Crossing Boundaries: Transforming STEM Education

November 13, 2015 | 4:30 - 6:30 pm
Seattle, Washington

POSTER SESSION

Theme 1: Integrative Undergraduate STEM Teaching and Learning

POSTER 1: BRAINS - Biosciences Retention and Academic Innovation Network for Students
University of Idaho’s Biosciences Retention and Academic Innovation Network for Students (BRAINS) takes an integrated, problem-solving approach to train undergraduates in relevant research techniques while addressing fundamental biological, chemical, and ecological questions. Re-designed laboratory modules for classes on organisms and environments, cells and the evolution of life, general microbiology, and principles of chemistry that focus on a common environmental question will be presented. Approaches to ensuring and assessing student learning outcomes including science concept knowledge, lab skills, and critical thinking skills will be highlighted.

Melinda A. Hamilton, Director, STEM Education, Patricia Hartzell, Professor, Department of Biological Sciences, and T. Rick Fletcher, Associate Professor, Department of Chemistry—all of University of Idaho

POSTER 2: Using ePortfolios and Folio-Thinking to Highlight and Advance Science Communication Skills
Stanford University’s Notation in Science Communication (NSC), launched in fall 2013 by the Program in Writing and Rhetoric, gives STEM undergraduates a way to develop and showcase their science communication expertise. In this poster, the facilitators will describe how the NSC uses ePortfolios and folio-thinking to develop, showcase, and evaluate students’ science communication skills throughout the two to three year program. They will discuss the technical and rhetorical implications of the Pathbrite ePortfolio platform, illuminating how the platform has shaped student, teacher, and reviewer experience. The poster will feature work examples from students who earned the NSC designation. Finally, the presenters will consider how the NSC program could serve as a model/case example for institutions interested in supporting STEM education and advancing science communication using ePortfolios.

Megan O’Connor, Academic Technology Specialist, Program in Writing and Rhetoric, and Jennifer Stonaker, Lecturer, Program in Writing and Rhetoric—both of Stanford University

POSTER 3: Using Large Data Analyses to Learn Lessons about the Impact of Pre-Health Undergraduate Experiences
The poster will address practical lessons learned from a large scale data analytics project specifically targeting tools for not only creating high-impact curricula, but also measuring the effect of such initiatives on improving the pre-health experience for undergraduate students and their long-term outcomes. The presenters will disseminate effective formal and informal learning strategies related to improving the pre-health infrastructure for the general student body, as well as for academically and socially vulnerable student populations.

Adrianne N. Haggins, Lecturer—University of Michigan

POSTER 4: Implementation of Student-Centered Pedagogy in Large Biology Courses
University of California, Los Angeles is confronting the nationally recognized STEM retention problem, a product of antiquated and ineffective teaching practices that pervade higher education. To improve student learning outcomes and persistence in STEM majors, the biology department is integrating student-centered pedagogy into introductory courses completed by thousands of STEM majors each year. Faculty are given support for professional development as it relates to teaching and provided with dedicated teaching post-docs to incorporate new technology and transition lecture-based courses to highly structured, interactive classrooms. This poster will describe the presenters’ strategy for motivating faculty to adopt student-centered pedagogy, the mixed-method assessment plan devised to evaluate its impact on both student and faculty stakeholders, and preliminary outcomes since implementing the project in fall 2014.

Erin R. Sanders, Director, Center for Education Innovation in Life Sciences and Assistant Adjunct Professor; M. Kevin Eagan, Managing Director, Higher Education Research Institute at UCLA and Assistant Professor in Residence; and Frank A. Laski, Chair, Department of Life Sciences Core Curriculum and Professor—all of University of California, Los Angeles
Theme 1: Integrative Undergraduate STEM Teaching and Learning

POSTER 5: Development of BioSQuaRE, an Instrument to Assess Undergraduate Biological Quantitative Skills
This poster will feature the Biological Science Quantitative Reasoning Exam (BioSQuaRE), an instrument designed collaboratively by members of seven institutions interested in innovative approaches to strengthening quantitative reasoning among our students. The presenters will share the motivation for the project, the iterative development of the instrument, and characteristics of items based on a small scale proposal at multiple institutions. Additionally, the process for collaborative development and implementation of a new assessment tool will be outlined.

Marcelo Vinces, Director, Center for Learning, Education and Research in the Sciences—Oberlin College; and Elizabeth Stanhope, Associate Professor of Mathematics—Lewis & Clark College

Theme 1: Integrative Undergraduate STEM Teaching and Learning

POSTER 6: Examining the Role of Numeracy in College STEM Courses
Is quantitative literacy a prerequisite for science literacy? Can students become discerning voters, savvy consumers and educated citizens without it? Should college science courses for nonmajors be focused on science appreciation, or should they engage students in the messy quantitative realities of modern science? This poster will present results from the recently developed and validated Quantitative Reasoning for College Science (QuaRCS) Assessment, which probes student quantitative reasoning skills and attitudes toward mathematics. The findings show that the majority of general education college science courses do not foster skill or attitude improvements over the course of a single semester, but show encouraging evidence for longer term trends and for intervention courses that emphasize quantitative literacy.

Katherine Follette, Postdoctoral Scholar—Stanford University

Theme 1: Integrative Undergraduate STEM Teaching and Learning

POSTER 7: Increasing and Retaining STEM Majors through an Integrated Freshman Year Experience
Sonoma State University (SSU), one of 23 campuses in the California State University system, is striving to meet the increased national demand for STEM majors. To this end, SSU has established a successful integrated freshman year experience titled “Science 120: A Watershed Year.” The course, supported through the NSF STEP program, engages students in scientific inquiry, connects them to a STEM discipline, and provides them with the skills they need to succeed. A Watershed Year has just finished its third year and has demonstrated significant gains in attracting and retaining majors. The innovative pedagogies and high-impact practices utilized have led to almost doubled retention rates for incoming STEM majors in their major as well as undeclared students being more than three times as likely to declare a STEM major than those not in the course. The course serves as a dynamic pathway for innovation and pedagogy to address the social and academic needs of students as well as a venue for faculty professional development.

Jeremy Qualls, Associate Professor of Physics and Astronomy and SCI 120 FYE Coordinator, and Martha Shott, Assistant Professor of Mathematics and Statistics—both of Sonoma State University

Theme 1: Integrative Undergraduate STEM Teaching and Learning

POSTER 8: Crossing Disciplinary and Cultural Boundaries to Improve Quantitative Skills
Advances in science have greater reliance on mathematical and statistical thinking and reasoning (quantitative skills, or QS) than ever before. As the dependence between science and mathematics increases, integration, interdisciplinarity, cross-disciplinarity and genuine collaboration become important considerations in teaching and learning. While some academics are coming to grips with the need to work together to develop students’ QS, there are many who would say that cultural differences divide biologists and mathematicians into different “academic tribes”, who operate in their own silos. The workflow model implemented by the MathBench Australia project in developing QS-related biology modules addresses concerns of the project team on the history of lack of collaboration and ensures balanced participation for both disciplines resulting in improved modules. This poster will share the contextualized online QS-biology modules and provide an overview of their development.

Cenk Suphioglu, Associate Professor of Biomedical Science—Deakin University; Katerina Thompson, Director of Undergraduate Research and Internship Programs—University of Maryland; and Shaun Belward, Senior Lecturer and Discipline Leader, Mathematics and Statistics—James Cook University

Theme 1: Integrative Undergraduate STEM Teaching and Learning

POSTER 9: Building Better Interactive Online Modules for Hybrid and Flipped Classes
Hybrid and flipped courses can be designed using online modules. This poster will share modules developed by professors at the University of California, Irvine to target learning misconceptions in an introductory biology course. In addition, modules have been used to flip upper division labs. These modules provided instructional support and clarification of concepts that students traditionally have had trouble comprehending. In addition, the modules were designed to capture student interest and encourage critical thinking by relating content to thought-provoking cases.
Conducted an experiment to assess the methodology of transferring students from one curriculum to another. The experiment involved 30,000 engineering students across the nation, representing a diverse group of schools.

**Helen L. Chen**, Research Scientist and Director of ePortfolio Initiatives, **Qu Jin**, Postdoctoral Scholar, Designing Education Lab, Department of Mechanical Engineering, and **Shannon Gilmartin**, Consulting Associate Professor, School of Engineering—all of Stanford University

---

**Theme 1: Integrative Undergraduate STEM Teaching and Learning**

**POSTER 10: Findings from the Engineering Majors Survey**
What are the underrepresented engineering students' innovation and entrepreneurship (I&E) interests and goals? How do these interests and goals change over time? In order to address these questions, the Engineering Majors Survey (EMS) was administered to over 30,000 engineering juniors and seniors across a nationally representative sample of 27 U.S. engineering schools in 2015. This poster will share EMS findings addressing a range of issues including the design and redesign of curricular and co-curricular experiences, cross-campus partnerships with business programs, career services, and gender differences in I&E experiences.

**POSTER 11: Integrative Learning - A Model for Student and Faculty Development**
As defined by AAC&U, integrative learning is “An understanding and a disposition that a student builds across the curriculum and co-curriculum, from making simple connections among ideas and experiences to synthesizing and transferring learning to new, complex situations within and beyond the campus.” This poster will outline a pilot project that allowed the students to reflect on the knowledge and attitudes about the concepts taught, to enhance the understanding of the concepts taught, and to assess their knowledge and attitudes about the concepts taught.

**Tennille Presley**, Associate Professor of Physics, and **Jill Keith**, Professor of Biochemistry and Chair—both of Winston-Salem State University

---

**POSTER 12: Promoting Leadership Development within Undergraduate STEM Curricula**
Scientists need to work together to find innovative solutions to complex problems greater than the sum of their parts. The Science Teaching and Research (STAR) Leadership Program at Austin College is designed to develop five behaviors necessary for effective leadership in science: problem solving, foresight and planning, interpersonal communication, collaboration, and moral consciousness. STAR achieves this goal through integrated leadership theory and activities in science courses at all levels of the curriculum that allow students to develop, practice, and reflect on these skills. The poster will describe the STAR program and share example activities and preliminary assessment results.

**Kelyne Reed**, Professor of Biology, **Lance Barton**, Associate Professor of Biology, and **Karla McCain**, Director of College-wide Assessment and Accreditation and Associate Professor of Chemistry—all of Austin College

---

**POSTER 13: Teaching Statistics and Research Methods - To Integrate or Not to Integrate?**
Coursework in statistics and research methods are core requirements in many majors. However, is there an optimal way to structure courses to facilitate student learning? For example, should statistics be required before research methods, should research methods be required before statistics, or should statistics and research methods be taught in a combined, integrated fashion? In this poster, the presenters review current literature on whether there is a preferred sequencing of methodology courses to enhance student learning outcomes. The poster will include assessment results from studies conducted in the psychology department of our institution comparing a non-integrated/two-course sequence that required statistics before research methods and an integrated/two-course sequence in which students shifted in an out of research methods and statistics units on short-term and long-term student outcomes. Students in the integrated sequence not only earned higher grades in initial coursework, they scored higher on later senior year assessments of their methodology skills.

**Kenn E. Barron**, Professor of Psychology and Co-Director, Motivation Research Institute, and **Kevin Apple**, Professor of Psychology—both of James Madison University

---

**POSTER 14: Writing Interactive Fiction - Developing an Interdisciplinary Computer Science/Creative Writing Course**
This poster will share an interdisciplinary-course development endeavor meant to leverage the similarities and potential synergy between programming and creative writing. Our efforts are based on the idea of re-framing programming tasks as
“Interactive-fiction-writing” tasks that are potentially more attractive to students who may find computer science intimidating. Creative tasks which incorporate students’ own interests and backgrounds are essential tools of culturally-sensitive pedagogy. By teaching students how to write interactive stories, faculty intend to empower them to find their own place in the computer science field by turning its tools into means of self-expression. As part of the course-development research, the presenters are currently working with English-major students to gain insight into ways in which they approach programming concepts and processes.

Alexandra Coman, Assistant Professor of Computer Science, Lisa Robeson, Professor of English, Chair of the Department of English, and Eric Baumgartner, Dean and Professor of Mechanical Engineering—all of Ohio Northern University

Theme 1: Integrative Undergraduate STEM Teaching and Learning

POSTER 15: Faculty Perspectives on Course-Based Undergraduate Research Experiences
Course-based undergraduate research experiences (CUREs) are a key component of national calls for science education reform. Studies have begun to show positive results for students engaged in CUREs, but there has been little focus on gains for faculty. This poster will present results from an interview-based study targeting the perspectives of a diversity of life science faculty (38 total) who have developed and taught CUREs. The presenters report their motivations for developing and teaching CUREs, and the benefits they receive. Results include 76% of participants reporting CUREs as a way to bridge teaching and research, 29% achieving service-related scholarship, and 74% reporting they simply enjoy teaching CUREs.

Erin E. Shortlidge, Postdoctoral Research Scholar, and Sara E. Brownell, Assistant Professor of Biology—both of Arizona State University; and Gita Bangera, Dean of Undergraduate Research—Bellevue College

Theme 1: Integrative Undergraduate STEM Teaching and Learning

POSTER 16: The Peer Enhanced Experiential Research in STEM (PEERS) project at Northeastern Illinois University
The poster will describe a multi-pronged approach to strengthen the STEM programs at NEIU and improve student engagement in STEM by nurturing a culture of research through embedding mini-research experiences within a classroom or laboratory setting. Peer leaders drawn from upper classes help guide students through these research experiences to create a sense of community of learners.

Sudha Srinivas, Professor of Physics—Northeastern Illinois University

Theme 1: Integrative Undergraduate STEM Teaching and Learning

POSTER 17: Crossing Boundaries in Undergraduate Biology Education
This poster will present a project that attempted to integrate mathematics and biology education. More often than not, mathematics courses for science majors do not specifically address the mathematics content and competencies necessary for success in the sciences. For this project, a mathematics educator, a doctoral student, and an ecology professor collaborated to develop modules that integrated relevant mathematics and ecology concepts. Qualitative and quantitative data were collected through surveys, exam scores, final grades, and focus group interviews to determine the impact of the modules on undergraduate students. In addition to monitoring their understanding of the mathematics and science content, students’ perceptions of and attitudes toward the role of mathematics in biology instruction were gauged. The poster will suggest implications of the results and highlight future avenues for study.

Mika Munakata, Professor of Mathematics Education, and Dirk Vanderklein, Professor of Ecology—both of Montclair State University

Theme 1: Integrative Undergraduate STEM Teaching and Learning

POSTER 18: Teaching to Learn – The Impact of Teaching Science in Elementary Schools on College Undergraduates
This poster presents year one findings from a mixed-methods study of the Teaching to Learn (T2L) project, in which undergraduates from two liberal arts colleges (one public and one private) teach weekly science lessons in elementary classrooms within a high-needs school district. This research explores the impacts of teaching science on undergraduates’ science course-taking and academic success. It also examines whether teaching science during one’s undergraduate career impacts undergraduates’ ability to communicate science or their understanding of the nature of science. Using data from surveys, observations, and questionnaires the presenters demonstrate the specific facets of the program that lead to the greatest impacts on undergraduates.

Christopher M. Himes, Jorge Endowed Professor in Education/STEM Program Manager—Massachusetts College of Liberal Arts

Theme 1: Integrative Undergraduate STEM Teaching and Learning

POSTER 19: Using MakerSpace Technology to Promote Innovation and Creativity
An interprofessional education course was offered to a mix of healthcare and engineering students from James Madison University in which teams of students developed an innovative solution to metabolic syndrome using Maker technologies
(3D printing, laser cutters/engravers, virtual reality, and related software). Students received training in problem solving techniques and working as a team. Examples of this training include using the StrengthsFinder analysis to form teams that build on the individual strengths present in the group and watching a video on the Challenger disaster and evaluating the systemic reasons that led to a failure in team decision making. Student outcomes related to teamwork, creativity and innovation, and engagement were measured using multiple methods including quantitative content analysis of student responses to prompts. Preliminary results indicate that interprofessional teams and MakerSpace technologies can enhance student learning and engagement.

**Patrice M. Ludwig**, Assistant Professor of Biology, **Erica J. Lewis**, Assistant Professor of Nursing, and **Jacquelyn Nagel**, Assistant Professor of Engineering—all of James Madison University

**Theme 1: Integrative Undergraduate STEM Teaching and Learning**

**POSTER 20: Enhancing STEM Education - An Example of Design-Based Implementation Research in Higher Education**

The presenters seek to enhance student learning in STEM classrooms through scaling the adoption and adaption of evidence-based instructional practices (EBIPs) using the design-based implementation research (DBIR) framework. This poster addresses challenges and opportunities for transferring DBIR from the K-12 setting, where it was developed, to higher education. The presenters use DBIR to catalyze change by intentionally feeding back research findings to improve their theory of action (i.e., implementation plan for the adoption and scaling of innovative practices). The feedback of research findings and the evolution of our project’s theory of action for scaling EBIPs will be shared.

**Ann Sitomer**, Postdoctoral Scholar, **Milo D. Koretsky**, Professor of Chemical Engineering, and **David Little**, Postdoctoral Scholar—all of Oregon State University

**Theme 1: Integrative Undergraduate STEM Teaching and Learning**

**POSTER 21: Teaching Computer Science and Mathematics through Audio and Music**

This poster will share the presenters’ experiences integrating audio and music to seamlessly incorporate modern teaching pedagogy such as creativity, student social interaction, collaboration and peer evaluation in our courses. This integration gives both students and teachers the opportunity to be creative and try new methods. The main ideas and reasons for choosing the cultural context of music for engaging students in the study of Computer Science are the seamless ways of teaching modular and abstract thinking through music composition and audio manipulation. Approaches to teaching linear algebra by applying its results to create different musical effects and to compare the results, are also presented. Efforts to develop a set of class projects and hands-on class activities to enhance student’s learning and understanding of on variety of topics such as superposition principle in linear algebra and graph transformations, and logarithm in college algebra are described as future advancements.

**Sambit Bhattacharya**, Associate Professor of Computer Science, **Chekad Sarami**, Associate Professor of Mathematics, and **Daniel Okunbor**, Professor of Computer Science—all of Fayetteville State University

**Theme 1: Integrative Undergraduate STEM Teaching and Learning**

**POSTER 22: Developing a Framework for Scaffolding Team Skills in Online STEM Programs**

Group projects are considered an effective approach to develop team skills in pedagogical literature. Recognizing that there are some inherent challenges in conducting group activities in the online environment, it is crucial to establish a well-thought out framework of implementing group activities to overcome those barriers. This poster will demonstrate a framework to incorporate group activities in an Engineer Technology program which scaffolds the development of the students’ team skills. Lessons learned and best practices of implementing group projects in an online learning environment will also be discussed in the poster.

**Lifang Shih**, Associate Dean of Technology Programs, and **Teresa Ferrer**, Academic Program Coordinator—both of Excelsior College

**Theme 1: Integrative Undergraduate STEM Teaching and Learning**

**POSTER 23: Inquiry-Based Learning for Every Biology Student**

Student success in STEM disciplines requires competency in written and oral communication, critical thinking, problem solving and collaboration. These skills can be built through inquiry-based experiences. The department of biology at Eastern Washington University recently updated its curriculum to optimize delivery of two research-centered courses to all majors (550 majors). In both a sophomore-level methods course and a senior Capstone course, students work in groups to design, conduct and present term-long, original research that is funded by course fees. This poster will outline each course’s learning objectives, provide examples of research projects, and summarize departmental investment of faculty and staff support.

**Luis F. Matos**, Assistant Professor of Biology, and **Joanna Joyner-Matos**, Associate Professor of Biology—both of Eastern Washington University
**POSTER 24: Using Living-Learning Cohorts to Foster Student Learning and Engagement in STEM**

Driven by the need to enhance student learning and engagement and increase retention rates in STEM disciplines, the department of natural sciences and mathematics partnered with the first year studies program in the fall of 2013 to launch a science cohort living-learning model. This poster will present the components of the living-learning community (shared courses and the living environment), the high-impact pedagogies of engagement adopted both in and out of the classroom, and its structure beyond the first year. Assessment data shows increased student engagement, retention and persistence in the sciences, and the positive impact the cohort model has on attracting and retaining underrepresented and first generation students in the sciences.

*Marie A. Turner, Associate Professor of Chemistry, Carrie L. Cokely, Associate Dean, Academic Affairs, and Ryan Theroux, Assistant Professor, First Year Studies—all of Curry College*

**POSTER 25: Embedding Undergraduate Research in Student Success Programs**

Undergraduates participating as facilitators in a peer-assisted learning (PAL) program (aimed at improving student success in STEM gateway courses) conduct action research projects that focus on student success in STEM. These projects provide an introductory, low-stakes (but authentic) research experience. PAL Facilitators are STEM majors, and work in cross-disciplinary teams on their projects. The great majority of PAL Facilitators are from traditionally at-risk groups: first-generation college, under-represented minority, and/or low-income; further, few (26% in the current year) had considered embarking on independent research prior to serving in the PAL program. This first exposure to an original research project includes all components of traditional research design, and, based on evaluation data, translates to an increased understanding of research design, data analysis, and critical assessment of project outcomes for these undergraduate leaders. In addition, their findings continually improve and provide important data about the PAL program, contributing directly to its future success.

*Jennifer Lundmark, Professor, Biological Sciences, and Lynn Tashiro, Professor, Physics and Astronomy and Director of Center for Teaching and Learning—both of California State University Sacramento*

**POSTER 26: Designing a Robust Summer Bridge Program Centered upon Interdisciplinary STEM Research**

Bridgewater State University was awarded an NSF–STEP grant in May of 2010. STREAMS, Student Retention Enhancement across Mathematics and Science, is designed upon best-practice approaches to increase the number of STEM graduates in the departments of biology, chemistry, computer science, geology, and physics. The STREAMS interventions include a summer bridge program, a residential learning community, curricular changes promoting inquiry-based teaching, structured learning assistance in gateway courses, and improved coordination of student transfers. The summer bridge program has a unique structure and supports underrepresented students in STEM through increased preparation and effective mentoring. The BSU summer bridge is an intense immersive experience in which students stay on campus for three weeks and perform 40 hours of research that is incorporated into their 6 credits of coursework, a writing-intensive first year seminar and mathematics course. Details of the program’s structure, interdisciplinary research, and the success of the participants will be presented.

*Stephen Waratuke, Associate Professor of Chemistry, Thomas Kling, Professor of Physics, and Matthew Salomone, Assistant Professor of Mathematics—all of Bridgewater State University*

**POSTER 27: Effective Use of Student Presentations in a Mathematics Course: An Analysis of Student Performance**

An effective use of student presentations was employed in a required mathematics course to increase students’ content knowledge and critical thinking skills. The professor used traditional methods for content delivery during the first half of the semester, and the students presented the continuing content information during the latter part of the semester. A comparative analysis was done on student performance based on examinations addressing the material presented in the traditional method versus material presented in the student presentations. The students’ performance was consistently higher on the examinations covering the material presented with the student presentations versus the material presented in the traditional method. This poster will include the benefits and pitfalls of student presentations; steps required to effectively plan, implement, and evaluate student presentations; and an explanation of the effects on students’ critical thinking, engagement, and content knowledge.

*Chinenye Ofodile, Professor of Mathematics, Rhonda Catina Porter, Professor of Mathematics Education, and Janis Carthon, Assistant Professor—all of Albany State University*
POSTER 28: Deliberative Pedagogy and Integrative STEM Learning - Scaffolding for Student Success
This poster will describe the model of deliberative pedagogy, an active learning strategy based on deliberative democracy models of citizen engagement in science policymaking. This integrative pedagogical approach, which has been developed and applied in a large, non-majors introductory biology course at an urban public university, revises the delivery of conventional introductory biology content around modules that engage students with current science policy controversies. Essential to this model is the scaffolding of individual and collaborative student experiences with peer-reviewed research, media coverage, and personal and community connections, which is built into the course structure. Through these experiences, students integrate both scientific and social and ethical content in the deliberative learning framework. Results of pre/post surveys and student learning outcomes indicate that this scaffolding approach leads to increased student engagement, confidence, content mastery, and the ability for students to apply STEM research and content to real-life issues.

Lisa H. Weasel, Associate Professor of Biology and Women, Gender and Sexuality Studies—Portland State University

POSTER 29: Implementation and Evaluation of a Course-Based Research Experience in Introductory Biology
In an effort to promote students’ development of scientific reasoning and experimental design skills, evidence suggests that introductory coursework in STEM should engage students in authentic, course-based research experiences (CURE). The presenters developed and implemented a novel CURE in a large, majors introductory biology course, which included structured professional development for graduate teaching assistants (GTAs) leading these laboratories. A quantitative approach was used to assess students’ development of scientific process skills and their motivation and attitudes about learning biology following participation in the CURE. These results were compared to data obtained from students in a traditional laboratory experience. Furthermore, evidence from a GTA focus group interview provided insight for appropriate structuring of the professional development experience to better promote inquiry teaching.

Jeffrey Olimpo, Assistant Professor of Biological Sciences—University of Texas at El Paso; Sue Ellen DeChenne, Assistant Professor of Biology Education, and Ginger Fisher, Assistant Professor of Biology—both of University of Northern Colorado

POSTER 30: Instilling Scientific Competencies in First-Year Students via Cell/Molecular-Based Food Research
Three years ago the presenters replaced the weekly laboratory activities in their first-year cellular and molecular systems course with integrated, multi-week modules that teach scientific competencies (as defined by AAAS’s Vision and Change report). Each module begins with exercises that promote mastery of essential skills. Next, students learn relevant methodologies. Finally, they apply these to conduct experiments that the students design, making use of the essential skills and methodologies they’ve learned. The course now consists of two modules: one investigating the effects of cooking parameters on the nutriceutical qualities of broccoli, and the other investigating the effects of isothiocyanates (a class of nutriceuticals) on the growth of human cancer cells. Data from pre-/post-testing analyses, student surveys, and scoring of student artifacts produced in the course show that students are making significant learning gains despite some increased anxiety, which the presenters are making progress in ameliorating.

David Koetje, Professor of Biology, and Herbert Fynnewever, Associate Professor of Chemistry and Biochemistry—both of Calvin College

POSTER 31: Broadening Opportunities and Leveraging Diversity - Collaborating across Boundaries
Advances in computing technology necessitate exposing students from all disciplines to computational thinking. Computational thinking includes concepts from computer science that empower specialists in all disciplines to more effectively adopt and develop computational tools to design systems and solve problems. Furthermore, diversity of perspectives, mindsets, and backgrounds improves performance and decision-making, resulting in more effective and creative solutions. This poster presents a replicable model for adapting existing courses to enable students with diverse perspectives and disciplinary backgrounds to collaborate and integrate concepts from their respective fields to develop innovative, socially relevant, computational solutions for real-world problems. Data analysis demonstrates significant increases in computational thinking among students enrolled in the collaborating courses. The poster additionally presents how the presenters addressed administrative challenges, managed logistics, and assessed the impact of the collaboration on learning outcomes.

Sarah Monisha Pulimood, Associate Professor and Chair of Computer Science, Kim Pearson, Associate Professor of English, and Diane Bates, Professor of Sociology—all of The College of New Jersey
The University of Maryland First-Year Innovation and Research Experience (FIRE) provides first-year students research experience, broad mentorship, and social connectivity that impacts academic success, personal resilience, and professional development through participation in faculty-led innovation and research streams. FIRE expands the well-established Freshman Research Initiative (FRI) developed at the University of Texas. Students earn degree credit while engaged with faculty and a peer cohort in the yearlong development of skill sets in authentic inquiry, critical thinking, innovation and experimental design, problem solving, leadership, and scholarly communication. The program is designed to better unite the twin research and educational missions of the institution while driving gains in student persistence, retention, degree completion, academic accomplishment, and acceptance into professional education programs. FIRE launched in the academic year 2014-15 and serves nearly 225 first-year freshmen through the operation of eight distinct research streams.

Patrick J. Killian, Director of First-Year Research Programs—University of Maryland

This poster will present the structure and outcomes of a comprehensive first-year model that aims to encourage the persistence, retention, and success of all students, and particularly underrepresented students in STEM disciplines. The HHMI funded program includes a summer bridge experience that focuses on skill and community building as well as an introduction to summer research. The summer program is followed by one of two year-long integrated (i.e., biology, chemistry, calculus, physics and computer science) sets of STEM courses taught around real-world problems that engage students in interdisciplinary research questions and active learning while building student’s higher order cognitive skills. Indirect and direct assessment of student outcomes will be reported as well as sharing best practices for engaging faculty and students across multiple disciplines in integrated courses and programs focused on student retention in STEM.

April Hill, Professor of Biology, Carol Parish, Professor of Chemistry, and Kathy Hoke, Professor of Mathematics—all of University of Richmond

Motivating student engagement in introductory science courses can be challenging when students tackle scientific principles divorced from real-world applications. Ocean acidification is a current environmental problem that can be explained using principles of equilibrium and acid-base chemistry. The presenter has developed and piloted an ocean acidification guided inquiry-based data analysis activity using real water chemistry and oyster larva growth data, designed to complement scientific skill and content learning objectives in advanced high school and introductory undergraduate chemistry courses. Based on pre- and post-activity surveys (n = 160), completion of the lesson increased students’ confidence in their ability to explain ocean acidification, their perception of the importance of the problem of ocean acidification, and their ability to explain ocean acidification using relevant chemical principles. This example suggests that incorporating real-world data analysis that allows students to investigate authentic problems of human interest can be a successful teaching strategy in science classes.

Hilary I. Palevsky, Graduate Student, School of Oceanography—University of Washington

Xavier University of Louisiana is nationally recognized for its STEM curricula. Xavier ranks first nationally in the number of African Americans earning undergraduate degrees in biology, chemistry, physics, and the physical sciences. Seventy percent of Xavier’s undergraduates major in the sciences, and Xavier is a national leader in the number of STEM majors who go on to receive M.D.s and Ph.D.s in science and engineering. However, most of Xavier’s students receive inadequate pre-college preparation in science and mathematics and so are academically underprepared to succeed in STEM majors. The I-CUBED, RISE and BUILD Programs are designed to address this under-preparedness, and provide support for students’ engagement and persistence in STEM disciplines from freshman through senior years. These programs work collaboratively to support initiatives that revamp freshman- through senior-level STEM courses, prepare students for research careers through specialized courses and workshops, and provide pedagogical support and mentor training to faculty.

Maryam Foroozesh, Chair, Division of Mathematical and Physical Sciences and Head, Department of Chemistry, Margaret W. Kelly, Endowed Professor in Chemistry, and Tiera S. Coston, Educational Improvement Specialist - STEM—all of Xavier University of Louisiana
POSTER 36: The Development of a Thriving, Large Scale Transformative PLTL Program in the Sciences and Mathematics
University of Texas at Dallas developed a campus-wide plan (Gateways to Excellence in Math and Science or “GEMS”) to enhance the quality of student learning in mathematics and science by providing students with innovative, intensive, and active learning experiences both inside and outside the classroom. The plan targets success, retention, and persistence in gateway math and science courses that play a critical role in influencing student decisions to continue their studies in degree programs heavily grounded in mathematics and the sciences. The cornerstone to the GEMS plan is a peer-led team learning (PLTL) program, born in general chemistry and extended into mathematics, physics, and organic chemistry that has led to remarkable increases in student performance and, equally important, a transformation in the academic culture of the campus. In this poster, the efforts, challenges, and successes in weaving PLTL into the fabric of a young, research university will be shared.

John W. Sibert, Associate Professor of Chemistry—The University of Texas at Dallas

POSTER 37: Chemistry and Biochemistry Learning Community for First Year Students
Learning communities are noted as a high-impact practice, offering active, experiential, and reflective learning as well as inclusion, a sense of community, and transition elements. The Sonoma State University Chemistry Department’s model for a Freshman Learning Community (FLC) includes two year-long courses: General Quantitative Chemistry (5 units lab, discussion and lecture), and Thinking Like a Scientist (2 units), a course dedicated to critical thinking, analysis of scientific data, evaluation of claims and literature, deductive reasoning, and the scientific method. This poster will share materials from the FLC.

Carmen Works, Professor of Chemistry, and Jennifer Lillig, Professor of Chemistry—both of Sonoma State University

POSTER 38: Retention of Diverse Students in STEM Fields through Achieving Excellence in Math, Engineering, and Science
This poster will provide evidence of the importance of early research experiences and faculty mentoring for students from diverse backgrounds as a means of recruitment and retention in STEM fields. Achieving Excellence in Math, Engineering, and Science Programs have been operating at Smith College since 2007. Data shows that pairing historically underrepresented first- and second-year students with faculty mentors for a paid research experience has closed the GPA gap in gateway courses between majority students and all students of color at Smith College since 2007. In addition, underrepresented students are now equally likely as majority students to pursue research beyond their second year and major in STEM fields.

Patricia DiBartolo, Professor of Psychology and Director of the Science Center, and Valerie Joseph, Mentoring Coordinator—both of Smith College

POSTER 39: Promoting Institutional Change in STEM Courses Using High-Impact Practices and Scaffolding
To address the needs of underrepresented minorities in STEM fields, many institutions attempt curriculum redesign. This offers unique opportunities and challenges. Student-centered environments and project-based approaches are considered effective pedagogy, but successful implementation of such practices requires facing challenges on multiple levels. This includes addressing the needs of students underprepared for an inquiry approach and helping faculty to invoke change across a department or institution. This poster will share techniques to design a more productive approach to STEM courses and programs, following the successful steps of the general biology course redesign for Pasadena City College.

Katie Rodriguez, Assistant Professor, School of Science and Math, Suzanne Iwanicki, Adjunct Instructor, School of Science and Math, and Diane Livio, Adjunct Instructor, School of Science and Math—all of Pasadena City College

POSTER 40: Broadening Opportunities and Leveraging Diversity
The Educational Opportunity Fund is an academic support program focused on increasing retention and graduation of underrepresented populations at The College of New Jersey. In collaboration with the School of Science, we developed a chemical biology course to run concurrently with a Foundations of Success course designed to develop skills necessary for success in STEM. During the summer bridge program, these courses were part of an integrated approach to allow entering STEM majors to learn core science concepts in conjunction with non-cognitive skills. Prior to the program, 28% of students had a GPA of 3.0 or higher and 79% had a 2.33 or higher in their first semester. Following the new program, these numbers increased dramatically to 67% above 3.0 (B) GPA and 91% above 2.33 (C+) GPA respectively.

Sudhir Nayak, Associate Professor of Biology, Kilpatry Cuesta, Associate Director, Educational Opportunity Fund Program, and John Marshall, Program Specialist, Educational Opportunity Fund Program—all of The College of New Jersey
**POSTER 41: Psychosocial and Academic Outcomes of an All-Female Residence Learning Community**

This poster presents results from a rare opportunity to assess the psychosocial and perceived academic outcomes of undergraduate female STEM students from the first Laurier Centre for Women in Science Residence Learning Community. Data was collected from the community’s residents using qualitative and quantitative methods. First-year female science students (N = 20) completed measures of self-esteem, social belongingness, academic motivation, undergraduate stress, coping, and system justification as well as semi-structured interviews. Results showed an all-female residence learning community positively affected perceived academic performance. However, women in science continue to be stigmatized and discriminated against on the basis of gender. Thus, results indicate that while women in STEM perceive benefits of an all-female learning environment, pervasive stereotypes of women continue to impact their experiences inside and outside of the classroom.

*Eden J.V. Hennessy, Student Research Coordinator, Laurier Centre for Women in Science, Anne E. Wilson, Professor of Psychology, and Shohini Ghose, Associate Professor of Physics and Computer Science; Director of the Laurier Centre for Women in Science (WinS) —all of Laurier University*

**POSTER 42: An Investigation of STEM as a Viable Career Option for GI Bill Recipients with Disabilities**

This poster will highlight findings of National Science Foundation funded study investigating the GI Bill recipients with disabilities perceptions of STEM careers. Participants will gain an understanding of strategies for developing research partnerships, underlying issues that may impact recruitment, enrollment, participation, and retention of GI Bill recipients with disabilities in STEM programs, and implications for future research and practice.

*Christine H. Grauer, Project Coordinator - Center on Transition Innovations, and Elizabeth Evans Getzel, Director - Center on Transition Innovations—both of Virginia Commonwealth University*

**POSTER 43: The Role of Interactions among Students and Faculty in Predicting a Supportive Campus Climate**

This poster shares a study that examined the impact of interactions on student perceptions of a supportive campus climate, a variable shown to predict STEM retention. First-year student (N=407) responses to the National Survey of Student Engagement were used to determine the role of (1) quality of interactions, (2) student-faculty interactions, and (3) discussions with diverse others in predicting a supportive campus climate. Results indicated the predictors accounted for 22% of the variance. Quality of interactions was the largest predictor, followed by student-faculty interactions and discussions with diverse others. When analyzing data from racial minority students (N=106), a population traditionally underrepresented in STEM fields, the overall model accounted for a smaller proportion of variance (16%). Quality of interactions remained a significant predictor, but student-faculty interactions and discussions with diverse others did not. It is important to investigate factors contributing to a supportive campus climate to increase STEM retention among underrepresented students.

*Kristina A. Monteiro, Graduate Student—University of Rhode Island; and Michael C. Savaria, Graduate Student at the University of Massachusetts Dartmouth—University of Massachusetts Dartmouth*

**POSTER 44: Gateway to Research Careers in Science**

The Gateway to Research Careers in Science program is a merit-based scholarship and research program that supports and motivates students from groups that are historically underrepresented in the sciences, to prepare them for graduate school and research-based careers as scientists. The core of the Gateway program is early and intensive research mentoring by faculty, combined with scholarships and supportive programmatic activities that build community. It starts in the freshman year and continues through graduation to developmentally build student identity as scientists. The Gateway program started in the biology department with an NSF grant and the school of social science has recently adopted a model that extends it and modifies it for all science departments. A key step was partnering with the department of admissions to re-identify funds that already were allocated to merit scholarships for underrepresented students.

*Janet A. Morrison, Professor and Chair of Biology, Director of Gateway to Graduate School, Pelson Chair in Faculty-Student Engagement—The College of New Jersey*

**POSTER 45: Leveraging Existing Structures into NSF S-STEM Grants**

The College of New Jersey’s S-STEM program for biology and chemistry majors yielded significant improvements in student success. Five-year graduation rates increased from 65% to 82% for all students in the program, from 71% to 100% for Hispanic students, and from 49% to 79% for African American students. The strength of the program is attributed to
support structures that required minimal additional financial support, including an abbreviated bridge program interspersed during orientation week for first-year students, peer and faculty mentoring within the major, a redesign of tutoring services, the ripple effect of raising the consciousness of faculty and staff to the needs of at-risk students, and the halo effect of both destigmatizing the use of support services and enhancing relationships between students and faculty. The college's success in obtaining external funding was due in part to the prior-existence of these structures.

Donald Lovett, Professor of Biology, Co-Director of PERSIST S-STEM Program, Sudhir Nayak, Associate Professor of Biology, Leadership Team for PERSIST S-STEM Program, and S. Monisha Pulimood, Associate Professor and Chair of Computer Science, Co-Director of iPics S-STEM Program—all of The College of New Jersey

Theme 2: Inclusive Excellence/Broadening Participation in STEM Higher Education

POSTER 46: Improving Retention of Underrepresented Students in Biology at a Liberal Arts College.
Susquehanna University's biology department has utilized an NSF S-STEM grant received in 2012 to create a program of support for underrepresented students with the aim of increasing persistence to graduation. In addition to awarding need based financial aid, specific program elements included 1) establishing student cohorts to provide peer support, 2) developing a pre-matriculation Bridge program to facilitate students’ transition to college, and 3) providing students with early opportunities for undergraduate research at Susquehanna and other institutions. This poster will discuss how these initiatives were implemented, and describe the positive impact of this program on student success and retention.

Thomas C. Peeler, Associate Professor of Biology, Alissa Packer, Associate Professor of Biology, and Margaret T. Peeler, Professor of Biology—all of Susquehanna University

Theme 2: Inclusive Excellence/Broadening Participation in STEM Higher Education

POSTER 47: Increasing Community College Students’ Access to Small/ Midsized Four-Year Colleges
Recent studies by various organizations concerned with STEM education have found that small and midsized private colleges make valuable contributions at preparing the next generation of the nation's scientists. These reports suggest that such schools have better rates of persistence and completion for STEM majors. Similar studies that focus on underrepresented minorities (URMs) indicate that graduation rates for URM in STEM are greater at small/midsized colleges when compared to larger institutions. With many URMs beginning their STEM education at community colleges, what work is being done by community colleges to encourage STEM transfers to small/medium sized colleges? What efforts are small/medium sized colleges making to recruit and matriculate STEM transfers who are URMs? Do URMs in STEM see small/medium sized colleges as viable options for transfer? This study utilizes quantitative and qualitative data to explore the aforementioned research questions.


Theme 2: Inclusive Excellence/Broadening Participation in STEM Higher Education

POSTER 48: Overcoming Barriers to Practice-Based STEM Disciplines for Students with Disabilities
Although undergraduate students with disabilities enroll in STEM disciplines at the same percentage as their classmates without disabilities, their participation in post-graduate STEM education and careers is significantly lower. The Institute for Accessible Science (IAS) seeks to increase participation of students with disabilities in STEM careers by providing interventions, including: STEM-based assistive technologies, summer research internships for students with disabilities, the Accessible Biomedical Learning Laboratory, and the IAS Internet hub for disseminating information and tools. This poster will present evidence that enabling students with physical disabilities to more actively and independently participate in lab courses, research internships, and other practical learning activities promotes greater success and interest in pursuing STEM higher educating and careers.

Bradley S. Duerstock, Associate Professor of Engineering Practice, Wilella D. Burgess, Managing Director -- Discovery Learning Research Center, and Lisa Hilliard, Academic Advisor Health Sciences—all of Purdue University

Theme 2: Inclusive Excellence/Broadening Participation in STEM Higher Education

POSTER 49: Empirically Testing a Three-Step Intervention to Increase Gender Diversity in STEM Faculty
Faculty homogeneity limits creativity, discovery, and job satisfaction, but the vast majority of university faculty in STEM fields are men. The presenters conducted a randomized and controlled three-step faculty search intervention based in self-determination theory aimed at increasing the number of women faculty in STEM where increasing diversity had historically proved elusive. Results show the numbers of women candidates considered for and offered tenure-track positions were significantly higher in the intervention groups compared to controls. Searches in the intervention were 6.3 times more likely to make an offer to a woman candidate, and women who were made an offer were 5.8 times more likely to accept the offer.
from an intervention search. Although the focus was on increasing women faculty within STEM, the intervention can be adapted to other scientific and academic communities to advance diversity along any dimension.

Ian M. Handley, Associate Professor of Psychology and Co-Director of ADVANCE, and Martha Potvin, Provost and Vice President for Academic Affairs—both of Montana State University

Theme 2: Inclusive Excellence/Broadening Participation in STEM Higher Education

POSTER 50: Julian Scholars - An NSF S-STEM Project with a 100% Graduation Rate and Subsequent Institutional Change

In 2009, the National Science Foundation awarded DePauw University half a million dollars to fund a four-year program to recruit and retain central Indiana first-generation students in STEM fields. Highlights of the project include a week-long summer research experience bridging high school and college, common classes for each cohort, mentoring, one-on-one resume and internship/research counseling, and scholarships. The presenters anticipate a 100% graduation rate for the Julian Scholars, with the last cohort graduating May 2015, and a 92% STEM graduation rate. Of the 2013 and 2014 STEM graduates, 42% are now in graduate school. DePauw committed $1.4M of its own resources to the Julian Scholars Program and, at the conclusion of the grant period, launched additional programs for first-generation and minority STEM students, including securing an Arthur Vining Davis grant to fund underrepresented STEM student summer research opportunities and joining Stanford University research that provides an intervention for first-year, at-risk students.

Gloria Townsend, Professor of Computer Science—DePauw University

Theme 2: Inclusive Excellence/Broadening Participation in STEM Higher Education

POSTER 51: AccessEngineering - Improving Engineering by Increasing the Participation of People with Disabilities

Despite the fact that students with disabilities are underrepresented in engineering, there are not many resources designed to increase their participation. This poster will present efforts through AccessEngineering to make engineering departments and courses more accessible and welcoming to students with disabilities, while improving engineering fields with their expertise. This includes curricula that incorporate accessibility and universal design as well as resources related to accessible labs. The resources have been developed through collaborations between engineering faculty, disability service professionals, and people with disabilities and present strategies that range from easy to implement to more involved.

Brianna Blaser, Coordinator/Counselor, Katherine M. Steele, Assistant Professor, Mechanical Engineering, and Sheryl Burgstahler, Director, Accessible Technology Services—all of University of Washington

Theme 2: Inclusive Excellence/Broadening Participation in STEM Higher Education

POSTER 52: The Case for LGBTQ+ Faculty and Students in STEM

The STEM industry has recognized the diversity needs of openly Lesbian, Gay, Bisexual, Transgender, Queer, Plus others (LGBTQ+) employees. LGBTQ+ people in higher education are an at-risk group, with workplace experiences lagging behind those of industry peers. STEM LGBTQ+ faculty, in particular, experience worse climates than their cisgendered, heterosexual STEM colleagues and their LGBTQ+ humanities colleagues. A campus climate survey conducted at The College of New Jersey produced similar results for many minority groups. Guided by these data, the School of Science is improving the climate by facilitating the intersectionality between the LGBTQ+ and STEM identities of faculty and students with initiatives such as a new faculty/staff affinity group, a LGBTQ+ STEM student club, seminars, and travel support for faculty and students to attend national conferences.

Benny C. Chan, Associate Professor Chemistry, Co-Director of the PERSIST S-STEM Program, Suriza Van der Sandt, Associate Professor of Mathematics and Statistics, and Matthew Cathell, Assistant Professor of Technological Studies—all of The College of New Jersey

Theme 3: Supporting, Rewarding, and Building Capacity of STEM Faculty

POSTER 53: Promoting Student Access and Success in STEM through the Teaching-Research Nexus

In 2011, Georgia Perimeter College was one of seven institutions and the only 2-year institution awarded a multi-year University System of Georgia STEM Initiative II Grant. Growing out of the need to find innovative ways to deepen faculty engagement and student success in STEM, the STEM Faculty Mini-Grant program was implemented. The program was developed to provide resources for faculty who participate in scholarly activities that improve student learning and/or engage students in research experiences beyond the traditional classroom environment. This poster will share institutional changes made to implement the program, challenges faced, program successes, and elicit suggestions for future improvement.

Cynthia Y. Lester, Executive Director of STEM Initiatives—Georgia Perimeter College
POSTER 54: Increasing the Use of Active Teaching Methods by STEM Faculty

Active teaching methods are critical for STEM student learning. This poster will present faculty development programs that encourage active teaching in undergraduate STEM courses by an internationally recognized and award-winning teaching and learning center. Details of the institution’s Technology Enhanced Active Learning (TEAL) classrooms that increased student success rates in introductory statistics and algebra classes by 20% as well as outcomes of faculty learning communities and mentoring will be presented.

*Marilyn Lockhart, Director of the Center for Faculty Excellence and Professor Adult and Higher Education—Montana State University*

POSTER 55: SPARCT - A Faculty Development Program to Transform STEM Teaching Culture

A multidisciplinary STEM faculty professional development program called STEM Professional Academy to Reinvigorate the Culture of Teaching (SPARCT) is in its second year at Florida Gulf Coast University. This program seeks to improve evidence-based practices in the introductory STEM classroom, develop professional peer observations, and enhance student learning in introductory STEM courses through STEM faculty projects in the scholarship of teaching and learning. SPARCT includes a 36-hour summer STEM academy and a commitment to a faculty learning community during the subsequent academic year. One year of SPARCT has been completed. Qualitative data and results collected from the videos, quantitative data from the student surveys, and faculty feedback will be shared.

*Laura Frost, Director, Whitaker Center for STEM Education—Florida Gulf Coast University*

POSTER 56: Evaluation of a Faculty Development Program to Design Inquiry-Based Curriculum across a Department

This poster presentation describes the implementation and evaluation of a Faculty Learning Community (FLC). FLCS are a replicable strategy for providing faculty professional development, and have been highly successful at Sacramento State, a large, primarily undergraduate, Hispanic serving institution. Undergraduate biology students – under-represented minority students and some future STEM teachers – participate with faculty in the FLC to design course-based undergraduate research experiences (CUREs) in twelve existing biology courses that span the curriculum. Nearly three-quarters of faculty in the department of biological sciences work together to integrate the courses. Individual faculty are aided by faculty-student teams to develop their CUREs, and are financially rewarded for their participation and the production of deliverable curriculum. The success of the professional development experience, and the CUREs themselves, will be reported on. In particular, the poster will focus on outcomes from a week-long intensive summer professional development institute focused on initial curriculum development and evaluation.

*Kelly K. McDonald, Assistant Professor of Biological Sciences, Thomas E. Landerholm, Professor of Biological Sciences, and Allison R. Martin, Graduate Student in Biological Sciences—all of California State University Sacramento*

POSTER 57: Using Course Syllabi as a Tool for Increasing Multicultural Engagement in STEM Fields

Course syllabi are often overlooked by faculty, who are frequently tempted to reuse an outdated syllabus or reluctantly prepare a new document at the last minute. However, syllabi are important contracts that bind faculty and students together, providing the student with a first glimpse into what the course entails and how it will impact their life. Care must be taken in crafting a syllabus to ensure that it expresses multicultural engagement to recruit and retain students from underrepresented populations. While these engagement techniques are important for all majors, it is crucial for STEM fields where there are many social barriers in place to dissuade certain students from entering into the field.

*Michael C. Savaria, Graduate Student—University of Massachusetts Dartmouth; and Kristina A. Monteiro, Graduate Student—The University of Rhode Island*

POSTER 58: Supporting Faculty in the Accountability Era: Fostering Instructional Data Use for STEM Improvement

The pressure is on postsecondary institutions to ensure that institutional decisions are informed by rigorous evidence about student learning, degree completion, and success in the labor market. With insights from faculty themselves, educational leaders can design and promote data-related policies and reform practices that are aligned with local structures and that are less likely to be rejected outright or undergo “lethal mutations” (Brown & Campione, 1996). A combination of a top-down and bottom-up approach to change shifts emphasis from data solely as a punitive compliance measure to one that can support educators in their daily work, serving as a mechanism for diagnosing problems and challenges in the classroom. Based on a qualitative study, the presenters will spell out five key findings on how dozens of STEM faculty use data to
inform their teaching and advance five recommendations for educational leaders as they work to encourage instructional data systems at their institutions.

Jana Bouwma-Gearhart, Associate Professor, Postsecondary STEM Education—Oregon State University; and Matthew Hora, Assistant Professor of Adult Teaching and Learning, and Hyong Park, Graduate Student Researcher—both of University of Wisconsin-Madison

Theme 3: Supporting, Rewarding, and Building Capacity of STEM Faculty

POSTER 59: Boyer Model of Scholarship and the Impact of Reduced Load on the Scholarly Productivity of STEM Faculty

Scholarly productivity in teaching-based institutions with high teaching loads and service expectations can be a challenge, especially for new faculty who are occupied with course development. Funded by an NSF ADVANCE-PAID grant, release load and research funds have been provided to female STEM faculty. This poster will share a rubric that was developed based on the Boyer Model of Scholarship attributes to measure the impact of the release load in scholarship productivity. Awardees are compared with peers in similar fields. The results clearly present the benefit of release time and research funds to scholarly productivity of faculty and undergraduate students. The university has now institutionalized a scholarship release time fund that allows all faculty to apply for up to eight credits of release time per academic year.

Karinna M. Vernaza, Professor of Mechanical Engineering and Associate Dean, and Weslene Tallmadge, Professor of Chemistry—both of Gannon University

Theme 3: Supporting, Rewarding, and Building Capacity of STEM Faculty

POSTER 60: Growing Professional Learning Communities through Interdisciplinary Collaboration and G6-16 Partnerships

A multilayered model of professional development incorporated interdisciplinary collaboration, grade 6-12 partnerships, and implementation of Critical Friends protocols to enhance teaching. STEM faculty collaborated with English and education faculty to develop and facilitate grade 6-12 teacher workshops. Continued interdisciplinary collaboration using Critical Friends protocols enabled STEM faculty to focus on elements of their teaching that relate to LEAP essential learning outcomes and principles of excellence. Scalable across a variety of institutional contexts, this poster presents the benefits of this professional development model, including quantative and qualitative data on scholarly activity and teaching enrichment.

Darlene Panvini, Professor and Chair of Biology, Ryan Fox, Assistant Professor of Mathematics Education, Department of Mathematics and Computer Science, and Lauren Lunsford, Associate Dean, College of Liberal Arts and Social Sciences—all of Belmont University

Theme 3: Supporting, Rewarding, and Building Capacity of STEM Faculty

POSTER 61: Bringing Online Teaching Resources and Communities to Undergraduate Life Science Educators

With an ever-expanding wealth of scientific knowledge online, there is a need for educators to be adept at finding, evaluating, and using these resources for their teaching. The Life Science Teaching Resource Community (LifeSciTRC) Scholars and Fellows Program teaches undergraduate life science educators how to 1) find, evaluate, and effectively use online resources for student-centered learning; 2) align existing materials to the AAAS/NSF Vision and Change core concepts and competencies; and 3) participate in an online community focused on evidence-based teaching. This poster will describe the program and its impacts on undergraduate life science educators from across the United States.

Miranda Byse, Program Manager, Life Science Teaching Resource Community and Professional Skills Training—American Physiological Society

Theme 3: Supporting, Rewarding, and Building Capacity of STEM Faculty

POSTER 62: Fighting the Fear - A Faculty Collaboration to make Statistics Accessible to Introductory Students

Two departments within a private Hispanic and American-Indian serving university formed a professional collaboration to bring relevant mathematics education to a diverse student body. A team of four faculty from the departments of mathematics and social science developed an iterative process of curriculum development using participatory action research methods, where faculty engaged in dialogue, applied learning in the classroom, collectively reflected on the results, and modified instruction accordingly. This process resulted in aligned curriculum for introductory statistics courses that are general undergraduate requirements. Shared curricula align key concepts and learning outcomes, yet attend to the specific content needs of students across a range of majors.

Kristen Maxwell, Assistant Professor, Mathematics, Sarah Augustine, Assistant Professor, Social Science, and Tamara Wiley-Fauth, Assistant Professor, Mathematics—all of Heritage University
Theme 4: Institutional Transformation for Undergraduate STEM Education Reform

POSTER 63: Supporting Teaching Innovation to Promote STEM Student Success
This poster will explore how Adrianna Kezar’s work on institutional change and Etienne Wenger’s theories regarding how the community of practice model of professional development can be employed to transform institutions by creating a culture of evidence-based teaching and learning that fosters deep learning in students and provides sustained faculty development opportunities. The poster will share the institutional data driving California State University-San Bernardino’s College of Natural Sciences to change, how the college is using inquiry-based faculty learning communities to translate Wenger’s design principles for “alive” communities of practice, and how the presenters are engaging in Kezar’s process for institutional change. The redesigned courses include those for STEM majors, service courses, and courses for future K-12 teachers.
David Polcyn, Professor of Biology, and Laura Woodney, Associate Professor of Physics—both of California State University-San Bernardino

Theme 4: Institutional Transformation for Undergraduate STEM Education Reform

POSTER 64: Enhancing Student Success in Biology, Chemistry, and Physics by Transforming the Faculty Culture
Change is ubiquitous within colleges and universities but sustained and directed change is notoriously challenging to implement. An expansive scholarly literature on organizational change theory in corporate settings has documented what is needed to encourage and sustain change, but much less effort has been directed to higher education settings. Recently Henderson, Beach, and Finkelstein have reviewed change strategies in the STEM disciplines suggesting some effective directions as well as identifying substantial missing scholarly evidence. This poster will present a model that reflects recent literature and report initial results of implementing several change strategies. The central elements of the approach involves identified departmental teaching and learning liaisons (faculty who have received special training), a unique faculty development component by the teaching center, a vertical integration of this work, and the explicit acknowledgement that change happens locally.
Howard E. Jackson, Professor of Physics, Jill R. Beyette, Assistant Professor of Biology, and Anne M. Vonderheide, Assistant Professor of Chemistry—all of University of Cincinnati

Theme 4: Institutional Transformation for Undergraduate STEM Education Reform

POSTER 65: Interventions for First-Time STEM Students Informed by Mixed Methods Analysis
Using cognitive, non-cognitive, and environmental factors, Montana State University developed an effort to identify and improve persistence of at-risk, first-time students (including students majoring in STEM disciplines). Cognitive factors include ACT and SAT scores and high school GPA. Non-cognitive factors were assessed using the Beginning College Survey of Student Engagement. Environmental factors include engagement facilitated and measured by the ChampChange program (campus engagement tracking and rewards system). Using this mixed method trial, MSU was able to identify students who withdrew at higher than average percentages. In the next phase of the effort, MSU is using this model to provide relevant and appropriate interventions to students targeted for being at risk. The aim of this poster is to present the results of the study, review STEM related intervention efforts catalyzed by this research, and share implications and possibilities for other campuses
Carina Beck, Director, Allen Yarnell Center for Student Success, and Diane Donnelly, Director, University Students and Academic Advising Center—both of Montana State University

Theme 4: Institutional Transformation for Undergraduate STEM Education Reform

POSTER 66: InTeGrate - Using a Systems Approach to Effect Educational Transformation
The InTeGrate project is transforming teaching and learning about the Earth in higher education by situating learning about the Earth in the context of societal issues, and by locating learning not only within geoscience programs but also in other majors, and across the undergraduate curriculum. Over 100 faculty are involved in developing teaching materials rigorously designed and tested to meet InTeGrate's goals and to employ engaged teaching practices demonstrated to improve student learning. These materials are being adopted by programs and institutions as part of InTeGrate funded implementation programs which will serve as new models for learning about the Earth in higher education. Workshops, webinars, and an extensive website are expanding
Cathryn A. Mandauro, Director of Science Education Resource Center—Carleton College

Theme 4: Institutional Transformation for Undergraduate STEM Education Reform

POSTER 67: Transformation of the Introductory Biology Experience for All Students
The Northwest Biosciences Consortium is a group of two-year and four-year college faculty at public and private institutions in the state of Oregon. Funded by an NSF grant, this group is working towards creating student-centered, integrated, and investigative introductory biology experiences for all students aligned with the action items in Vision and Change: A Call to
Action. This poster will share recent faculty development efforts focused on assisting faculty to develop active learning techniques that enhance their efforts to align introductory biology courses for both majors and non-majors with the content and skills outlined in Vision and Change.

**Anne E. Kruchten**, Chair and Associate Professor of Biology—Linthicum Heights; **Walter Shriner**, Instructor of Biology—Mt. Hood Community College; and **Stasinos Stavrianides**, Professor of Exercise Science—Willamette University

*Theme 4: Institutional Transformation for Undergraduate STEM Education Reform*

**POSTER 68: Transforming STEM Education at Two-Year Colleges**

Over the past four years, Edmonds Community College has been embarking on a great change in STEM programs in part due to an NSF-funded STEP project, Relationships in Science Education ( RiSE). The presenters will focus on three areas of transformation that are ongoing in the STEM division: faculty relationships (including with adjunct faculty) and increased collaborations, student relationships and community building, and changes in teaching and learning. The poster presentation will provide examples of changes implemented as well as quantitative and qualitative assessment results of the RiSE program.

**Deann Leoni,** Mathematics Instructor, **Jenny McFarland,** Biology Instructor, and **Rachel Wade,** Physics Instructor—all of Edmonds Community College

*Theme 4: Institutional Transformation for Undergraduate STEM Education Reform*

**POSTER 69: Increasing Retention and GPA Using Living-Learning Communities and Research Collaboration**

The St. Edward’s University STEP Project, the Community for Achievement in Science, Academics and Research, aimed to increase the number of STEM graduates and increase retention and GPA with particular attention to minorities and women. To obtain this goal, a phased program of high-impact practices was implemented in 2010: 1) a summer, pre-college academic enhancement workshop; 2) a first-year experience course for students in STEM disciplines directly linked to a science living-learning community; and 3) early undergraduate research and interdisciplinary learning opportunities across all STEM disciplines. Using a very hands-on managerial approach combined with intentional and formative assessment practices and procedures, the presenters achieved success as the overall retention rate showed an increase of 25% and an increase in average GPA by .25 to .69 depending on cohort.

**David A. Blair**, Director of Institutional Assessment, and **Richard Kopiec**, Professor of Computer Science and Chemistry—both of St. Edward’s University

*Theme 4: Institutional Transformation for Undergraduate STEM Education Reform*

**POSTER 70: Collaborative Learning through Faculty-Student Learning Communities in STEM**

The goal of the faculty-student learning community is to develop and promote student engagement in critical thinking and problem solving research through collaborative curricular exercises on global issues. Challenges and strategies of building collaborative learning will be displayed. The theoretical or conceptual framework is psychoanalytic critical thinking methodology.

**Anita Mandal,** Associate Professor of Biology, **Felicia Wider-Lewis,** Assistant Professor of Mathematics, and **Suzan Armstrong-West,** Associate Professor of Psychology—all of Edward Waters College

*Theme 4: Institutional Transformation for Undergraduate STEM Education Reform*

**POSTER 71: Collaborations for SySTEMic Change - A Scalable Model for Student Transitions**

The critical juncture between pre-college and college is generally accepted as a strong determinant of socio-economic mobility and a well-informed citizenry. Heritage University, a minority serving institution, will discuss a 3-year program to increase institutional capacity and student achievement in STEM content. A most notable result is cooperative institutional support for common STEM learning outcomes aligned to national reforms in STEM education. To improve the student transition from pre-college to college and beyond, a collaborative professional learning community (PLC) of university faculty and STEM high school instructors was implemented. The results of the PLC include the transfer of high school teachers to university instruction, improved pedagogy of university faculty, and increased student achievement in STEM content. The modified PLC model is shown to be particularly effective for small school districts and universities.

**Cheryl Young,** Associate Professor of Geology, **STEM Activities Coordinator, Kristen Maxwell,** Assistant Professor, Mathematics, and **Tamara Wiley-Fauth,** Assistant Professor, Mathematics—all of Heritage University

*Theme 4: Institutional Transformation for Undergraduate STEM Education Reform*

**POSTER 72: What’s Space Got to Do with It?**

Purdue University has been engaged in an ambitious, campus-wide initiative of faculty professional development to enhance active teaching strategies—particularly in large, foundational courses. To support these pedagogical changes, the university is also building active learning classrooms. This poster will present preliminary results of a campus-wide study at
a research university exploring the impact of space on faculty practice, feelings of self-efficacy, and satisfaction with teaching. The presenters will also share challenges and considerations inherent to effectively scheduling active learning classrooms to best support faculty pedagogical needs while maintaining efficiency.

Wilhelma D. Burgess, Managing Director, Discovery Learning Research Center, Loran C. Parker, Assessment Specialist Discovery Learning Research Center, and M. Brooke Robertshaw, Assessment and Data Analyst Office of Institutional Assessment—all of Purdue University

Theme 4: Institutional Transformation for Undergraduate STEM Education Reform

POSTER 73: Implementing a Reformed Curriculum in a Multi-Section Undergraduate General Chemistry Course
The implementation efforts of a reformed two-course sequence curriculum for undergraduate general chemistry, Chemical Thinking, will be reported. The analysis uses data obtained from classroom observations including the Classroom Observation Protocol for Undergraduate STEM and interviews with the course curriculum developers and instructors teaching the new curriculum for the first time. The presenters assessed curriculum fidelity, instructor preparation to teach the curriculum, and techniques used to manage student thinking. The poster will highlight implementation successes and challenges and offer suggestions for achieving and maintaining fidelity between course sections and improving a departmental culture favorable for curriculum reform.

Jonathan Cox, Postdoctoral Research Associate, Debra Tomanek, Associate Vice Provost for Instruction and Assessment, and Gail Burd, Senior Vice Provost for Academic Affairs—all of University of Arizona

Theme 4: Institutional Transformation for Undergraduate STEM Education Reform

POSTER 74: Discipline-Based Experts for Teaching Transformation - The Carl Wieman Science Education Initiative
Since 2007, the Carl Wieman Science Education Initiative at the University of British Columbia has had extensive success in transforming undergraduate science education, influencing the teaching of faculty and the learning of tens of thousands of students, with a particular specialty in high-engagement methods in large classrooms. The key factor in this change has been the addition of Science Teaching and Learning Fellows (STLFs) to departments: an STLF has deep disciplinary expertise and training in current learning science in order to partner with faculty members as a course consultant in creating or adapting evidence-based methods and measuring effectiveness toward learning. A significant knowledge base of practical resources and published evidence of effectiveness has accrued and the STLF model for faculty development is being adopted elsewhere. This poster will outline the model for change, share lessons learned, and present evidence of teaching changes with a summary of assessments and results.

Warren J. Code, Associate Director of Science Centre for Learning and Teaching—University of British Columbia