying “folio thinking” toward the development of ongoing scientific inquiry, will explore a case study using a group project that maps student learning through reflective inquiry. The process of ‘thinking about thinking’ is scaffolded through e-portfolios. The approach validates uncertainty as a component of the iterative model of scientific inquiry and is unique in its collaborative application of the e-portfolio. Students shift from an outcomes-focused approach to an iterative, reflective approach that cultivates the habits of mind for scholarship. Participants will develop a framework to apply collaborative folio thinking to student projects in large introductory courses as well as upper level or interdisciplinary courses.
Kathy Takayama, Executive Director of the Sheridan Center for Teaching and Learning and Adjunct Professor in the Department of Molecular Biology, Cell Biology and Biochemistry—Brown University

Room 203 Workshop 4: A Scientific Framework for Leading Strategic STEM Reform
The Keck/PKAL Scientific Framework for Strategic Change takes a scientific approach to facilitate change and offers leadership, planning, assessment, and practical tools for developing an evidence-based strategic plan. It provides tools for assessing the capacity for change in terms of faculty expertise, resources, and campus infrastructure. Project leaders
will present the framework which participants will then apply to their campus. This workshop will be of particular relevance to PKAL network members and those who have attended the PKAL Summer Leadership Institute.

Susan Elrod, Interim Provost and Vice President for Academic Affairs—California State University, Chico; and Kathleen Weaver, Director of the La Verne Experience and Associate Professor of Biology—University of La Verne

Room 206

**Workshop 5: Quantitative Reasoning and Data: From Analysis to Visualization**
Big data has caught the imagination of the public and the pocketbooks of corporations. Google’s flu trends predict flu outbreaks faster than the CDC—until they don’t. Yes, big data offers new possibilities, but data is still not information until interpreted by humans. Students need to be critical users of data—fluent in both data analysis and visualization tools. Participants will discuss how to create a curriculum to address these needs; learn how to effectively interpret and use data; and gain concrete ideas for nurturing students who are critical consumers of and practitioners with data.

Eric Gaze, Director, Quantitative Reasoning Program, Bowdoin College, and President, National Numeracy Network; and Heather Van Volkinburg, Associate Director, Learning Initiatives and Data Services—Barnard College, and Vice President—National Numeracy Network

Room 207

**Workshop 6: Using the Degree Qualifications Profile (DQP) to Help Frame STEM Learning**
Quality Collaboratives: Assessing and Reporting DQP Competencies in the Context of Transfer is a three-year AAC&U project engaging campuses on issues of learning outcomes, curricular change, high-impact practices, and assessment. Campus project representatives will share their latest findings on mapping and assessing STEM learning in the undergraduate curriculum. Participants will consider the implications for STEM learning frameworks, policies, and practices.

Zachary G. Goodell, Co-Director, Center for Teaching Excellence, and Scott F. Oates, Director, Assessment and Institutional Effectiveness—both of Virginia Commonwealth University; and Susan Albertine, Vice President, Office of Diversity, Equity, and Student Success—AAC&U

7:00 pm – 8:00 pm **KEYNOTE ADDRESS**

Grand Ballroom

Welcome: Kelly Mack, Vice President for Undergraduate STEM Education and PKAL Executive Director—AAC&U

**Creating a Powerful Eco-system of STEM Success**
The federal government invests more than $3 billion per year on hundreds of STEM programs, yet there has been little measurable change in STEM student retention, graduation, or workforce readiness, particularly for underrepresented groups. Is it possible that the larger issue is not engagement, but rather inspiring motivation to persist? Answering this question requires that we rethink conventional wisdom about pedagogy, and incorporate the social reality of how students experience learning. Dr. Bracey will present outcomes from Temple University’s STE/A/M 2.0—an ecosystem approach to STEM teaching and learning that successfully integrates social, institutional, and domain cultures into rigorous learning strategies that promote STEM student retention. She will examine culture and cognition research, and explore evidence related to an integration of culture and teaching approaches that help address barriers to STEM learning.

Jamie Maatkare Bracey, Director of STEM Education, Outreach and Research, College of Engineering—Temple University

8:00 pm – 9:00 pm **RECEPTION**

Salon West

Beverages and light hors d’oeuvres will be served.
FRIDAY, NOVEMBER 7, 2014

8:00 am – 8:30 am  **BREAKFAST**
Breakfast will be available on the second floor.

8:30 am – 9:30 am  **PLENARY**
Grand Ballroom

Assessing STEM Education: Advancing Student and Faculty Success
As STEM educators move towards more integrative and active modes of teaching and learning, how can they ensure that the experiences they are designing are leading to the intended student learning outcomes? How are evaluation and assessment methods being designed in ways that connect quantitative and qualitative data to help refine learning environments so that all students benefit from high-quality, high-impact practices? Dr. DePass will use the case study approach to examine how assessment might be designed, data collected, and findings used to both advance student success and contribute to faculty scholarship, promotion, and tenure.

*Anthony L. DePass, Professor of Biology and Director of MBRS (NIH), ADVANCE (NSF) and Understanding Interventions (NIH) Programs—Long Island University Brooklyn*

10:00 am – 11:30 pm  **CONCURRENT SESSIONS**

Room 202

**Research, Development, and Assessment**

**CS 1: Teaching Multidisciplinary STEM Courses for Liberal Education**
Participants will consider how to design a multidisciplinary STEM course to address decision making and liberal learning outcomes.

Presenters will share a multidisciplinary approach to developing and teaching undergraduate STEM courses with liberal and civic learning outcomes. They will discuss how they created a STEM course focused on educating non-science majors about the process of science and how decisions in daily life can be made using scientific methodology and concepts. Discussions on development of STEM-guided courses which follow development of scientific methodology for societal, ethical, and practical decision making will be facilitated, including the Transfer-Meaning-Acquisition cycle and the Understanding by Design process. This session has been designed for faculty or instructors who are in the process of developing or realigning STEM courses for non-science majors.

*Mohammad W. Ahmed, Professor of Physics, Brennetta Simpson, Professor of Music, and Eric T. Saliim, Instructor of Biology—all of North Carolina Central University*

Room 210/211

**Inclusive Excellence in STEM**

**CS 2: Creating a Layered Assessment Model to Engage and Retain Diverse Learners in Gateway STEM Courses**
Participants will gain greater understanding of the complex nature of academic motivation and the non-cognitive variables related to academic success.

To truly succeed in our mission to teach diverse learners, we need a multi-disciplinary assessment approach that can give robust understandings of the diverse characteristics students bring to college—and we need to use these understandings to integrate and coordinate institutional resources in a holistic response to their needs. This workshop will introduce participants to a novel assessment of practice methodology used in Duke University’s Science Advancement through Group Engagement (SAGE) program. SAGE is an institution-wide science support program housed in Duke University’s undergraduate learning center that has, in five years, nearly doubled the numbers of students persisting in a gateway science course sequence compared to a matched control group.

*Donna M. Hall, Administrative Director of Academic Resource Center, Instructor Program in Education, Amanda J. Curtin-Soydan, Assistant Director of Academic Resource Center, Research Associate Department of Biology, and John H. Blackshear, Clinical Director of Academic Resource Center, Instructor Department of Psychology—all of Duke University*
Room 203

**CS 3: Nurturing STEM Identity Development in Community College Students**

Participants will learn about a STEM identity development model and ideas for programming that will support it.

The ways in which students experience and interact with their campus influence their persistence. Their relationships with STEM faculty and students are critical to their STEM identity development and to their success and persistence. This session will share best practices and results of two programs designed to enhance STEM education, pedagogy, and persistence, primarily through the development of relationships—among students, between students and faculty, among faculty, and between the college and the community. These NSF-funded programs will be examined through the lens of developing students' STEM identity. Using these programs as models, participants will work in groups to brainstorm campus and department programs that support STEM identity development in students, particularly targeting underrepresented groups and commuter students.

*Rachel Wade, Physics Faculty—Edmonds Community College*

Room 204/205

**CS 4: Working with Colleagues to Advance Change in STEM Education**

Participants will understand how Experiential Learning Exercises (ELEs) may be used to develop leadership skills and build teams that can advance change in STEM education.

Instructors have the knowledge, materials, and strategies for revising their STEM curricula and enhancing teaching by utilizing high-impact practices. Many think they lack the leadership and teambuilding skills to bring their colleagues and department on board to make it happen. This session's presenters have experience helping early and mid-career faculty enhance their leadership and teambuilding skills and develop a personal agenda for leadership in STEM education. They will demonstrate how to use ELEs to build teams, teach leadership concepts, and explore sensitive or controversial issues in a low-risk, low-stakes environment. The ELEs utilize Kolb's Experiential Learning Cycle and parallel hands-on, experiential, personally meaningful, and collaborative learning environments which take place in a community of learners.

*Judith Dilts, Associate Dean, College of Science and Mathematics, and Sylvia Nadler, Faculty Affiliate, College of Science and Mathematics—both of James Madison University; and Elizabeth McCormack, Associate Provost, Professor and Chair of Physics—Bryn Mawr College*

Salon A

**CS 5: Implementing Widespread, Community-Driven, and Evidence-Based Pedagogies**

Participants will learn how collaborative course transformation and intellectual community can be used to catalyze broader adoption of evidence-based teaching practices in STEM.

This session describes a project of the Bay View Alliance (BVA), a network of nine U.S. and Canadian research universities carrying out applied research on strategies to promote widespread adoption of evidence-based teaching methods. Four universities, led by the University of Kansas, are testing a model that uses instructional partnerships, department planning, and faculty learning communities to catalyze and support STEM course transformation and changes in teaching culture. Postdoctoral teaching fellows or faculty leaders collaborate with department faculty to guide and support implementation of evidence-based practices, and communities of scholars are formed around course transformation, with the goal of promoting STEM reform and institutional change. Session facilitators will share preliminary findings and invite participants to consider how to bring additional pedagogical expertise into departments in their own institutional contexts and identify opportunities to build or expand intellectual communities around evidence-based pedagogy.

*Andrea Follmer Greenhoot, Professor of Psychology and Director, Center for Teaching Excellence, and Kelsey S. Bitting, Postdoctoral Teaching Fellow and Visiting Assistant Professor, Department of Geology—both of University of Kansas; Anna Correen Hiatt, Assistant Professor, Department of Biological Sciences—East Tennessee State University; and Pat Hutchings, Senior Scholar—Bay View Alliance*
CS 6: HEDsUp – STEM Talent Expansion Program (STEP)
Moderator: Richard McGee, Associate Dean for Faculty Recruitment and Professional Development—Northwestern University

From STEP to STEM: Improving Undergraduate STEM Education
The STEP Central project was developed to support a "community of practice" among NSF STEM Talent Expansion Program (STEP) Grantees. It supports community activities through a platform for sharing ideas and building on each other's successes, including an engaging website; online working groups; a database of resources, newsletters, email notifications; and webinars. As a successful and easily scalable tool, STEP Central is planning to join forces with AAC&U and ASEE to broaden its audience and better serve the educational community, including Project Kaleidoscope's 7000-strong network of educators. The presenters' goal is for STEP Central to become a transformative mechanism that empowers STEM faculty to graduate more students in STEM fields and to improve the value and success of a broad array of STEM reform initiatives nationwide. Presenters will describe strategies and challenges in building a virtual community and our plans for expansion.
Daniel Udovic, Senior Scholar, Office of STEM Undergraduate Education, and Tania Siemens, Research Coordinator, Office of STEM Undergraduate Education—both of AAC&U

Evaluating Community across Disciplinary and Institutional Boundaries
STEP Central—the community of practice created around the NSF STEM Talent Expansion Program (STEP)—aims to build and support networking among those working to increase the number of college graduates in STEM in the United States. It is a community that is open to anyone interested in advancing the group's mission. STEP Central is organized around seventeen working groups that focus on specific critical issues associated with advancing STEM educational reform on campuses, including the implementation of high-impact practices. This session presents an innovative effort to support and analyze this STEM community through the results of an extensive needs assessment and environmental scan of the STEP community. Through the data, presenters will identify successful approaches to catalyze campus change, and elicit attendee suggestions for additional community resources.
David Blair, Director of Institutional Assessment—St. Edward's University; Kathyne Drezek McConnell, Assistant Director, Assessment and Evaluation—Virginia Tech; and Tania Siemens, Research Coordinator, Office of STEM Undergraduate Education—AAC&U

CS 7: HEDS Up: Frameworks for Change
Moderator: Alan White, Associate Dean for Undergraduate STEM Education, College of Arts and Sciences and Professor of Biological Sciences—University of South Carolina

A Scientific Framework for Leading Strategic Undergraduate STEM Reform
Countless national reports have been calling for the transformation of undergraduate STEM education to improve student learning and success; however, by many measures these recommendations have not been widely implemented. In order to help campus leaders create more widespread implementation of effective reforms, the Keck/PKAL Scientific Framework for Strategic Change was developed in a project funded by the WM Keck Foundation. The framework takes a scientific approach to facilitate change and offers leadership, planning, assessment, and practical tools for developing a strategic plan for change, including evidence-based practices. The framework also provides readiness tools for assessing the capacity for change in terms of faculty expertise, resources, and campus infrastructure. Participants will learn how this framework was informed by STEM and higher education change literature and was developed by eleven California colleges and universities who participated in the project.
Susan Elrod, Interim Provost and Vice President for Academic Affairs—California State University, Chico; Kathleen Weaver, Director of the La Verne Experience and Associate Professor of Biology—University of La Verne; and Chris Pagliarulo, Director of Instruction and Assessment, iAMSTEM Hub—University of California-Davis
Changing the Teaching Culture by Campus-Wide Self-Assessment of STEM Faculty

Catalyzing a campus-wide shift in the practice of student-centered teaching can be accomplished by understanding institutional barriers that keep STEM departments entrenched in outdated pedagogy and curricular models and then by empowering instructors with knowledge about and resources in support of effective teaching. Presenters will describe the process by which they engaged STEM faculty and departments in a self-assessment of current teaching practices that involved documentation of barriers to educational innovation as well as identification of best practices and course models. The session will highlight ways in which a Center for Teaching and Learning focused on STEM instruction can advance cultural change through the compilation of teaching and assessment resources and by supporting the professional development of faculty.

Erin R. Sanders, Director, Center for Education Innovation in Life Sciences, Blaire Van Valkenburgh, Associate Dean of Life Sciences for Academic Programs, and M. Kevin Eagan, Managing Director, Higher Education Research Institute—all of University of California-Los Angeles

Driving Institutional Change: Faculty Perceptions

As part of an NSF WIDER project, all science, engineering, and math faculty on Boise State University’s campus engaged in a facilitated data-gathering process to learn how they perceive a proposed change to student-centered, evidence-based teaching practices. Faculty were asked to identify factors in five categories (relative advantage, simplicity, compatibility, adaptability, and social impact) that serve as either driving or restraining forces for change. The session facilitator will discuss results from the process, and participants will consider how these results can drive institutional change on their campuses.

Amy Moll, Dean, College of Engineering—Boise State University

CS 8: Research-Based Instructional Strategies: The Fidelity Factor

Participants will be able to articulate critical components associated with Research-Based Instructional Strategies (RBIS), and evaluate the potential of Fidelity of Implementation Theory for driving transformative change.

The fundamental elements necessary for enhancing undergraduate STEM education are well established and yet implementation of innovative approaches and high-impact practices frequently lags behind. Improvement in undergraduate STEM education through adoption of Research-Based Instructional Strategies, for instance, depends critically on high-quality measures of faculty instructional practice that are rarely available. Based on their experience with an NSF-STEP program (SetGO) characterized by excellent student outcomes and high faculty buy-in, the facilitators developed and deployed a survey to identify STEM faculty use of RBIS. We will describe quantitative and qualitative analyses of survey results with an emphasis on the fidelity of RBIS implementation, the association between teaching and assessment strategies, and the challenges of implementing highly effective STEM practices given the demands on faculty and institutional structures.

Moira J. van Staaden, Professor of Biology, Director of Science Engineering Technology Gateway Ohio—Bowling Green State University; and Dianne C. Raubenheimer, Director of Research, Planning and Assessment—Meredith College

Room 212

CS 9: AAC&U: A Newcomers’ Welcome and Introduction to LEAP—Liberal Education and America’s Promise

Participants will learn the who, what, why, and where of AAC&U and the LEAP initiative, and how the LEAP vision for learning serves as a useful overarching framework for undergraduate learning.

As the leading national association concerned with the quality, vitality, and public standing of undergraduate liberal education, AAC&U works closely with its member institutions to extend the advantages of a liberal education to all students, regardless of academic specialization or intended career. In this session, participants will learn how AAC&U’s four broad goals for student learning (1) LEAP: Liberal Education as a Global Necessity; (2) Quality: 21st-Century Markers for the Quality of U.S. Degrees; (3) Equity: Innovation,
Friday

Inclusive Excellence, and Student Success; and (4) Social Responsibility: Integrative Liberal Learning and the Global Commons and its LEAP initiative provide both a context and a framework for the undergraduate educational experience.

Susan Albertine, Vice President, Office of Diversity, Equity, and Student Success—AAC&U

11:30 am – 1:30 pm  LUNCH ON YOUR OWN

1:30 pm – 2:45 pm  CONCURRENT SESSIONS

Room 210/211  Research, Development, and Assessment

CS 10: Teaching Methods Related to Student Progress in Introductory STEM Courses
Participants will review and consider findings from student ratings of instruction in STEM courses and their implications.

This session presents findings from analyses of IDEA Student Ratings of Instruction data collected from a national sample of more than 170,000 first-year and sophomore STEM classes from all types of institutions. Presenters will engage participants in a lively discussion of learning outcomes and teaching methods emphasized in lower-level STEM courses. Results of Bayesian Model Averaging will show which teaching methods are most highly associated with student progress on learning objectives emphasized by instructors. Participant outcomes will be to review and consider (1) learning outcomes that faculty members emphasize in introductory STEM courses; (2) differences between introductory courses enrolling primarily STEM majors and non-majors; (3) teaching methods that might be employed most frequently to enhance student learning; and (4) student perceptions of STEM courses and student characteristics that could have an influence on student learning.

Steve Benton, Senior Research Officer—The IDEA Center

Salon A  Research, Development, and Assessment

CS 11: The Joys of Discovery: Incorporating Research in Undergraduate Lab Classes
Participants will examine impediments and solutions to incorporating research in lab classes.

Numerous studies point to the efficacy of research experiences in increasing learning and retention in STEM majors. However, most undergraduate lab classes rely on conventional cookbook modules, which do not replicate authentic research. Session facilitators will provide examples of how they incorporated authentic research and primary literature reading into small and large enrollment lab classes. They will share strategies for converting existing lab modules into authentic research experiences and ways in which they collaborated with other faculty to design and implement scientific research projects in their lab classes. In addition, the presenters will model their primary literature module, which has produced longitudinal gains in students’ abilities to analyze a scientific paper. Participants will examine how these ideas can be adapted across a broad range of institutions and subjects so that educators increase student research in undergraduate labs.

Pavan Kadandale, Lecturer, and Brian Sato, Lecturer Potential Security of Employment—both of University of California-Irvine

Room 206/207  Research as Teaching: Implementing Undergraduate Research at Community Colleges

CS 12: HEDsUp – Interventions that Work
Moderator: Lee Ann Clements, Professor and Chair, Division of Science and Mathematics—Jacksonville University

This session will include two presentations followed by time for questions and discussion.

Research as Teaching: Implementing Undergraduate Research at Community Colleges
The Community College Undergraduate Research Initiative (CCURI) is a NSF grant focused on the development and implementation of undergraduate research at community colleges across the nation. The CCURI model utilizes case studies to engage students on research projects during their first year and provides opportunities to further explore the projects during subsequent semesters. The model promotes deep learning and motivates students to continue their education and career in STEM fields. During year two of the CCURI grant,
CCURI partners provided undergraduate research experiences to over 2,400 students, twenty-five percent from racial and ethnic minority groups. Participants will learn how the success of CCURI partners has provided data on overcoming unique challenges faced in implementing undergraduate research at two-year colleges.

**Kellie Aitchison, Assistant Professor of Biology—Finger Lakes Community College**

**Supporting Underprepared Students to Learn and Future Teachers to Teach Developmental Mathematics**

Session facilitators will report on an intervention that uses research-based pedagogies and materials to teach developmental mathematics with extensive support for instructors. At Michigan State, students who typically enroll in the developmental mathematics course are disproportionately from lower income and/or minority populations for whom remedial courses have not been successful. The future teachers are mathematics majors in a teacher certification program who will be teaching high school courses that prepare students for college. Facilitators will describe the research-based materials and pedagogies designed for the course, explain how the course supports future teachers’ learning to teach, and discuss outcomes from the project’s first two years.

**Raven McCrory, Associate Professor of Teacher Education and Associate Director of the CREATE for STEM Institute, and Pavel Sikorskii, Associate Director of Mathematics Undergraduate Studies—both of Michigan State University**

**Room 202**

**Inclusive Excellence in STEM**

**LEAP Featured Session**

**CS 14: Factors of Influence for Occupational Attainment of African-American Women in Information Technology**

Participants will learn how to structure collegiate learning environments and experiences to support and encourage the engagement of African-American females in STEM fields.

Recent research confirms a dearth of women and minorities in STEM occupations. This lack of participation is related to attrition, especially the diversion of STEM college graduates from STEM related occupations. Many research efforts have attempted to better understand women and minority participation in STEM, or the lack thereof, from a collective female or minority perspective. This universalizes women’s experiences without considering ethnicity or generalizes minorities’ experiences without considering gender. In an effort to understand how to supply the demand of future STEM occupations with a growing African-American female population, the research study described in this session employed in-depth interviews and surveys with fifteen African-American female Information Technology practitioners to explore factors of influence for occupational attainment.

**Keiona L. Middleton, Director of Institutional Effectiveness and Instructor—Shorter College**
CS 15: Assessing and Improving Persistence of Underrepresented Minorities in Science

Inclusive Excellence in STEM

Participants will receive practical information and strategies for using various assessment tools to effectively evaluate academic support programs.

Low persistence rates of women and underrepresented minority students in STEM majors remain a significant challenge for institutions of higher education. Session facilitators will present findings from a matched comparison group study of academic performance and persistence of undergraduate science majors in a two-year academic support program for underrepresented students. Program participants, on average, earned higher grades in key math and chemistry courses, had higher GPAs, and took more science courses than the comparison group. The study design will also be discussed, including the use of existing data sources and partnerships across campus that facilitated effective program assessment. Finally, the facilitators will consider innovative approaches to promote institutional efforts that support STEM students from underrepresented backgrounds. Participants will use this case to consider the use of formative and summative assessment approaches and discuss strategies for developing similar projects.

Brit Toven-Lindsey, Research Analyst, Center for Educational Assessment, and Marc Levis-Fitzgerald, Director of Survey Research and Curricular Assessment—both of the University of California Los Angeles

CS 16: Liberal Education in the New Engineering Curriculum

Institutional Change Strategies

Participants will discuss how to weave liberal education outcomes throughout engineering courses to better prepare students to responsibly address the social, environmental, economic, and political challenges of an increasingly complex global society.

Numerous professional organizations in the U.S. have recently re-examined curriculum requirements for students in engineering. Reports listing recommendations for the education of future engineers share an emphasis on specific elements of liberal education that are now regarded as essential. According to these reports, the new engineering curriculum must now address—in addition to the scientific and technical courses—a broad range of concerns, including the environmental, political, social, international, legal, ethical, and artistic ramifications of engineering. Besides communications and leadership skills, future engineers must also be well versed in the humanities and social sciences. Participants will examine these liberal education components and their implications for engineering studies.

Pangratios Papacosta, Professor of Physics—Columbia College Chicago

CS 17: Low Stakes Interactions Catalyze High Impact STEM Education Programs

Institutional Change Strategies

Participants will gain new ideas about how to implement frequent, low stakes interactions on the topic of STEM education and how to use momentum as the fuel for STEM education reform with high faculty support.

The mere thought of the numerous common roadblocks to effective and sustainable STEM education reform is enough to make many researchers and educators cringe. Institutional inertia compounds from limited resources, drastically different departmental cultures, and, most notably, low faculty buy-in. A STEM education transformation program at Brown University has overcome many of these roadblocks and now boasts collaboration between chairs, research faculty, lecturers, postdoctoral researchers, and graduate students in five separate departments to improve STEM pedagogy and instruction across the institution. Participants will explore how, through low stakes interactions, the presenters gained the momentum and faculty buy-in necessary to receive a multi-department AAU STEM Initiative grant and how others can use low stakes interactions as an effective method for increasing faculty buy-in and creating an environment where change is encouraged.

Kathryn Trenshaw, Postdoctoral Research Associate, and Kathy Takayama, Executive Director of Sheridan Center for Teaching and Learning—both of Brown University
Salon B
Institutional Change Strategies

CS 18: Enhancing STEM’s Impact through Community-Engaged Scholarship and Research
Participants will gain a better understanding of community-engaged scholarship and leave with a toolbox of ideas for implementing projects on their home campuses.

Evidence suggests that well-designed community-engaged scholarly projects assist with the retention and recruitment of underrepresented groups in STEM at all levels. From town-gown relations and simple outreach to service-learning and problem-based research, the way the work of the university intertwines with the local and global communities has evolved. Presenters will discuss models of community-engaged scholarship and research for invigorating the curriculum with high-impact learning practices while encouraging the diverse pursuits of STEM faculty and students. Using the university as an incubator of ideas, they will discuss the trials and promises of this type of work.

Bridget G. Trogden, Associate Professor of Chemistry and Director of QEP, and Gary Wall, Graduate Research Assistant—both of Mercer University; and Barbara Coble, Program Manager, Center for Community Partnerships—Emory University

2:45 – 3:00 pm
Coffee will be available on the second floor.

3:00 – 4:30 pm
CONCURRENT SESSIONS

Room 206/207
Research, Development, and Assessment

CS 19: Facilitating Enhanced Undergraduate Capstone Writing Experiences in STEM
Participants will learn about writing-to-learn (WTL) theory and practice, specifically within STEM settings.

Although writing is vital in all academic areas, STEM faculty are not generally trained to mentor student writers in ways that promote the development of critical thinking and communication skills in addition to content knowledge. Consequently, writing is an underutilized and underappreciated tool for assessment, learning, and teaching in the STEM disciplines. In their research, session facilitators strive to better understand how writing an undergraduate thesis improves critical thinking and writing skills through impacting metacognition, motivation, and beliefs and how these impacts differ as a function of student characteristics and department context. In this session, the presenters will share their perspective as they discuss recent findings and will engage the audience in a discussion of the strengths and challenges of employing writing to improve learning through empirical design.

Julie A. Reynolds, Associate Professor of the Practice in Biology and Director of Undergraduate Studies, Jason Dowd, Postdoctoral Researcher, and Christopher A. Roy, Lecturer of Chemistry and Associate Director of Undergraduate Studies—all of Duke University

Salon B
Research, Development, and Assessment

CS 20: Increasing Student Retention and Success through Educational Interventions
Participants will be able to identify evidence-based high-impact educational practices that make an impact on STEM student learning, retention, and success.

Supported by the National Science Foundation, the Central Indiana STEM Talent Expansion Program (CI-STEP) engages faculty in developing and implementing several intervention strategies to enhance student success and increase the number of students graduating with STEM degrees. Through leadership and faculty development, the CI-STEP project takes a coordinated and systematic approach to increasing student success in STEM at all levels, from pre-college, to the first year experience, and onto graduation. By blending research on teaching and learning with the participation in teaching and training by students from diverse backgrounds, including underrepresented minorities, better knowledge of what works in successful academic programs and strategic implementation of interventions has led to increased STEM degree attainment.

Kathleen A. Marrs, Associate Dean for Academic Affairs, Howard Mzumara, Director of the IUPUI Testing Center, and Jeff X. Watt, Associate Dean for Student Affairs—all of Indiana University-Purdue University Indianapolis
CS 21: Creating Curricula for a Sustainable Future: A Team-Based, Rubric-Supported Approach
Participants will leave with an example of a rubric to guide course development across multiple courses or departments and an understanding of how this rubric could be used in various institutional settings.

The InTeGrate project uses a rubric-supported, team-based process to develop course materials addressing the grand challenges we face in living sustainably on Earth. Developing materials that scaffold student engagement with scientific data and capitalize on high-impact teaching practices while also building interdisciplinary problem solving skills is a challenging task. The presenters’ rubric encodes the project’s overarching goals for materials, as well as best practices in curriculum design, and serves as a guide to development teams drawn from multiple institutions with diverse expertise. The resulting materials are suitable for adoption in a wide variety of instructional settings. This session will showcase the rubric and development process as well as the resulting materials. Presenters will discuss how the process might be adapted, the full range of resources and support available for adoption, and the current opportunities for participation.

Anne E. Egger, Assistant Professor, Science Education and Geological Sciences—Central Washington University; and Cathryn A. Manduca, Director, Science Education Resource Center—Carleton College

CS 22: Discovering the Art of Mathematics: Inquiry-Based Tools for Engagement
Participants will gain an understanding of the use and effects of inquiry-based learning in mathematics and access materials and pedagogy that can support adoption of these methods.

Discovering the Art of Mathematics (DAoM), is an innovative approach for teaching mathematics to liberal arts and humanities students. DAoM envisions that liberal arts students will be actively involved in authentic mathematical experiences that are challenging, intellectually stimulating, and provide meaningful cognitive and metacognitive gains. What kinds of experiences nurture healthy and informed perceptions of mathematics, mathematical ways of thinking, and understanding of the ongoing impact of mathematics not only on STEM fields but also in the liberal arts and humanities? Participants will experience mathematical inquiry, investigate content areas, and reflect on the interaction of teacher, students, investigations, and inquiry materials in the classroom. The presenters will discuss evaluation data to assess the impact of this approach on students’ beliefs, confidence, mathematical skills, and performance, especially in regard to gender differences.

Volker Ecke, Professor of Mathematics, and Christine von Renesse, Professor of Mathematics—both of Westfield State University

CS 23: HEDsUp – Collaborative Teaching and Learning
Moderator: Susan Elrod, Interim Provost and Vice President of Academic Affairs—California State University, Chico

Dovetailing First-Year Engineering Curricula in Physics and Computer Science through MATLAB Analyses of Experimental Lab Data
First-year engineering students at the University of Vermont are concurrently enrolled in two compatible courses: Computer Programming in MATLAB and Physics I (Mechanics). Faculty have coordinated their respective curricula in order to contextualize and reinforce the collective skills they wish their common students to hone. The lab manual for each Physics experiment explicitly indicates the set of MATLAB skills to be used when analyzing experimental data files. Meanwhile, related developmental activities are introduced throughout the Computer Programming course, culminating in the parsing and computational analysis of acquired data, in advance of the relevant Physics lab recitation. Available institutional data from a wide variety of sources, including admissions and placement scores, GPA, exit surveys, and the national Beginning College Students Survey of Engagement (BCSSE) provide an opportunity to assess the impacts and drivers of this pedagogical partnership.

Alison Pechenick, Senior Lecturer—University of Vermont
Replacing the Standard Introductory Biology, Chemistry and Physics Laboratories: Implementing a Single Cross-Disciplinary Course

The Cross-Disciplinary Laboratory (X-Lab) at the University of Florida is a new, two-semester, six-credit course developed with support from HHMI that integrates biology, chemistry, and physics laboratory coursework. The X-Lab replaces the standard two-semester lab courses in each discipline that are typically required of students in most life sciences majors. Development and deployment of the X-Lab required strategies for obtaining the participation of multiple departments spread across multiple colleges, in addition to endorsement at a variety of administrative levels. The X-Lab has now been approved as meeting the traditional biology, chemistry and physics laboratory course requirements for all undergraduate STEM majors, as well as graduate programs in the Schools of Medicine, Dentistry and Veterinary Medicine. Student pre and post surveys (RISC and SURE) are positive, indicating that the X-Lab experience meets or exceeds the learning gains of a research experience and outperforms the student engagement of apprentice-based research.

David Julian, Director of Curriculum—University of Florida

Moving Mountains: Collaborative Teaching and STEM Education Reform

Transforming undergraduate STEM education is vital to maintaining international competitiveness and increasing entry into and persistence in STEM majors. Countless calls for change have come from prestigious scientific organizations, and millions of dollars of funding have been directed at reform. Yet, very few faculty have actually transformed their courses. This presents a puzzling question: why aren’t smart people making necessary changes? The presenter posits that one reason even well-informed faculty don’t transform their courses is the lack of time and/or knowledge to initiate and implement reform. However, pouring more resources into educating faculty about the need for transforming STEM education is not the solution. True transformation is more likely to occur when faculty leverage their most valuable resources—their colleagues—and create high-impact collaborative learning environments for themselves. These environments, which are known to foster powerful student learning and outcomes, can also foster faculty innovation.

Alicia S. Schultheis, Provost Faculty Fellow for Faculty Development and Associate Professor of Biology—Stetson University

Room 202

CS 24: Understanding the Impact of Formal and Informal Pedagogical Support on First Generation Hispanic STEM Student Success

Participants will learn about the impact of STEM academic programming and support for first generation Hispanic college students' retention, achievement, preparedness, and propensity for innovation in STEM.

The presenters will share the design and results of a study which explores the impact of STEM programs’ academic and pedagogical supports on students' transfer and academic success. Findings from the study indicate that diverse factors affect students’ success in STEM education; some are socio-demographic and others experiential. Mentorship and tutoring were found to be helpful for students. Factors outside of school including familial responsibilities, financial challenges, and other external factors impact students’ ability to persist and achieve in college. Multiple factors are at play when students enter college as first generation college students.

Armando Rivera-Figueroa, Associate Professor Chemistry and MESA/STEM Director—East Los Angeles College; and Gisele Ragusa, Associate Professor of Engineering Education—University of Southern California

Salon A

CS 25: Partnership and Pedagogy: Admissions, Assessment, and Curricular Reform for Improving Diversity in STEM

Participants will learn to differentiate student deficit and institutional readiness models and be able identify curricular change and assessment methodologies.

This session will outline how faculty observation of achievement and retention gaps within a STEM program led to specific curriculum innovations at Duke University. Faculty observed an increasing proportion of students struggling to maintain acceptable grades in STEM.
courses despite a strong will to learn. In response, they formed new collaborations to investigate and, later, confirm a persistent trend among students in the bottom quartile of undergraduate math SAT scores: subpar grades and attrition from science classes. Following this research, the Chemistry department embarked on evidence-based curriculum and classroom reform resulting in new models for teaching STEM gateway courses. An alternative to student deficit models of curriculum development, this approach presumes that students’ pre-college preparation should inform the design of academic programs.

Jennifer L. Hill, Associate Director, Office of Assessment, and Dorian Canelas, Assistant Professor of the Practice of Chemistry—both of Duke University

Room 210/211

CS 26: Integrative Strategies for Departmental Change: Developing a Shared Vision for Ongoing Improvement

Participants will identify a set of priorities for improving their STEM programs and receive an overview of the PULSE (Partnership for Undergraduate Life Sciences Education) initiatives and tools available.

Advocating for departmental reform without widely shared aspirations may be justifiably interpreted as change for change's sake. This workshop will engage participants using a new rubric designed to help STEM departments set priorities and establish a shared vision for continuous improvement of their programs. Participants will evaluate the extent to which their students engage in authentic scientific inquiry, practice higher-order cognitive skills, develop metacognitive awareness and resilience, and build core scientific competencies. They will also consider their faculty's use of best pedagogies and whether appropriate assessment evidence is used to guide reform. Because successful reform initiatives depend on an ethos of collaboration between the faculty and administration, administrators are strongly encouraged to attend this session with their STEM faculty. This workshop will be led by PULSE Leadership Fellows as part of their work to promote the type of departmental reform called for in the American Association for the Advancement of Sciences' Vision and Change report.

Melanie Lee-Brown, Associate Professor of Biology and Director of Undergraduate Research and Creative Endeavors—Guilford College; Ellen Goldey, William R. Kenan Jr. Professor and Chair of Biology—Wofford College; JoAnne Powell-Coffman, Professor and Department Chair—Iowa State University; and Nitya Jacobs, Associate Professor of Biology, Oxford College—Emory University

Room 203

CS 27: If We Only Knew Then What We Know Now: The Journey from Lessons Learned to a Theory of Change

Participants will learn about the concerns-based adoption model (CBAM) theory of change and consider how it might be applied to their own STEM reform efforts.

The literature is replete with references to curricular and co-curricular approaches that promise increased student engagement in the STEM fields. When attempting to innovate, often the first step is to identify peers who have successfully implemented these high-impact practices and work to emulate that success on our own campuses. But what happens when this does not work as intended? Using one institution's NSF-STEP project as a case study, this presentation moves the conversation from local lessons learned toward developing a theory of change that can cross varying institutional, disciplinary, and cultural contexts and increase the likelihood of successful best practice translation and adoption, highlighting the role formative evaluation plays in successful STEM reform efforts.

Kathryne Drezek McConnell, Assistant Director, Assessment & Evaluation, and Jill Sible, Assistant Provost, Undergraduate Education—both of Virginia Tech
POSTER 1: Facilitating Learning in Introductory Genetics: Flipping the Classroom

In fall 2013 and 2014, a flipped classroom approach was taken to teach a genetics course. Multiple sections of this course are offered, with most taking a traditional approach. The students in the flipped section were assigned a portion of the textbook and/or an audio lecture to read or watch on their own time prior to the next class period. The class periods were primarily spent on group work that included activities, models, worksheets, and discussions. The GCA, a standardized genetics assessment, was given as pre- and post-tests to both the flipped and traditional classes. The percent gains for the students in the flipped section were significantly higher than those in the traditional classrooms.

Kasey Karen, Assistant Professor of Biology—Georgia College

POSTER 2: Breathe, Eat, Touch Project (BET): Engaging Students in STEM through Case Method Teaching in Environmental Health

Pedagogical literature supports case-based approaches to maximize learning outcomes. Through an NSF-TUES grant, the BET project uses case studies in environmental health as a strategy to transform undergraduate STEM education. An interdisciplinary team, including faculty and students, developed an introductory environmental health course for undergraduates that incorporates biology, chemistry, and epidemiology. The course was designed to be modular so that individual cases could be integrated into pre-existing courses in public health, biology, chemistry, and environmental studies. The poster will highlight results of the initial course offering, including student learning outcomes and interest in STEM. Data obtained from students in the environmental health course will be compared to data from students enrolled in other introductory STEM courses on campus.

Karen K. Bernd, Associate Professor of Biology, and Cindy D. Hauser, Associate Professor of Chemistry—both of Davidson College

POSTER 3: Peer to Peer Projects: Bringing STEM Academics to Life through a Community-based Culture of Innovative Learning

The Da Vinci and Curie Living-Learning Communities (LLCs) at Virginia Tech consist of life, physical, and quantitative science freshman and sophomores and are part of the broader inVenTs STEM community, which is designed to promote interdisciplinary collaboration between science and engineering students. The LLCs’ learning outcomes align with student affairs learning aspirations and include elements of leadership and curiosity, in addition to traditional academic STEM outcomes. The program includes semester-long peer to peer projects—envisioned, spearheaded, managed, and implemented by students—on which all Da Vinci and Curie students collaborate. This poster will describe how the faculty facilitates the process of bringing student ideas to life in a way that creates a culture and tradition of learning. It will also highlight the work of two undergraduate researchers who used versions of AAC&U VALUE rubrics to assess student learning in the peer to peer projects.

Lori Blanc, Research Scientist and Program Director, DaVinci LLC, Stephanie N. Lewis, Co-director, Curie LLC, C. Houston Wiedle Jr., Student, and Russell Fritzemeier, Student—all of Virginia Tech

POSTER 4: Collaborative Research for Novice Undergraduates

Research experiences for undergraduates confer a host of benefits on students bound for STEM careers, but the number of research faculty members available to serve as mentors often limit program feasibility or size. The presenters’ summer research program for undergraduates tested the hypothesis that a team-based collaborative-learning model (CLM) produces outcomes at least as positive as a traditional one-on-one apprenticeship model (AM). AM students were paired with research mentors in active research laboratories and produced a research report. CLM students learned a variety of research techniques according to a defined curriculum in a dedicated teaching laboratory and produced team-based research proposals with preliminary data. Both program formats produced similar benefits, demonstrating that CLM provides positive outcomes with fewer faculty mentors.

Kyle J. Frantz, Professor of Neuroscience, Laura L. Carruth, Associate Professor of Neuroscience, and Chris T. Goode, Senior Lecturer of Psychology—all of Georgia State University
POSTER 5: Teaching through Scientific Journal Articles in the Undergraduate Classroom
Teaching through scientific journal articles in the classroom allows students to understand the relevancy of learning in the classroom as it applies to current research in the field. Connections between classroom learning and real world research in any field of science, mathematics, or engineering enhance the learning experience for students while teaching additional valuable skills in journal article reading and discussion. This poster will demonstrate strategies for selecting articles and assignments in STEM classrooms, incorporating teaching though journal articles into the classroom, and assessing outcomes.

Kimberly Suzanne George Parsons, Assistant Professor of Chemistry—Marietta College

POSTER 6: Generating Student Interest in STEM Learning
This poster will showcase the presenters’ interdisciplinary approach and efforts to generate interest in STEM education for students from public high school to graduate programs at Eastern Illinois University (EIU). The engagement of students in STEM research and learning is facilitated by a Renewable Energy Research Mentorship program with the help of a research project funded by the National Science Foundation. The poster will share how student-led research is used to motivate and engage students in learning science, technology, engineering, and mathematics.

Rose Z. Gong, Professor of Education—Eastern Illinois University

POSTER 7: Effects of Hybridizing a Research Methods and Statistics Course
To assess the outcome of teaching a psychological research methods and statistics course as a hybrid course (half online, and half in person), the presenters asked instructors to teach alternate sections with a randomized starting order. The presenters measured American Psychological Association-recommended learning outcomes for critical thinking, scientific communication, and quantitative skills and surveyed students to measure constructs hypothesized to be predictors of success in an online environment, e.g. experience with web browsers, reading speed and comprehension, and self-efficacy. This poster will report the results of the comparison between standard and hybrid versions of the course.

Chris Goode, Director of Undergraduate Studies, Marika Lamoreaux, Lecturer, Department of Psychology, and Elizabeth Sheehan, Lecturer, Department of Psychology—all of Georgia State University

POSTER 8: Using a Cognitive Theory of Analogy to Support Science Learning
This poster will present cognitive science research on the role of comparison and analogical processes in science learning. In one study, the presenters examined the role of mutual alignment analogy—a type of analogical comparison in which the analogues are only partially understood—in learning a complex biology concept from expository texts. The presenters will describe another study that tested how analogical processing of images affects student learning of spatial concepts in structural geology. Together, these studies provide evidence that promoting comparison between two examples and orienting the learner toward relational commonalities and distinctions result in greater abstraction and transfer of science concepts presented in texts and images. The presenters will discuss how this work can be applied to support student learning in a range of STEM disciplines.

Florencia K. Anggoro, Assistant Professor of Psychology—College of the Holy Cross

POSTER 9: Ripped from the Headlines: Current Events as the Framework for Inquiry-based Learning in Biology for Nonmajors
Whether to cast a ballot on a new environmental policy, to make a major medical decision, or to choose the most nutritious food at the grocery store, all citizens need a basic understanding of biology. In order to improve scientific literacy among nonmajors, an introductory biology course at the University of Montevallo was redesigned to use current events as a framework for teaching core biological principles through inquiry-based learning strategies. The goals of this course are to help students identify and confront their misconceptions about science, to motivate students to analytically search out and apply reliable sources when addressing real-life scientific problems, and to help students make connections between science and their own lives. Evidence suggests that this new approach will improve students’ engagement, perception of biology, and retention of key concepts. This poster will share the course design and student outcomes from the first semester of the course.

Heather N. Tinsley, Assistant Professor of Biology—University of Montevallo

POSTER 10: Undergraduate Research Experiences in Mathematics
The analysis of large data sets to provide understanding and ultimately knowledge is one of the fundamental intellectual challenges of our time. Some of the most useful techniques for analyzing data come from linear algebra and graph theory. For example, the singular value decomposition of matrices leads to several useful techniques, such as principal component analysis and latent semantic indexing. Many real-world phenomena are modeled as networks, and centrality measures from graph theory are used to determine the power structure in the network. These models and techniques are grounded in undergraduate mathematics, but their applications are new and novel. This poster will share how research experiences were integrated into a mathematics course so students could begin working on research projects without participating in a specialized summer REU program.

Sandra Kingan, Associate Professor of Mathematics—City University of New York Brooklyn College

Research, Development, and Assessment

POSTER 11: Thinking Like a Neuroscientist: Using Scaffolded Grant Proposals to Teach Introductory Neuroscience

This poster describes the implementation and evaluation of a set of teaching activities designed to foster critical and scientific thinking in a freshman neuroscience course. Our learning goals included formulating scientific questions, developing systematic approaches to answer those questions, demonstrating analytical and scientific reasoning, and communicating effectively in written form. The teaching activities centered around three small grant proposals that students wrote throughout the term. The presenters scaffolded students’ ability to write effective proposals through discussion, brainstorming worksheets, and oral and written feedback. This poster will provide an overview of the teaching methods used, as well as an evaluation of teaching effectiveness and student attitudes based on pre and post comparisons of student work and survey data.

Melinda Owens, Thinking Matters Lecturer—Stanford University

Research, Development, and Assessment

POSTER 12: Increasing Student Engagement and Performance in College Algebra

In an effort to develop students’ critical thinking skills and to increase engagement and performance, a pilot study was conducted in a college algebra course. The course was redesigned to consist of best practices in instruction and assessment, lower enrollment, and a lab component. Instructional methods included whole class instruction, small group instruction, and student presentations. Additional course revisions included a writing component using personal reflections and a software package aligned with the adopted textbook, and bi-weekly progress reports. The students’ performance results showed the benefit of such a reformation.

Rhonda Catina Porter, Professor of Mathematics, Coordinator of Mathematics Education, Janis Carthon, Coordinator of Educational Leadership, and Chinenyе Ofodile, Professor of Mathematics—all of Albany State University

Research, Development, and Assessment

POSTER 13: How Well Do Flipped Approaches to STEM Education Support Students in Learning the Methods of Science?

By flipping their approaches to teaching STEM courses, faculty members at the Community College of Vermont (CCV) have created more time for investigations and discussions in field, laboratory, and online environments. CCV offers courses at twelve academic centers across Vermont, as well as online. This poster will share examples from an environmental biology class based on the experiences of two instructors at different CCV centers with distinct perspectives on flipping—one online and one blended. The poster will include a rubric used to assess student mastery of scientific methods across online and on-the-ground sections of Environmental Biology, using both flipped and conventional methods.

Elizabeth Perry Thomas, Coordinator of Academic Services—Community College of Vermont

Research, Development, and Assessment

POSTER 14: Peer-Assisted Team Research (PATR): A Model for Early Research Experiences

The PATR model provides first-year undergraduate students the opportunity to participate in interdisciplinary research modules. Students gain experience in designing and carrying out research plans, analyzing data, and drawing conclusions, while learning about new fields of science through a structured format designed to scaffold an understanding of the research process in a team setting. PATR modules are led by experienced junior and senior peers who have high academic STEM training and have participated in the same modules previously.

This poster will show how this model can be utilized in various extra-curricular settings, in research methods courses, and in STEM courses.
Lori Sims, Research Programs Coordinator, and Louise Hainline, Director, Center for Achievement in Science Education and Professor, Department of Psychology—both of the City University of New York Brooklyn College

POSTER 15: The Advantages of Technology Enhanced Active Learning for Entry Level Math
A 2012 goal of Montana State University was to improve success (passing with a C or above) in courses that traditionally had success rates below 70 percent. For the previous six semesters, College Algebra had a success rate below 55 percent. Technology Enhanced Active Learning (TEAL) classrooms were suggested as a possible solution. The administration renovated two classrooms with a physical design that encouraged student collaboration and incorporated technology. Mathematical Sciences was funded to establish an innovative TEAL Algebra curriculum. In the spring of 2013, three of thirteen total sections were taught in the new TEAL rooms. The success rate for the three sections was 81 percent. Success for the remaining 10 sections was 63 percent.

Thomas Hayes, Assistant Teaching Professor—Montana State University

POSTER 16: Incorporating STEM in a Natuculture Laboratory for Teaching Agriculture Majors
Faculty in the School of Agriculture and Environmental Sciences at North Carolina Agricultural and Technical State University (NCA&T) were involved in a project to enhance students’ STEM knowledge through the use of an interactive natuculture learning garden. Natuculture is any manmade system that mimics nature in landscapes disturbed by humans. The purposes of establishing the natuculture garden were: (1) course instruction and experiential learning for students; (2) demonstrations of multifaceted environmental benefits; and (3) recruitment of agriculture majors to the field. The research design was a highly visible, conventional lawn on campus that functioned as a multifaceted natuculture garden with a STEM focus. Outcomes resulted in courses where faculty from a variety of disciplines incorporated the natuculture garden into their instruction. This poster will examine the matuculture model and describe how it serves as an innovative recruiting tool for students and a more sustainable and ecologically friendly environment for NCA&T.

Alexander Joyce, Graduate Student in Agricultural Education—North Carolina Agricultural and Technical State University

POSTER 17: Utilizing Institutional Student Data to Vest University Stakeholders in STEM Education Reform
STEM persistence data has been primarily informed by surveys that may not capture true movement of students into and between majors. To address this issue, the presenters utilized a cohort approach to assess nearly 3,000 first-time-in-college STEM majors for movement between majors, graduation rates, academic progression and student success factors. Results show that 45 percent of students leave STEM within 4.2 semesters and only 55 percent of the remaining students earn a STEM degree. Less than 70 percent of the students who switch to a non-STEM major earn a degree, although nearly a third of this population was making good academic progress prior to switching. Students who switched from STEM majors were much less likely to have participated in a high-impact practice such as undergraduate research. Research shows that institutions are only able to bring 15% of those who switch out of STEM majors back into them.

Richard S. Pollenz, Associate Dean and Director Office for Undergraduate Research, Humberto Linero Fuentes, Undergraduate Student, and Gerry Meisels, Director, Coalition for Science Literacy—all of University of South Florida

POSTER 18: Quantitative Reasoning across the Disciplines (QUAD) Program: Examining Quantitative Competency Requirements
Quantitative reasoning allows a well-educated citizen to apply quantitative concepts to daily life, applying the principles of logic to real world arguments or using statistical and data analysis to make decisions, judgments, and predictions. The presenters take the perspective that quantitative reasoning should not be simply described as a skill or ability to solve numerical problems. Rather, quantitative reasoning should be perceived as a habit of mind that allows students to process, analyze, and communicate quantitative information in authentic, everyday contexts. This poster will share Stockton College’s interdisciplinary approach to quantitative reasoning through its QUAD program.

Betsy McShea, Associate Professor of Developmental Mathematics—The Richard Stockton College of New Jersey
**Research, Development, and Assessment**

**POSTER 19: Connecting Learning Experiences for Future Teachers: Assessing and Applying Knowledge of Crosscutting Concepts that Bridge Disciplinary Boundaries**
The courses in the STEM Concentration for future elementary teachers at Fresno State have been purposefully designed with explicit attention to the three dimensions of the Next Generation Science Standards, employing the seven crosscutting concepts as elements of a storyline that bridges course content. These concepts were the mechanism for faculty collaboration in constructing a connected set of science learning experiences that are engaging, meaningful, and rigorous. The presenters will share their approach to measuring how preservice teachers employ these crosscutting concepts to make sense of new content in other disciplines. The poster will include a set of ranking tasks to measure this progression.

*Fred Nelson, Assistant Professor of Science Education—California State University-Fresno*

**Research, Development, and Assessment**

**POSTER 20: Interdisciplinary Teaching in Action: Connecting the Dots between Business, Science, and Society**
In order to explore and solve multi-layered problems, students need to be able to bridge the gap between STEM and the social sciences. To assist students in becoming integrative thinkers, the presenters have introduced interdisciplinary teaching between biology and business disciplines. Students from two classes collaborated on an interdisciplinary poster session: The Cost of Connection—Pandemics and Globalization. The success of the interdisciplinary collaboration was assessed through pre-conference and post-conference surveys, collaborative discussion outcomes and student interviews. The class syllabi, collaborative plan, assessment methods, rubrics, and student outcomes will be shared.

*Karobi Moitra, Clare Boothe Luce Assistant Professor of Molecular Biology, and Diana Watts, Chair and Associate Professor, Department of Business—both of Trinity Washington University*

**Inclusive Excellence in STEM**

**POSTER 21: Women ≠ Scientists: Stereotypes about Gender and Science**
Research on gender stereotyping has shown that people perceive men to be agentic and women to be communal, but no studies have examined stereotypes about scientists. This study assessed stereotypes about men, women, and successful scientists. As predicted, intraclass correlations revealed a strong overlap between the stereotypes about successful scientists with those of men, but no overlap between the stereotypes about successful scientists and those of women. Successful scientists were seen as exceptionally high in agentic traits and low in communal traits. Thus, one obstacle for women as scientists is the stereotype that, in order to be successful, scientists must possess hyper-masculine personality traits. To overcome this obstacle, people must come to see scientists as more like women—highly agentic, but also highly communal. This poster will examine if and how exposing people to communal scientists can facilitate this change in stereotypes.

*Linda L. Carli, Senior Lecturer—Wellesley College*

**Inclusive Excellence in STEM**

**POSTER 22: From Stumped to STEM: Breaking Down Barriers to STEM via Interdisciplinary and Integrative Learning**
Using two case studies in which students leveraged their self-designed majors to create novel curricular pathways that draw upon STEM fields, this poster will demonstrate how collaboration among faculty and staff across academic programs can lead to the creation of unique interdisciplinary and integrative learning environments. These environments, in turn, foster access to, and success in, STEM education, and they promote innovative explorations in undergraduate research. These case studies illustrate the strategies utilized at Drexel to help break down institutional and disciplinary barriers, as well as the high-impact practices that resulted from these new learning environments.

*Kevin Egan, Acting Director, Center for Interdisciplinary Inquiry, and Diana Nicholas, Assistant Teaching Professor of Interior Design—both of Drexel University*

**Inclusive Excellence in STEM**

**POSTER 23: Integrated Algebra-STEM Curriculum to Increase Student Engagement**
In 2013-2014, the University of Wisconsin-Whitewater piloted new sections of pre-algebra and college algebra courses for first-year STEM majors integrating new STEM case studies. Placements in these courses are consistent predictors of STEM student success in gateway courses. Campus data suggest that only a fifth of first year STEM majors who begin in the pre-algebra course will successfully pass the first-year biology course sequence. This poster reviews the curriculum and the presenters’ effort to increase the math readiness of freshman STEM students, as well as the collaboration between math and other STEM faculty to design special
STEM-specific math sections with new algebra word problems aligned with the gateway course curricula. The poster also provides evidence from student surveys, focus groups, and course grades on the impact of the new curriculum on STEM student engagement and the relative success of students in the first biology gateway course.

Seth Meisel, Associate Dean of Graduate Studies and Continuing Education, and Catherine Chan, Director, Undergraduate Research Program—both of University of Wisconsin-Whitewater

Inclusive Excellence in STEM

POSTER 24: The Merit Model and Recruitment and Retention of STEM Majors
Based on Uri Treisman’s model, the Merit Program at the University of Illinois at Urbana-Champaign uses collaborative learning and assists in establishing a supportive peer structure needed for retention and recruitment in STEM. The program has experienced overwhelming success with underrepresented minorities and students from small high schools by providing academic support in the large introductory courses in chemistry, biology, and mathematics. This achievement led to an NSF STEP funded expansion to include entering freshmen who have not declared a major. That seven-year project was highly successful, impacting approximately 1000 new students in the Merit Program with approximately 50 percent of these undeclared majors completing, or on track to complete, a STEM degree. This poster will provide information about the program, evaluation methods, results, and dissemination.

Jennifer McNeilly, Director, Math Merit Program, and Gretchen Adams, Director, Chemistry Merit Program—both of University of Illinois at Urbana-Champaign

Inclusive Excellence in STEM

POSTER 25: When the Deck is Stacked against Them: First-generation Women in STEM and the Relationships that Shape Their Persistence
First-generation college students are twice as likely to exit STEM and leave college altogether than their peers whose parents completed college. Their personal backgrounds and academic preparation place them at increased risk for attrition. More often than not, first-generation college students come from minority and lower socio-economic groups. This study focuses on first-generation undergraduate women who have completed at least two years in their STEM major and looks at those factors that have contributed to their persistence. Drawing on a theoretical framework of social capital, the purpose of this study is to gain a better understanding of how social networks may provide agency that affects the retention of first-generation women in STEM.

Deborah Tully, PhD Candidate—University of Sydney

Recruiting, Supporting, and Rewarding Faculty

POSTER 26: Faculty Development Using Virtual Communities of Practice
With support from the National Science Foundation, the American Society for Engineering Education (ASSE) is leading an effort to develop a sustainable virtual community of practice (VCP) model for faculty development. The two goals of the project are: (1) to develop a sustainable VCP model for faculty development that enables faculty members to gain an understanding of evidence-based instructional approaches to implement in their classrooms, and (2) to characterize the operation of VCP implementations, relating these to VCP effectiveness. The project supported the development of two cohorts of five faculty communities. Over the course of two academic terms, the communities engaged using web-based synchronous and asynchronous communication tools. Each community was composed of 10-25 engineering faculty members across the country teaching discipline-specific introductory and sophomore level courses. Early evaluation data shows participant engagement, satisfaction, and positive changes in awareness and attitudes toward evidence-based instructional approaches.

Rocio C. Chavela Guerra, Manager of Faculty Development—American Society for Engineering Education

Recruiting, Supporting, and Rewarding Faculty

POSTER 27: Faculty Participation in a Learning Community Improves STEM Student Success
STEM educators must have the tools and support to implement changes in their teaching that provide students with innovative and effective learning environments. However, STEM educators receive relatively little formal training in teaching, and many lack skills in assessing student learning. The College of Natural Sciences and Mathematics at California State University-Long Beach is currently undertaking a cross-discipline, STEM-specific faculty development project to empower STEM faculty to engage in active and effective pedagogical practices. The preliminary results have been replicated in four completed cohorts, and suggest that: (1) participating faculty felt connected to other members of the cohort and (2) a STEM-focused Faculty Learning
Community can directly affect the pedagogical practice of faculty participants. These guided changes can significantly impact student learning and engagement.

**Jen-Mei Chang**, Professor of Mathematics—California State University-Long Beach

**Recruiting, Supporting, and Rewarding Faculty**

**POSTER 28: What Faculty Say They Need: Instructional Feedback to Support Change in STEM Education**

Most college biology instructors could benefit from more sustained support in implementing innovative strategies. Instructional feedback has the potential to be one of the best ways to receive this support. However, there is an over-reliance on student evaluations of teaching which may be undermining effective teaching and adoption of engaged pedagogies. This poster presents findings from a large national survey of biology faculty teaching at a wide range of institutions. These findings include the state of current instructional feedback practices, faculty’s unmet needs and wishes for ideal feedback practices, and feedback practices that faculty perceive as most useful to support their implementation of engaged pedagogies. Finally, the presenters will share strategies to bridge current gaps, in order to help faculty identify and solicit needed instructional feedback.

**Cara Gormally**, Assistant Professor—Gallaudet University; and **Peggy Brickman**, Professor—University of Georgia

**Recruiting, Supporting, and Rewarding Faculty**

**POSTER 29: Creative Networking Among STEM Faculty Women at Predominately Undergraduate Institutions**

This poster will share the activities of an ADVANCE project that aims to change the culture in the academy and encourage women to enter STEM fields. The project has created a network of 70 tenure-tracked faculty women in the STEM disciplines of biology, chemistry, computer science, engineering, mathematics, and physics from 27 predominately undergraduate institutions across the country. The network is composed on alliances, groups of five women in the same discipline and at the same career stage (early, mid, or late) with the goal of providing peer mentorship and cross-disciplinary support. Activities have included monthly video conferences. Other creative ways of connecting for collaboration and support will be shared.

**Joanne Smieja**, Professor of Chemistry, and **Catherine Cronin**, Project Coordinator—both of Gonzaga University

**Recruiting, Supporting, and Rewarding Faculty**

**POSTER 30: Innovation Corps for Learning: Evidence-based Entrepreneurship™ to Improve STEM Education**

The Innovation Corps for Learning (I-Corps-L) is a pilot initiative from the NSF and the American Society for Engineering Education to propagate and scale educational innovations. The eight-week program provides participants a model approach to assess the potential of educational innovations for sustainable scalability. It consists of an introductory three-day training session, five online sessions, and a closing two-day training session. The pilot cohort was comprised of nine teams of three to four members, including a principal investigator, an entrepreneurial lead, and a mentor, who used their current projects as platform for exploration. This poster will feature pilot projects including a Web platform to speed the propagation of evidence-based instructional approaches, a holistic transition program to support veterans interested in engineering and technology careers, and a boot camp for preparing for a math placement test.

**Karl A. Smith**, Emeritus Professor—University of Minnesota-Twin Cities; and **Rocio C. Chavela Guerra**, Manager of Faculty Development—American Society for Engineering Education

**Institutional Change Strategies**

**POSTER 31: A Statewide Collaborative Model to Improve STEM Teacher Preparation Programs**

The number of K-12 STEM schools is growing, yet many Colorado Institutions of Higher Education continue to prepare K-12 educators as focused science or mathematics teachers. Given the changing landscape of K-12 schools, the presenters hosted the first statewide meeting for STEM teacher preparation programs. The two primary challenges addressed were: (1) to develop a collective vision of teacher preparation programs to support STEM in K-12 schools, and (2) to develop an understanding of the education initiatives at the state and national level that impact K-12 STEM education and teacher preparation. This poster will describe the collaborative model developed for the statewide symposium, challenges facing STEM teacher preparation, and share strategies to increase the number of underrepresented STEM teacher candidates.

**Lori A. Reinsvold**, Associate Director of the Mathematics and Science Teaching Institute, and **Susan M. Keenan**, Director and Associate Professor of Biological Sciences—both of University of Northern Colorado
Institutional Change Strategies

POSTER 32: Synergism between Systemic STEM Projects and Campus Equity Programs: Success for Underrepresented STEM Students

Sacramento State, a large, public university that enrolls students, primarily from the ethnically diverse Sacramento area, is midway through the funding cycle for Project PASS, a five year project funded by NSF STEP. The project's purposeful synergism with existing campus equity programs has created a network of support that greatly improves the safety net for at-risk students in STEM disciplines. Co-sponsored peer-assisted learning (PAL) sections in STEM gateway courses, early-intervention advising, and collaborations among campus faculty and staff with respect to student progress have particularly improved the performance of at-risk students in gateway courses as indicated by increases in pass rates. This poster will explore how the strong relationship between interventions and programs is leading students to improved rates of retention and baccalaureate degree completion.

Jennifer Lundmark, Professor, Biological Sciences, and Enid Gonzalez-Orta, Associate Professor, Biological Sciences and Director, Science Educational Equity Program—both of California State University-Sacramento

Institutional Change Strategies

POSTER 33: Parallel Programmatic Efforts Increase Student Opportunities and Retention for STEM Majors

This poster will examine how the STEM disciplines at Northern Kentucky University (NKU) are implementing three parallel NSF-funded programs to improve student persistence and provide impactful career exploration. Project FORCE (Focus on Occupations, Recruiting, Community, and Engagement) builds STEM-wide efforts that include peer-led study sessions, research opportunities for students at risk of leaving, and activities that promote community. Project SOAR (Scholarships, Opportunities, Achievements, and Results) recruits academically-talented students with financial need and provides them with scholarships, targeted academic interventions, intentional mentorship, and career networking. The PRIME Project (Preparing Regional Increases in Mathematics Educators) is designed to increase the number and effectiveness of secondary mathematics teachers in high-need schools by providing scholarships, travel funds, and professional development to pre-service teachers. The leadership teams of these projects use data-mining and visualization techniques to assess STEM student data provided by NKU Institutional Research.

Kristi L. Haik, Chair and Associate Professor, Bethany V. Bowling, Associate Professor of Biological Sciences, and Maureen Doyle, Associate Dean of Informatics and Associate Professor of Computer Science—all of Northern Kentucky University

Institutional Change Strategies

POSTER 34: Faculty-led Strategies for Advancing Undergraduate STEM Education

This poster will describe the development of a voluntary faculty-led steering committee as a mechanism for institutional change, a platform for sharing best practices in diverse student retention and engagement across departmental boundaries, and a means of engaging campuses in institution-wide initiatives. It will share an analysis of lessons learned and recommendations for institutions interested in implementing similar campus-wide change strategies. The presenters will share examples of best practices developed to enhance STEM education, including a chemistry/STEM program to improve persistence of diverse students and matriculation into advanced degree programs, and an interdisciplinary STEM research foundations program to encourage student persistence and engagement.

Eman El-Sheikh, Associate Dean, College of Science, Engineering, and Health, and Professor of Computer Science, Karen S. Molek, Assistant Professor of Chemistry, and Hui-Min Chung, Associate Professor of Biology—all of University of West Florida
Saturday, November 8, 2014

7:45 am – 8:15 am  Breakfast
Breakfast will be available on the second floor.

8:15 am – 9:15 am  Plenary
Grand Ballroom
Celebrating 25 Years of PKAL: Re-Focusing the Kaleidoscope
Project Kaleidoscope has been instrumental in empowering STEM faculty to graduate more students in STEM fields who are competitively trained and liberally educated. Today, PKAL exists as AAC&U’s center of STEM higher education reform and remains committed to its principles, which are also central to AAC&U’s Liberal Education and America’s Promise initiative. Please join us in celebration of 25 years of commitment to cutting-edge, integrative STEM education for all students, and to discuss PKAL’s next steps in leading the nation toward effective and inclusive STEM higher education.

Elizabeth McCormack, Associate Provost, Professor and Chair of Physics—Bryn Mawr College and PKAL Board Member; and Kelly Mack, Vice President for Undergraduate STEM Education and PKAL Executive Director—AAC&U

9:30 – 10:45 am  Concurrent Sessions

Room 210/211
EYP Sponsored Session
CS 28: Teaching Lab of Tomorrow
Participants will review a framework for designing teaching labs, explore a hands-on strategy for prototyping and evaluating potential layouts, and analyze a range of prototypes in the context of instructional goals.

The creation of effective inquiry, discovery, and problem-based laboratory learning environments is critical to the evolution of teaching laboratory design. STEM laboratories are quickly moving away from the dominant “cook book” method and moving toward inquiry based instruction. The current inventory of laboratories is not always adequately flexible to meet this transformation. This dynamic and interactive session will focus on co-exploring the relative merits and disadvantages of innovative laboratory spaces that enable a wider variety on instructional methods and encourage collaboration and guided inquiry.

Leslie Sims, Academic Planning and Design Principal, and Toni Loiacano, Academic Planning and Design—both of EYP Architecture & Engineering

Room 208/209
This session will include two presentations followed by time for questions and discussion.
CS 29: HEDs UP: Writing in STEM Disciplines
Moderator: Julie Reynolds, Assistant Professor of the Practice—Duke University

The Duke Reader Project: Alumni Expert Readers Supporting STEM Student Writers
This talk will report on a novel approach to providing undergraduates with feedback on STEM writing assignments through engaging university alumni. Students in selected courses are paired with alumni volunteers whose STEM backgrounds make them suitable readers for specific writing assignments. The Volunteer Expert Reader approach acknowledges the realities of labor in STEM teaching contexts by facilitating student interactions with experienced STEM professionals who have the time and inclination to give them substantive feedback on their writing, based on real-world experience. Assessment data demonstrates that large numbers of qualified alumni are willing to help their institution’s undergraduates develop their scientific writing and reasoning skills and that this interaction increases student engagement in STEM writing tasks.

Cary Moskovitz, Director of Writing in the Disciplines—Duke University

Reading and Writing Science Rhetorically: A Continuous Assessment Model for Inclusive Classes
Science education continues to suffer from two myths regarding science communication that are particularly detrimental to students from underrepresented groups. One is that science
writing merely reports objective observations within a conventional structure. The second is that writing of science is not governed by rhetorical principles that govern other types of written composition. Consequently, science students are rarely taught to read science critically and rhetorically; hence, they struggle to learn the argumentative structure and momentum of articles, as well as ways to vary language to meet the needs of diverse readers. This presentation describes a long-standing university program in science writing that teaches with a rhetorical emphasis.

Chris Thaiss, Clark Kerr Presidential Chair and Professor, University Writing Program—University of California-Davis

Room 202


Participants will learn about NANSLO, its current offerings and long-term goals, and how to get involved.

NANSLO is an international collaboration between nine institutions in the United States and Canada. NANSLO is using open source licensing to construct a network of internet controllable, real-time, teaching laboratories. NANSLO’s goal is to provide access to challenging inquiry-based laboratory procedures run on high-quality scientific instrumentation to students both outside and inside traditional laboratory environments. NANSLO’s procedures can be modified by faculty to suit any science course. NANSLO presently offers experiments in first year biology, chemistry, and physics courses from three operational labs: North Island College in Canada, the Colorado Community College System, and Montana State University. The presenters will share the history of the NANSLO project and data showing feedback from students and faculty that have used the Denver laboratory. Additionally, the presenters will discuss plans for growth and development.

Paul Bennett, NANSLO Lab Technology Manager—Colorado Community College System

Room 203

CS 31: Outcome-Based Innovation and Engagement in STEM Courses: A Model for Success

Participants will develop a basic outline of ideas for incorporating outcome-based, learner centered instruction and assessment into their own courses, programs, or institutions.

A major overhaul of our higher education system’s approach to STEM undergraduate courses is desperately needed to increase interest and competence in STEM disciplines. Currently only forty percent of students entering college who declare STEM majors complete degrees in STEM disciplines. Engagement in courses, especially large undergraduate STEM courses, remains a difficult challenge. Results from the presenters’ course redesign show initial successes using an outcome-based model that is predicated on the seamless alignment of course objectives with instructional strategies and assessment, which allows for student attainment of course goals to be explicitly quantified. The model also facilitates identification of areas where student attainment is low. This presentation will use the redesign of a large enrollment organic chemistry course as an example of best practices to improve student performance and interest in all STEM disciplines.

Rob Petros, Assistant Professor, Department of Chemistry, and Michael Simmons, Senior Associate Director, Center for Learning Enhancement, Assessment and Redesign—both of University of North Texas

Room 212

CS 32: HEDsUp – Using Data to Advance Student Success in STEM

Moderator: Susan Albertine, Vice President, Office of Diversity, Equity, and Student Success—AAC&U

Why Students Change Majors: Plugging Leaks in the STEM Pipeline

The number of students who graduate with a STEM degree can be increased by attracting more students into STEM majors, facilitating their academic progress, and ensuring that they remain in a STEM major. The latter factor is especially important, since more students at many institutions change majors than remain. The present study examines student questionnaire responses and institutional data from California State University, Stanislaus,
to determine why students change their majors. Undergraduates who changed out of STEM majors are compared with students who switched between other majors. Particular attention is given to women and other populations traditionally underrepresented in STEM.

Harold Stanislau, Professor of Psychology—California State University, Stanislaus

Connecting the Dots: Aligning Academia and Industry for a Sustainable Future
According to national data, the number one reason why students go to college and why their parents send them is to get a better job. The number one reason why the American public sees college as having value is that it gets people better jobs. But there is a mismatch between what students, parents, and the American public thinks and what college faculty think is the purpose of postsecondary education. The facilitator will demonstrate this mismatch with national data from multiple sources and highlight the seriousness of the problem. In a time of great disruption in higher education; this mismatch has the power to topple institutions.

Erin D. Knepler, P-20 Program Director—The University System of Maryland Office

Room 207

Inclusive Excellence in STEM

CS 33: Strengthening the STEM Pipeline in Georgia with Winning Practices in Recruitment, Retention, and Persistence of Minority Students
Participants will learn about winning recruitment and retention strategies for minority STEM students and get the nuts and bolts for implementing them at their institutions.

The Peach State Louis Stokes Alliance for Minority Participation (Peach State LSAMP) is one of forty-one NSF-funded LSAMP programs with the mission to significantly increase the number of underrepresented minorities completing baccalaureate degrees in STEM. Sustained by a coalition of seven University System of Georgia institutions, the Peach State LSAMP has had a significant impact on increased enrollment and graduation of underrepresented minorities with STEM majors—both as an alliance and at each of the institutions. This session will provide an overview, assessment plan, and program outcomes. The facilitators will lead the audience through a series of program design and development scenarios for implementing key recruitment and retention strategies for student access and success in STEM majors at both two-year and four-year institutions.

Angela Y. Birkes-Grier, Director of the Peach State LSAMP—University of Georgia; Margaret H. Major, Associate Professor of Biology, Project Director Peach State LSAMP—Georgia Perimeter College; and Tia Jackson-Truitt, On-Campus Recruitment and LSAMP Program Manager—Georgia Institute of Technology

Room 204

Institutional Change Strategies

CS 34: Faculty Development and Student Learning: A Synergistic, Collaborative, and Fiscally Sustainable Approach
Participants will learn about a successfully implemented model to promote undergraduate research and curriculum innovation in STEM while simultaneously encouraging faculty development and student learning in a fiscally sustainable manner.

Session facilitators will describe the synergistic approach one institution has taken over the past seven years—in the face of a marked decline in state funding—to encourage faculty development and student learning in a fiscally sustainable manner. Consistent with the University of Central Oklahoma’s emphasis on transformative learning, these efforts have included reallocating internal resources to form interdisciplinary centers that have significantly enhanced external grantsmanship efforts in support of undergraduate research. The Center for Undergraduate Research and Education in Science, Technology, Engineering and Mathematics (CURE-STEM), for example, provides resources to faculty with student-centered research programs, including reassignment time, student wages, travel funds, and supplies. Session participants will learn how participating scholars have obtained external funding that supports undergraduate engagement in research, with an emphasis on including members of underrepresented groups.

Beverly Endicott, Director of Sponsored Programs, Charlotte K. Simmons, Dean, College of Mathematics and Science, and Wei R. Chen, Assistant Dean, College of Mathematics and Science—all of University of Central Oklahoma
CS 35: Fostering Institutional Change: What Can We Learn From Agents in the Field?
Participants will learn about the theory of change used by the Pathways program, hear examples of translating the idea of making change into an on-the-ground effort, and reflect on their own institutional context.

Efforts to make the undergraduate learning experience more reflective of the skills needed to meet global challenges often founder on the realities of working within institutions to adapt curricula, learning spaces, and policies. This session will feature participants in the Epicenter Pathways program, an initiative to embed innovation and entrepreneurship themes into the undergraduate engineering experience using experiential, real-world-oriented, evidence-based approaches that enhance student retention. Informed by a comprehensive examination of successful faculty development initiatives, Pathways provides schools with a portfolio of models around the country, a facilitated process for planning and implementation, peer support, and ongoing guidance from advisors who have successfully made change in their own institutions. The panelists will describe how the Pathways framework has supported their change efforts, what challenges they have addressed through the process, and what they wish they had known or done when they began their work. **Elizabeth Nilsen**, Senior Program Officer, Epicenter—VentureWell; and **Holly Stretz**, Associate Professor of Chemical Engineering —Tennessee Technological University

CS 36: Studying STEM Teaching, Learning, and Culture at a Comprehensive University: Gathering Information for Reform
Participants will examine multifaceted methods for investigating STEM practices from the perspective of both faculty and students.

Session facilitators will share their design for gathering comprehensive information about the teaching, learning, and culture in STEM disciplines at Otterbein University in order to examine the strengths of STEM teaching and areas for strategic reform. An interdisciplinary team that includes STEM faculty and the director of the Center for Teaching and Learning are employing a rigorous, mixed-method design to understand the current state of practice, culture, and learning from the perspective of both faculty and students, as well as beginning efforts to promote interdisciplinary faculty learning communities. Challenges that have been encountered will be addressed, as well as preliminary institutional data. Session participants will be asked to reflect on reform efforts at their home institutions and discuss obstacles and solutions they may face in similar efforts. **Joan M. Esson**, Associate Professor of Chemistry, **Beth Derringer**, Instructor and Math Coordinator, Academic Support Center, and **Paul Wendel**, Assistant Professor of Education—all of Otterbein University

11:00 am – 12:00 pm  CLOSING PLENARY  Grand Ballroom

**Transforming STEM Education: Evidence Based Research on STEM Teaching and Learning**
What strategies and policies are effectively connecting STEM innovation with relevant institutional change agendas such as those for underrepresented student success, general education reform, and assessment? How are campuses using evidence about what works in STEM education to enhance STEM learning for all students. Dr. Singer will share practices that are demonstrating the greatest promise for supporting inclusive approaches to advancing innovation and change in STEM teaching and learning across an array of institutional types. **Susan Rundell Singer**, Director, Division of Undergraduate Education—National Science Foundation

12:00 pm  CONFERENCE ENDS