



NETWORK
for ACADEMIC
RENEWAL

Transforming STEM Higher Education

November 7-9, 2019

Chicago, IL

<https://www.aacu.org/conferences/stem/2019>

PRELIMINARY PROGRAM OF EVENTS

THURSDAY, NOVEMBER 7, 2019

Promenade, Fourth Floor

9:30 A.M. – 7:00 P.M. CONFERENCE REGISTRATION

2:00 P.M. – 5:00 P.M. PRECONFERENCE WORKSHOPS

Erie Room, Second Floor

Workshop 1: Sparks for Change: Advancing Leadership for Broadening Participation of Underrepresented Faculty

The NSF-Geoscience Opportunities for Leadership in Diversity Sparks for Change program focuses on improving the retention of underrepresented faculty in STEM using small group theory to overcome institutional inertia towards broadening participation (BP) efforts. This transferable intervention is based on “triads” comprised of the experience and BP values of an early career minority faculty member, a supportive later-career faculty member in the same department and an external broadening participation expert, who are provided with appropriate leadership training and supported in developing action plans. This workshop offers faculty and administrators who are already engaged in or committed to BP the opportunity to enhance their leadership capacity, recognize the value of small group intervention, and spark action toward valuing, rewarding, and distributing BP efforts in their departments.

Rebecca L. Batchelor, Adjunct Professor of Biology—University of Puerto Rico Humacao; **Brenee King**, KS-LSAMP Program Administrator—Kansas State University; **Sennai Habtes**, Assistant Professor of Biological Oceanography—University of the Virgin Islands; **Robert Kirsch**, Assistant Professor, Faculty of Leadership and Interdisciplinary Studies—Arizona State University; and **Jeremy Williams**, Assistant Professor of Geology—Kent State University

Michigan Room B, Second Floor

Workshop 2: Building Inclusive Leadership the Project Kaleidoscope (PKAL) Way

PKAL has thirty years of experience transforming STEM education. This includes success providing effective leadership development for STEM faculty through the STEM Leadership Institute (SLI). Nearly 60 percent of the SLI’s curriculum is grounded in experiential learning using the framework of Kolb’s Experiential Learning Cycle. Join PKAL SLI leaders and mentors in experiential learning exercises (ELEs) designed to develop leaders of inclusive and systemic change in STEM higher education. This hands-on session will use ELEs to engage participants and help them experience and understand how an ELE can be used to explore various aspects of

leadership, team building, and inclusivity. This workshop will engage you in a community of practice that will enhance your ability to use an experiential approach to develop leadership capacity in others.

William B. Davis, Associate Dean—Washington State University; **Mary Majerus**, Chair, Department of Mathematics and Physics—Westminster College; **Brandon E. Schwab**, Associate Provost for Academic Affairs—Western Carolina University; **Sylvia F. Nadler**, Retired Director, Pryor Center for Leadership Development—William Jewell College; and **Judith A. Dilts**, Retired Associate Dean of Science and Mathematics—James Madison University

Mayfair Room, Second Floor

Workshop 3: EvaluateUR—A New Approach to Support Learning from Undergraduate Research

EvaluateUR is a strategy for obtaining an objective assessment of the value of undergraduate research by documenting student growth in critical academic and workforce-related knowledge and skills without placing a significant evaluation burden on students and research mentors. EvaluateUR provides an online guided process and supports summer and academic year undergraduate research experiences. The process and tools can help you document the impact of your program while fostering meaningful dialogue between students and their faculty mentors. In this workshop, attendees will role play and model the pre-, mid-, and end-of-research assessment students and faculty members engage in while using EvaluateUR. After the hands-on introduction, workshop participants will learn how EvaluateUR is being modified for course-based undergraduate research and how its eleven outcome categories map to National Association of Colleges and Employers competencies.

Jill Singer, Professor of Earth Sciences—State University of New York College at Buffalo; and **Mary Crowe**, Associate Professor of Experiential Education—Florida Southern College

Michigan A Room, Second Floor

Workshop 4: Integrating Social Issues Related to Demographic Categories into Science

This workshop will examine the integration of topical information related to demographic categories into science courses in a way that addresses misperceptions being perpetuated by presenting socio-politically defined categories as rooted in scientific discovery. We seek to promote understanding of the impact of diverse environmental conditions, including those related to racism and sexism, on the health of people in different demographic groups. Participants will leave the workshop with increased comprehension of the variation of sociopolitical categories over time and space, a concept or example of a topical social issue to be integrated in their class, and the confidence to implement this integration. This work contributes to recruitment and persistence of students from traditionally underrepresented groups into STEM fields and improvement of science taught to all students.

Leslie Gregg-Jolly, Professor of Biology, and **Katya Mevorach**, Professor of Anthropology and American Studies—both of Grinnell College; **Rachel Bergstrom**, Assistant Professor of Biology—Beloit College; and **Diane Angell**, Assistant Professor of Practice, Biology and Environmental Studies—St. Olaf College

Huron Room, Second Floor

Workshop 5: Scaffolding Signature Assignments to Build STEM Identity Using ePortfolios

The pathways that students take to earn STEM degrees are diverse and complex, with multiple entry and exit points. This calls for better alignment of STEM programs and implementation of high-impact practices that enable students to overcome these barriers. This workshop will engage participants in connecting STEM skills and content, high-impact practices, ePortfolios, and STEM identity to energize a mind shift in the learning process. The facilitators will explore a curricular design for STEM majors where assignments, student

narratives, and identities are captured in a comprehensive core ePortfolio. Using small group discussions, we will create scaffolded, curricular maps and conduct mini-assignment charrettes to examine a sequence of signature assignments. Finally, we guide participants through visual collages of student work curating STEM identity.

Preethi Radhakrishnan, Professor of Biology; **Tonya Hendrix**, Assistant Professor of Biology; **Olga Calderon**, Associate Professor of Biology; **Kevin Mark**, Associate Professor of Chemistry; **Richa Gupta**, Assistant Professor of Biology; and **Dionne Miller**, Interim Associate Dean for Academic Affairs—all of LaGuardia Community College

Sheraton Ballroom 4& 5, Fourth Floor

7:00 P.M. – 8:00 P.M. WELCOME AND KEYNOTE ADDRESS

Creating Conditions to Transform Undergraduate STEM Education

Significant change is the result of collective learning and collective action. Which conditions align to make it possible? Dr. Boyce has made institutional change a focus as a faculty and academic leader at both small colleges and large universities. In her current role at the University of Michigan, she is engaged in a campus-wide equity and inclusion initiative. The questions she will address include: How can we transform undergraduate STEM? How can we catalyze and sustain collective learning? What conditions enhance curricular change? How is addressing equity a meaningful goal? Examples of transformational change in STEM at small and large institutions will be highlighted.

Mary E. Boyce, Assistant Vice Provost, Office of Diversity, Equity, and Inclusion—University of Michigan

Riverwalk Promenade, First Floor

8:00 P.M. – 9:00 P.M. WELCOME RECEPTION AND POSTER SESSION

PKAL/Type III: National-Level Interventions

Poster 1: Celebrating 30 Years of PKAL

Kelly Mack, Executive Director, Project Kaleidoscope, and Vice President for Undergraduate STEM Education; **Christina Shute**, Program Coordinator; **Tania Siemens**, Research Associate; **Tykeia Robinson**, Assistant Director for Policy and Research; **Sasha Kolomensky**, Program Assistant; **Ariel Kirkland**, Program Coordinator; and **Maria Qadri**, Postdoctoral Fellow—all of Association of American Colleges and Universities

Poster 2: Center for the Advancement of STEM Leadership

Orlando Taylor, Vice President of Strategic Initiatives and Research—Fielding Graduate University; **Camille McKayle**, Provost and Vice President for Academic Affairs—University of the Virgin Islands; **Kelly Mack**, Vice President for Undergraduate STEM Education and Executive Director, Project Kaleidoscope—Association of American Colleges and Universities; and **Margaret Kanipes**, Professor of Chemistry—North Carolina A&T State University

Poster 3: STEM Central: A Metacommunity for Broadening Participation in STEM

Kelly Mack, Vice President for Undergraduate STEM Education and Executive Director, Project Kaleidoscope; and **Tania Siemens**, Research Associate—both of Association of American Colleges and Universities

Poster 4: Inclusive Excellence: Engaging All Students in Science

Kelly Mack, Vice President for Undergraduate STEM Education and Executive Director, Project Kaleidoscope; **Tykeia Robinson**, Assistant Director of Research and Policy, Office of Undergraduate STEM Education—both of Association of American Colleges and Universities; **Melvin Hall**, Professor of Educational Psychology—Northern

Arizona University; **Kate Winter**, Principal—Kate Winter Evaluation; **Patrice McDermott**, Vice Provost for Faculty Affairs—University of Maryland Baltimore County; and **John Matsui**, Director, Biology Scholars Program and Assistant Dean, Biological Science—University of California, Berkeley

Poster 5: Broadening Faculty Representation in the PKAL STEM Leadership Institute

Kelly Mack, Vice President for Undergraduate STEM Education and Executive Director of Project Kaleidoscope, and **Christina Shute**, Program Coordinator, PKAL Signature Programs—both of Association of American Colleges and Universities

Poster 6: My Tenure Trek®: An Experiential Diversity Simulation for STEM Faculty Leadership

Kelly Mack, Vice President for Undergraduate STEM Education and Executive Director, Project Kaleidoscope; and **Ariel Kirkland**, OUSE Program Coordinator—both of Association of American Colleges and Universities

Poster 7: AAC&U Tides: Teaching to Increase Diversity and Equity in STEM

Kelly Mack, Vice President for Undergraduate STEM Education and Executive Director, Project Kaleidoscope—Association of American Colleges and Universities

Type I: Individual Classroom/Project-Level Interventions

Poster 8: Lateral Transfer Maps as a Metacognitive Tool in First-Year STEM Courses

Elizabeth Hane, Associate Professor of Life Sciences—Rochester Institute of Technology

Poster 9: Teaching Programming with Interactive and Collaborative Learning

Mahmudur Rahman, Associate Professor of Computer Science—Morgan State University

Poster 10: Participation in Citizen Science: A Tool for Introductory STEM Courses

Carie Cardamone, Associate Director for STEM and Professional Schools of the Center for Enhancement of Learning and Teaching—Tufts University

Poster 11: A Microbiome-Based Cure Leads to a Quest to Understand and Mitigate Student Depression

Alexandria Ardisson, Assistant—University of Florida

Poster 12: Research with Community Partners to Engage Minority STEM Majors at an HSI

Angela Frey, STEM chair, Natural Science, Mathematics, and Technology Division—Alverno College

Poster 13: Humanitarian Engineering: Attracting and Inspiring Under-Represented Students

Leslie Dodson, Co-director, The Global Lab, Foisie Innovation Studio—Worcester Polytechnic Institute

Poster 14: Listening to Student Voices: Focus-Group Research to Promote Inclusion

Pamela Propsom, Professor of Psychology and Neuroscience; **Hira Ahmad**, Undergraduate Student; **Brittany Davis**, Undergraduate Student; and **Sydney Majka**, Undergraduate Student—all of DePauw University

Poster 15: Advanced Investigative Experiences in Biology as Authentic CUREs

Jacqueline Wittke-Thompson, Associate Professor of Biology—University of St. Francis

Poster 16: The Role of Science Museums in Student Growth

Olivia Carducci, Associate Professor of Mathematics; **Teresa Jones-Wilson**, Professor of Chemistry and Biochemistry, and **Bonnie Green**, Professor of Psychology—all of East Stroudsburg University

Poster 17: STEM Peer Role Models Build Strong, Sustainable STEM Communities

Ariel Firebaugh, Postdoctoral Fellow; **Tara Phelps-Durr**, Professor of Biology; **Anna Curtis**, Postdoctoral Fellow; **Rhett Herman**, Professor of Physics; **Sarah Kennedy**, Assistant Professor of Chemistry; **Jeanne Mekolichick**,

Associate Provost for Academic Programs; **Todd Rutkowski**, Postdoctoral Fellow; and **Orion Rogers**, Dean of Artis College of Science and Technology—all of Radford University

Poster 18: Flipping Genetics: Increasing Success of Under-Performing Students

Luis Matos, Associate Professor in Biology—Eastern Washington University

Poster 19: Solving the Big Problem: A Student-Driven CURE

Gina Florio, Associate Professor of Chemistry and Physics, and **Alison Hyslop**, Associate Professor of Chemistry—both of St. John's University

Poster 20: Beyond Gen Ed: Effective Communication and Collaboration in STEM Education

Rena Levitt, Professor of Computational Sciences, Lead of Instruction for Computational Sciences, and **Alexandra Terrana**, Assistant Professor of Computational Sciences, Cornerstone Head Instructor—both of Minerva Schools at Keck Graduate Institute

Poster 21: Supporting Active Learning via Course-Based Communities of Transformation

Jill Nelson, Associate Professor of Electrical and Computer Engineering, and **Jessica Rosenberg**, Associate Professor of Physics and Astronomy—both of George Mason University

Poster 22: Bridging the Divide with Classroom-Based Undergraduate Research Experiences

Moriah Beck, Associate Professor of Chemistry—Wichita State University

Poster 23: Biochemistry at Hiram College: A Case Study on Classroom Mobile Technology

Steven Romberger, Assistant Professor of Chemistry, Coordinator of Student Research—Hiram College

Poster 24: Freshmen Doing Research: Broadening Participation with an Introductory CURE

Scott Horrell, Post-doctoral Researcher, Harris-Stowe State University

Poster 25: Transferring Rube Goldberg Projects from a Pilot to an Engineering Course

Yanjun Yan, Associate Professor of Engineering and Technology—Western Carolina University

Poster 26: Impact of Pre-Matriculation Research Experience on Student Success

April Wynn, Assistant Professor of Biology; **Dianne Baker**, Professor of Biology; and **Katherine Crowder**, Associate Professor of Chemistry—all of the University of Mary Washington

Poster 27: Academic and Social Integration: A Summer Bridge Program in Chemistry

Alison Hyslop, Associate Professor of Chemistry; **Heather Mann**, Instructional Coordinator; and **Joseph Serafin**, Associate Professor of Chemistry—all of St. John's University

Type II: Institution-Level Interventions

Poster 28: Intrusive Advising in Improving Student Success in STEM Disciplines

Richard Jarman, Professor of Chemistry—College of DuPage

Poster 29: Broadening STEM Participation through Institutional Collaboration

John Kaup, Director of Science Education, and **John Wheeler**, Associate Provost for Integrative Science—both of Furman University

Poster 30: Lowering the Barriers to Undergraduate Research: STEM Transfer Student Program

Kimberly Schneider, Assistant Dean, Division of Teaching and Learning, and Director, Office of Undergraduate Research—University of Central Florida

Poster 31: Two-Year Degrees at Loyola Chicago Expand Access to Liberal Arts Education

Megan Kelly, *Clinical Assistant Professor of Environmental Science, Arrupe College—Loyola University Chicago*

Poster 32: Increasing STEM Success on a Diversifying Campus

Jeffrey Bartz, *Professor of Chemistry—Kalamazoo College*

Poster 34: Holistic Learning through a Sciences and Visual and Performing Arts Minor

Ana Fraiman, *Professor Emerita* and **Audrey L. Reynolds** *Distinguished Teaching Professor*, and **Mark McKernin**, *Acting Vice Provost—both of North Eastern Illinois University*

Poster 35: STEM-Specific First-Year Seminar Impact at an Emerging HSI

Lisa Smelser, *Professor of Biology—Polk State College*

Poster 36: A STEM Program to Broaden the Participation of Minorities in the Materials Engineering Workforce

Shaik Jeelani, *Vice President for Research and Dean of Graduate School*, and **Mohammed Qazi**, *Professor of Mathematics—both of Tuskegee University*; **Martha Escobar**, *Professor of Psychology—Oakland University*

Poster 37: A STEM Internship Program That Leads to Employment Opportunities

Linda Droblich, *Senior Business Development Manager—San Jacinto College*

Poster 38: Preventing a Boondoggle: Short-Term Research Abroad Experience

Kelly George, *Associate Professor of Economics—Embry Riddle Aeronautical University*

Poster 39: Science-Specific Educational Development: A New Framework

Marcy Slapcoff, *Director, Office of Science Education, Faculty of Science—McGill University*

Type IV: STEM Education Research

Poster 40: Student Predictions as a Means of Conceptual Change in Biology

Ann Davis, *Lecturer, Department of Biology—Texas Woman's University*

Poster 41: How Effective Are Course-Embedded Undergraduate Research Experiences?

Clay Runck, *Assistant Professor of Biology*; **Allison D'Costa**, *Associate Professor of Biology*; **Judy Awong-Taylor**, *Professor of Biology*; and **Cindy Achat-Mendes**, *Associate Professor of Biology—all of Georgia Gwinnett College*

Poster 42: Factors Affecting Black/African-American Engineering Student Success at PWIs vs. HBCUs

Lesley Berhan, *Associate Dean for Diversity, Inclusion, and Community Engagement—Alabama Agricultural and Mechanical University*

Poster 43: Using the Theory of Reasoned Action to Incentivize STEM Course Improvement

Daniel Wisneski, *Assistant Professor*, and **Maryellen Hamilton**, *Full Professor—both of Saint Peter's University*

Poster 44: Peer Supplemental Instruction: Enrichment of a High-Impact Practice

Cindy Achat-Mendes, *Associate Professor of Biology*; **Judy Awong-Taylor**, *Professor of Biology*; **Allison D'Costa**, *Associate Professor of Biology*; **Kathryn Pinzon**, *Associate Professor of Mathematics*; and **Clay Runck**, *Assistant Professor of Biology—all of Georgia Gwinnett College*

Poster 45: Experiences and Challenges of Female Latinx STEM Majors Placed on Academic Probation

Natalia Caporale, *Assistant Professor of Teaching*, and **Lina Mendez**, *Associate Director, Center for Chicanx and Latinx Academic Student Success—both of the University of California—Davis*

Poster 46: Leadership Self-Assessment for Female McNair Scholars: Early Barriers to Leadership

Lisa Nogaj, *Chair and Associate Professor of Chemistry—Gannon University*

Poster 47: Collaborative Design, Creativity, and Community as Mechanisms for Faculty Change

Jennifer Adams, Canada Research Chair of Creativity and STEM and Associate Professor—University of Calgary

Poster 48: STEM Transfer Students' Experiences with Advising

Raquel Harper, Research Associate—University of Colorado Boulder

Poster 49: STEM Education Renaissance at ECSU: Initial Steps

Anthony U. Emekalam, Associate Professor—Elizabeth City State University

Poster 50: The Applicable Takeaways of a Summer Bridge Program

Chad Wiseman, Graduate Assistant—Texas Christian University

Poster 51: It's Not About "Standards": Prioritizing STEM Gateway Course Transformation

Victoria McGillin, Resident Fellow—John N. Gardner Institute; Tabitha Mingus, Associate Professor of Mathematics, and Thayma Lutz, Instructor of Mathematics—both of Western Michigan University

Poster 52: Assessment to Document Student Learning in Frontiers of Science

Adam Brown, Columbia Science Fellow and Lecturer in the Discipline of Biological Sciences—Columbia University

Poster 53: ACCESS STEM: A Predictive Model for STEM Student Retention

Melissa Hanzsek-Brill, Professor of Mathematics and Mathematics Education, College of Science and Engineering Student Success Initiatives Coordinator; David Robinson, Professor of Statistics; and Corey Smith, Assistant Professor of Statistics—all of St. Cloud State University

FRIDAY, NOVEMBER 8, 2019

Promenade, Fourth Floor

7:30 A.M. – 5:00 P.M. CONFERENCE REGISTRATION

Promenade, Fourth Floor

7:30 A.M. – 8:30 A.M. BREAKFAST

Michigan AB Room, Second Floor

8:00 A.M. – 8:30 A.M. NEWCOMERS WELCOME

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, intended career, or the type of institution they attend. Participants will learn how AAC&U's broad agenda for student learning—which focuses on quality, equity, inclusive excellence, student success, integrative and global learning—and its signature LEAP initiative together provide content, framework, and practical guidance for the undergraduate educational experience.

Tia Brown McNair, Vice President for Diversity, Equity, and Student Success and Executive Director for the TRHT Campus Centers—AAC&U

*Breakfast will be available in the meeting room.

Sheraton Ballroom 4 & 5, Fourth Floor

8:45 A.M. – 9:45 A.M. KEYNOTE ADDRESS

Transform STEM Education by Teaching Students How to Learn: Metacognition Is the Key!

All students who are admitted to college have the ability to succeed in STEM courses. However, most do not have effective learning strategies, and they resort to memorizing information just before tests. This interactive keynote will introduce faculty to cognitive science research-based learning strategies that will help all students experience meaningful, transferable learning. The session will focus on ways to teach STEM students simple yet powerful learning strategies to ensure success.

Sandra Yancy McGuire, *Director Emerita of the Center for Academic Success, retired Assistant Vice Chancellor and Professor of Chemistry—Louisiana State University*

Promenade, Fourth Floor

9:45 A.M. – 10:15 A.M. REFRESHMENT BREAK

10:15 A.M. – 11:15 A.M. CONCURRENT SESSIONS

Sheraton Ballroom 1, Fourth Floor

Session 1.1 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type I: Individual Classroom/Project-Level Interventions

Research Experience as an Early Intervention for At-Risk STEM Scholars

The status of the United States as the world's largest economy is in jeopardy as a result of our inability to produce enough STEM majors. The SUSTAIN project seeks to increase the retention of high-achieving, low-income STEM majors through a series of project interventions during the first two years of college. This study explores the experiences of students in an early immersion research program. We investigated whether any differences in perceived learning gains, levels of research engagement, and levels of research satisfaction exist between the scholars and their mentors. We also investigated the most beneficial and challenging aspects of the research experience. Results help to identify potential areas for refinement in undergraduate research programs.

Gaye Ceyhan, *PhD Candidate, Department of Teaching and Leadership*, and **John Tillotson**, *Associate Professor and Chair, Department of Science Teaching—both of Syracuse University*

Type IV: STEM Education Research

Improving STEM Retention and Commuter Engagement through Research, Cohorts

The Establishing Practices Integrating Commuter Students (EPIC) program at Valparaiso University (VU) integrates commuter STEM students into the campus community through shared research experiences and social activities with residential students. EPIC relieves some of the commuter student burdens (e.g. transportation, multiple life roles) through a significant scholarship and additional support services. The keystone to EPIC is four academic years and one funded summer of research opportunities. The ongoing EPIC program aims to: improve student retention, especially among commuters; increase the number of STEM graduates prepared for research-intensive careers; and strengthen VU's research intensive majors. We will report on the results of our recruitment initiatives, including demographics of cohorts 1-3, as well as current retention rates for the first and second cohort.

Kristi Bugajski, *Associate Professor of Biology—Valparaiso University*

Type IV: STEM Education Research

Benefits and Barriers to Undergraduate Research for Students and Faculty

With an increase in distance students and faculty, it is important to understand how high-impact practices, like undergraduate research, are similar and distinct between these units. This study compared student and faculty participation rates, interests, and perceptions regarding undergraduate research in traditional and distance education. While some similarities in benefits and barriers were revealed, there are some unique considerations for both students and faculty based on their campus affiliation. For example, while all students perceived an access barrier, despite inherent structural limitations of online education, there were no significant differences in the respondents' perceptions of access to opportunities, physical resources, or human resources.

Emily Faulconer, Assistant Professor of Chemistry—Embry-Riddle Aeronautical University

Sheraton Ballroom 2, Fourth Floor

Session 1.2 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type II: Institution-Level Interventions

University-Wide Team and Leadership Minor for STEM Majors

Recent employer surveys indicate employers feel many new university graduates lack interpersonal and teamwork skills. Providing specific training in these skills is difficult because few scientific majors have room in their technical heavy course load. To fill this gap, a minor has been created that spans across a student's education, introducing the concepts in general education courses and providing repeated application, practice, and evaluation of these skills in STEM courses. Social science, theater, and communication courses introduce the theory, practice, and self-assessment of skills required for good teamwork and leadership. Students enhance and reflect on their skills through team-based interdisciplinary research projects in required in-major courses. This model provides future graduates the necessary future interdisciplinary collaborations the workforce needs to advance its competitive edge.

Justin Fair, Associate Professor of Chemistry—Indiana University of Pennsylvania

Type II: Institution-Level Interventions

Creation of a Distinction in STEM Leadership to Engage Minority Students

The Distinction in STEM Scholastic Leadership is part of an initiative to increase student retention, completion, and success for traditionally underrepresented students in STEM fields. The Distinction provides a pathway to success and an additional motivation to follow that path. It recognizes students who complete activities in areas designed to prepare them for the next steps of their academic and professional careers. These include: academic excellence, career exploration, service, soft-skill training, and reflection/self-assessment. Some supported activities are: a lab assistant program, research internships, a STEM career speaker series, workshops, and writing supports. The activities are designed to assist students pursuing the Distinction by providing both knowledge and skills. Participants in the program have already demonstrated improvements in numerous metrics including retention, grades, knowledge, and abilities.

Carolyn Margolin, Director, STEM Institute for Scholastic Leadership Experience (ISLE) and STEM Engage Intern Employ (EngInE) Grants—Miami Dade College

Type IV: STEM Education Research

How to Keep Us: Student Voices on What Works for Transfer Retention in STEM

We designed and studied an intervention program to respond to lack of access to bachelor's degrees in STEM for underrepresented transfer students. We provide up to \$10,000 per student per year, pre-transfer advising, and have created articulation agreements that guarantee transfer. A weekly seminar addresses the more complex factors of 'transfer shock' and identity. We use a design-based, mixed methods model in which the qualitative component uses narrative analysis to examine both the substance of the stories students told as well as the functions that the stories served. Students identified access to

faculty and professionals, educational navigation/networking, and feeling valued or cared about among other supports that helped them remain enrolled.

Angela DosAlmas, *Research Fellow, Justice at the Intersections—Mills College*; and **Valerie Imbruce**, *Director, Undergraduate Research Center and External Scholarships—Binghamton University*

Huron Room, Second Floor

Session 1.3 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type I: Individual Classroom/Project-Level Interventions

Communicating Science with Infographics

Producing infographics is a creative way for students to communicate what they've learned in their STEM classes. Infographics can provide a way for students to summarize a process or the results of a research project, for example, and can be designed to communicate scientific information to a variety of different audiences. Creating an infographic provides students with the opportunity to develop both their quantitative and visual/graphical literacy skills. In this session, I will describe a first-year seminar on infographics that I teach and the activities and projects I assign to guide students through the process of creating and evaluating infographics.

Debra Hydorn, *Professor of Mathematics—University of Mary Washington*

Type I: Individual Classroom/Project-Level Interventions

The Science Stories Project: Connecting Science with Society via Comics

Students must see science as relevant to everyday if they are to engage with it beyond the classroom. This classroom intervention places biology in a societal context, addressing a Vision & Change core competency, "science education for civic engagement and responsibility." Students read longform comics about socio-scientific issues, making science accessible for deaf, hard-of-hearing, and other ESL students. Deaf students are underrepresented in STEM and face health disparities. Students learn to use scientific information to address their own questions and develop comics to communicate findings. The four-week unit culminates in the creation of a social media-shareable comic. Curricular dissemination plans include publication at CourseSource and presentations. The curriculum is suitable for general education courses, for crossing disciplinary boundaries in STEAM courses, and for STEM majors.

Cara Gormally, *Associate Professor of Biology—Gallaudet University*

Type I: Individual Classroom/Project-Level Interventions

Translating Data: Library Partnerships in Undergraduate Art-Science Initiatives

This project highlights a recent climate science workshop, initiated by librarians, in which students created artistic works based on one hundred years of forest data. Librarians collaborated with campus faculty to engage students in climate research that resulted in student-created artistic interpretations of the data. The students' works were displayed in the Libraries STEAM Gallery as part of an effort to share scientific research results more broadly. An analog exhibit accompanied the students' work that demonstrated how scientific observations are part of a continuum with the present and future rooted in the past. Learning outcomes and pedagogy are discussed. The results are generalizable as these partnerships can be developed across the curriculum and data sets can be found freely available from online repositories.

Barbara Losoff, *Associate Professor and Science Librarian*; **Deborah Hollis**, *Associate Professor and Head Special Collections*; and **Abbey Lewis**, *Senior Instructor and STEM Science Librarian—all of University of Colorado Boulder*

Sheraton Ballroom 4 & 5, Fourth Floor

Type III: National-Level Interventions

Session 1.4: NSF Hours

This year, the AAC&U STEM Conference is pleased to again feature NSF HOURS, which aims to showcase and offer insight into the most salient priorities of the National Science Foundation for advancing the reform of US undergraduate STEM education. During this session, NSF program officers will discuss the future directions of undergraduate STEM education reform, review funding mechanisms for broadening participation in STEM, and provide technical assistance for proposal development and submission. Participants will have an opportunity to raise questions, offer community feedback, and gain a fresh perspective on pre- and post-award processes, including annual reporting.

Claudia Rankins, Senior Program Director, and **Michelle Claville**, Program Director—both of National Science Foundation

Michigan Room AB, Second Floor

Type I: Individual Classroom/Project-Level Interventions

Session 1.5: Strategies and Tools to Study and Evaluate STEM Education-Oriented Projects

Participants in this workshop will learn how proposals involving educational research can incorporate tools appropriate for research that contributes to general knowledge and evaluation that supports ongoing project improvement. Participants will learn to distinguish between research and project evaluation, explain the role of the educational researcher and external evaluator, define parts of a logic model and theory of change, and apply these tools to design projects. Additionally, the presenters will help participants identify resources and choose measures appropriate to assess variables for research, evaluate project processes and outcomes, and distinguish between affective, behavioral, and cognitive outcomes. This interactive workshop will involve group work on tasks designed to reinforce the learning objectives. Participants should bring a project they are working on, have worked on, or are considering for future implementation.

Richard Kopec, Professor of Computer Science and Chemistry—St. Edward's University; and **Michelle Burd**, Principal & Owner—Burd's Eye View Co.

Erie Room, Second Floor

Type I: Individual Classroom/Project-Level Interventions

Session 1.6: Transforming Science Education with Three-Dimensional Teaching and Learning

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (NRC, 2012) introduced three-dimensional (3D) learning as a guide to help students develop a robust understanding of science. 3D learning helps instructors to define what students should learn (core ideas), what students should do with their knowledge (scientific practices), and how students should connect their knowledge in one scientific discipline to another (crosscutting concepts). Attendees will be introduced to 3D learning and how it is being used to drive transformation of introductory STEM courses at Michigan State University. They will explore 3D learning by creating 3D learning objectives and using the 3D Learning Assessment Protocol to characterize and develop assessment items.

Cori Fata-Hartley, Assistant Dean, College of Natural Science, and **Rebecca Matz**, Academic Specialist in the Hub for Innovation in Teaching and Learning—both of Michigan State University

Columbus Room AB, Third Floor

Session 1.7: PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type I: Individual Classroom/Project-Level Interventions

Institutional Change toward Inclusive Excellence: Case Study and Conversation

Through our Howard Hughes Medical Institute Inclusive Excellence program, Realizing Inclusive Science Excellence (REALISE), we focus strategically, intentionally, and simultaneously on faculty development, curricular reform, student support, and institutional change. We explore the proximate and distal social

and academic environments within which students engage and their impact on students' sense of belonging in the scientific community. Employing a mixed-methods approach and supported by an external evaluator, we gather data to identify indicators of an inclusively supportive campus environment and student baseline perceptions of self and community. We will report on preliminary findings of our work two years into our STEM educational reform effort and engage session participants in an exercise to explore their own STEM educational reform efforts and offer an opportunity to learn from one another.

Sarah Kennedy, Assistant Professor of Chemistry, and **Jeanne Mekolichick**, Associate Provost for Academic Programs—both of Radford University

Type IV: STEM Education Research

A Multi-Institutional Model for an Institute for Inclusive Teaching in STEM

The Virginia Commonwealth University (VCU) Howard Hughes Medical Institute Inclusive Excellence grant is a partnership between VCU, John Tyler Community College, and J. Sargeant Reynolds Community College. The grant pillars are (1) enhancing the inclusiveness of STEM courses, (2) reducing administrative barriers for transfer students, and (3) building community among faculty and students. The Champions for Change STEM Faculty Learning Community is one grant initiative, which begins with a summer institute on Inclusive Teaching in STEM (IIT-STEM). Participants in the IIT-STEM engaged in a robust curriculum, which focuses on cultural awareness building, universal design for learners, backward design, and building partnerships and community. The IIT-STEM curriculum, activities, and outcomes will be shared.

Rosalyn Hargraves, Associate Vice President for Assessment and Transformation; **Allison Johnson**, Associate Professor and Assistant Director, Center for Biological Data Science; **Theresa Ronquillo**, Assistant Director, Center for Teaching and Learning Excellence—all of Virginia Commonwealth University; and **Deborah Neely-Fisher**, Assistant Professor of Biology—J. Sargeant Reynolds Community College

Sheraton Ballroom 3, Fourth Floor

Session 1.8 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type I: Individual Classroom/Project-Level Interventions

One Size Does NOT Fit All: Promoting Growth Mindsets in College Students

The notions of growth and fixed mindsets have swept through education, and it is clear that growth mindset tendencies benefit younger students. However, is the same true for college students? In this session, we share the results of two related studies on mindsets in college. One study tested the effects of targeted growth mindset interventions in a single genetics course taken by life sciences majors. The other measured the impact of student instruction on mindsets as part of a remedial math summer program prior to freshman matriculation. The findings of both studies indicate that, indeed, one size does not fit all and that manipulating mindsets in college-aged students is more complicated, and yields lesser academic returns, than what has been reported for younger student populations.

Thomas Mennella, Associate Professor of Biology, and **Princy Quadros-Mennella**, Assistant Professor of Psychology—both of Westfield State University

Type IV: STEM Education Research

Feedback-Focused Rubrics to Develop Student Intellectual and Practical Skills

Skills such as communication, teamwork, critical thinking, and problem solving are frequently cited as important outcomes for STEM degree programs. However, the development of these skills is often taken for granted, and they are rarely explicitly assessed in the classroom. Assessment serves two purposes: (1) providing a measure of achievement, and (2) facilitating learning by conveying what is valued in a course. This project has developed feedback-focused rubrics that serve as a resource for instructors to assess and support student skill development. In this facilitated discussion, participants will explore novel feedback

rubrics and strategies for their classroom use in assessing practical skills. Participants will also reflect on the role of assessment and feedback as key elements in constructive alignment to achieve student learning outcomes.

Courtney Stanford, Assistant Professor of Chemistry—Ball State University; and **Teresa Bixby**, Associate Professor of Chemistry—Lewis University

Ontario Room, Second Floor

Session 1.9 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type II: Institution-Level Interventions

Impact of an Ag+STEM Intervention Program on Undergraduate Minority Students

The purpose of this session is to provide the audience with an overview of an Ag+STEM Intervention Program, which has been effective in creating a pipeline of underrepresented minority (URM) students who are prepared for the Ag+STEM workforce. The intervention program being highlighted focuses on addressing two goals: (1) Ag+STEM career readiness, and (2) Ag+STEM pre-graduate education preparation of URM students attending historically black land grant universities (HBLGUs), also known as 1890 institutions. Session participants will learn: (1) about the pipeline issues facing the Ag+STEM disciplines, (2) findings indicating program impact on students who participated in the intervention program, and (3) how to develop mutually beneficial partnerships with HBLGUs that focus on addressing the diversity needs of the Ag+STEM workforce.

Levon Esters, Associate Professor of Agricultural Science Education—Purdue University

Type II: Institution-Level Interventions

Effectiveness of Sequenced Classroom Interventions to STEM Success

Wright State University has implemented a project that utilizes a Student Centered Active Learning Environment with Upsidedown Pedagogies (SCALE-UP) teaching model to address non-technical barriers that may prevent underrepresented groups from progressing through a STEM discipline. Removing the traditional lecture, classroom time is now used to overcome possible obstacles (psychosocial, STEM identity, academic preparedness, opportunity, and cognitive skills) to student success through targeted group active/collaborative learning activities. The SCALE-UP project is being evaluated on increased retention, success in STEM majors, and improvement of measurable educational outcomes throughout a freshman/sophomore two-year computer science core sequence.

Travis Doom, Professor of Computer Science—Wright State University

11:30 A.M. – 12:30 P.M. CONCURRENT SESSIONS

Michigan Room AB, Second Floor

Session 2.1 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type I: Individual Classroom/Project-Level Interventions

Catalyzing a Student Action Team for Improving Inclusivity in STEM

Students provide critically important voices in fostering positive campus changes, yet they can be readily overlooked. The slogan “nothing about us without us” insists that higher education invite student participation whenever crafting structures and policies that affect students. We catalyzed an ongoing student “Action Team” within a multi-year STEM inclusive excellence initiative. Specifically, we aimed to empower STEM students from historically marginalized groups to lead important campus conversations, identify challenges, recommend improvements, provide feedback, and influence ways we collaboratively enhance inclusivity within and beyond STEM. In establishing a student Action Team, we aimed to provide

autonomy, safety, empowerment, support, guidance, and acknowledgement of the critically valuable talent, investment, insight, labor, and expertise our students brought—balanced with institutional accountability to our student partners.

Barbara Lom, Professor of Biology and Neuroscience, and **Esther Lherisson**, FIRST Program Analyst—both of Davidson College

Type I: Individual Classroom/Project-Level Interventions

Learning Researchers to Foster Formative Assessment in College STEM Classes

This session will introduce a specialized type of undergraduate learning assistant on formative assessment and examine the affordances and challenges of this role in large STEM classrooms. A Learning Researcher (LR) is an undergraduate student who gathers and analyzes student thinking data during classroom activities and then generates daily reports that can inform an instructor's subsequent planning and instructional decisions and actions. We analyzed these written reports to characterize how LRs noticed and interpreted student thinking and suggested possible instructional decisions, and how their approach evolved. The analysis indicated LRs showed a great potential as effective collaborators in promoting reflective formative assessment practice in college STEM classrooms. Affordances and challenges in adopting this approach to promote formative assessment to support diverse students' learning will be discussed.

Lisa Elfring, Associate Vice Provost, Instruction and Assessment, and **Jonathan Cox**, Research Scientist, Department of Chemistry and Biochemistry—both of University of Arizona

Type III: National-Level Interventions

An Embedded STEM Guide Program: Improving Student Performance and Persistence

STEM classrooms still rely heavily on lecture, despite evidence that students (particularly those from underrepresented groups) find this approach alienating, and research demonstrates its lower effectiveness as compared to active learning strategies. This workshop will present one method to make the classroom more interactive and welcoming to all students. We will demonstrate how a flipped classroom coupled with an embedded, peer STEM Guide (ideally a URM student), both in and out of the classroom, can lead to significant gains in student performance and persistence. Participants will have the opportunity to adapt this methodology to a course, and generate ideas for how to develop a STEM Guide program at their own home campus and obtain faculty buy-in to create broader institutional change.

Jackie Roberts, Chair and Professor of Chemistry and Biochemistry, and **Jeff Hansen**, Professor of Chemistry and Biochemistry—both of DePauw University

Sheraton Ballroom 1, Fourth Floor

Session 2.2 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type IV: STEM Education Research

S-STEM Support Improves Work Readiness Not GPA in Underrepresented Students

The NSF Scholarships in STEM (S-STEM) program addresses critical needs in workforce development by funding scholarships for academically talented, low-income students and funding institutional strategies that support the retention and workforce readiness of STEM students. A five-year S-STEM program at a regional comprehensive university supported a diverse set of juniors and seniors in four majors. Students received scholarship support, enhanced faculty mentoring, and activities designed to increase their workforce readiness. Students significantly decreased their work commitments, shifted to STEM-related employment, and increased engagement with co-curricular activities, but did not experience an increase in GPA. Activities developed for these students were identified as capacity-building initiatives if they were favorably assessed by the students and they increased engagement between STEM faculty and university

staff or regional partners.

Joanna Joyner-Matos, *Professor of Biology—Eastern Washington University*

Type III: National-Level Interventions

Artificial Intelligence Promoting Authentic and Real-World Learning

Preparing our students for the fast-changing job market is becoming an urgent task for higher education; the choice is either getting our students ready for a new job market or leaving them behind jobless. Is higher education quickly adapting to the industrial revolution that brings shaking changes to the job market? STEM higher education is facing the challenges to reskill students for the future job market. In this session, Texas Southern University will share with audiences a research project funded by NSF to infuse modern artificial intelligence into a traditional civil engineering program to prepare students with the knowledge and skills for their future career in the twenty-first century digital age.

Yachi Wanyan, *Associate Professor of Civil Engineering—Texas Southern University*; and **Youmei Liu**, *Director of Assessment and Accreditation Services—University of Houston*

Type II: Institution-Level Interventions

STEM Education Re-Imagined: Developing a Whole Person Learning Experience

Scott Scholars at the University of Nebraska at Omaha (UNO) participate in an enriched undergraduate learning experience that integrates both curricular and co-curricular learning. This challenging program has been designed to prepare students with the technical, social, emotional, and effective thinking skills necessary to excel as STEM leaders in their communities and ultimately impact positive change in the world. The Scott Scholars program includes a whole person learning agenda intended to support student success and enhance overall career readiness. Students are expected to engage with the following program elements: (1) research and internship opportunities seminars, (2) stress management and resiliency training workshops (3) industry internships and research fellowships, (4) career advising and placement services, and (5) design thinking and community engagement programs.

Harnoor Singh, *Director of Student Development for Scott Scholars*, and **Dan Shipp**, *Vice Chancellor for Student Success—both of University of Nebraska at Omaha*

Sheraton Ballroom 2, Fourth Floor

Session 2.3 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type II: Institution-Level Interventions

IDEAs for Transformative Learning and Reflection in STEM

Change at the institutional level often requires a substantial amount of time and effort, and often the implementation of an elaborate new system. If it turns out that the system doesn't work ideally, these levels of investment can be a deterrent to further change. The months-old IDEA Hub (Innovate, Design, Engage, Act) at Michigan Technological University proposes to address these challenges as an innovation incubator. Based in the honors college, which uses self-authorship theory to marry excellence and inclusivity, IDEA Hub will serve as an incubator for curricular initiatives designed to bring transformative learning to this STEM-focused institution. We seek to model the key quality we hope to cultivate in our students: agility.

Lorelle Meadows, *Dean, Pavlis Honors College—Michigan Technological University*

Type I: Individual Classroom/Project-Level Interventions

Transforming Gateway STEM Instruction

Introductory STEM courses are the entry point for a large percentage of students at the University of Rhode Island interested in STEM careers. While we have seen very modest improvement, our retention

rates still dovetail with national trends showing low retention for students from historically disenfranchised backgrounds. Over the last decade, greater attention has been paid to the quality of the educational experience especially from the standpoint of incentivizing practitioners attempting to make changes. In this session, we will discuss the creation of STEM Education URI (SURI), which is a cadre of STEM faculty who engage in pedagogies rooted in the philosophy of “Deep Teaching.”. In this inclusive teaching model, practitioners are asked to engage in reflection on their identity and engage with the social contexts of their students before they determine the strategies they need for effective pedagogies and appropriate classroom climate.

Brian Dewsbury, Associate Professor of Chemistry, and **Anna Santucci**, Faculty Development Specialist—both of University of Rhode Island

Type I: Individual Classroom/Project-Level Interventions

What Are the Barriers and Incentives to Change STEM Teaching Practices?

One of the factors that lead to student attrition from STEM majors is lack of satisfaction with the didactic instructional methods routinely used by STEM faculty, especially in introductory courses. The purpose of this study was to determine the needs, expectations, and incentives of the STEM faculty teaching at a private research-intensive university in the northeast U.S. to expand the use of evidence-based teaching practices in STEM courses. Our findings indicate departmental differences, as well as differences in the academic rank and tenure status of the participants in barriers, and drivers to the adoption of professional development strategies. Increasing our understanding of common incentives and barriers may help us improve the efficiency of STEM teaching practices.

Gaye Ceyhan, PhD Candidate in Science Education Program, and **John Tillotson**, Associate Professor of Science Teaching—both of Syracuse University

Ontario Room, Second Floor

Type IV: STEM Education Research

Session 2.4: It Takes a Department to Shift a Paradigm: Starting in the Lab!

As STEM departments attempt a paradigm shift, laboratories often serve as “pedagogical catalysts” for the implementation of experimental and innovative strategies. We have introduced several theory-based innovations, including e-learning materials, flipping part of the class, hands-on models, case studies, and inquiry and problem-based lab frameworks, in two very diverse lab settings in one department. We have also employed data collection/monitoring initiatives and have demonstrated increased student performance and higher student satisfaction. However, the paradigm shift is incomplete. We believe our issues are indicative of those commonly faced as departments attempt drastic pedagogical change. This engaging workshop will allow participants to discuss strategies and experiences in changing pedagogy in the STEM lab and beyond.

Natalie Mountjoy, Assistant Professor of Biology; **Kerrie McDaniel**, Associate Professor of Biology; and **Naomi Rowland**, Biotechnology Center Manager and Biology Lab Instructor—all of Western Kentucky University

Sheraton Ballroom 3, Fourth Floor

Type IV: STEM Education Research

Session 2.5: Building a Community of Practice around Leadership Development

This workshop will introduce you to PKAL’s STEM Leadership Institute (SLI) and the practice that sets the SLI apart from most others—Experiential Learning Exercises (ELE™). In addition to examining the SLI, this hands-on session will use an ELE to help you experience how an ELE can be used to explore essential aspects of leadership and teambuilding. The ELE will be “challenge by choice,” which allows attendees to participate in the ELE or become process observers. Process observers will join participants to reflect on what happened during the ELE and to expand their reflections to apply the lessons learned from the ELE to advance teambuilding and grow leadership capacity on their own campuses.

Mary Majerus, Chair, Department of Mathematics and Physics—Westminster College; **Brandon Schwab**, Associate Provost for Academic Affairs—Western Carolina University; **William Davis**, Associate Dean—Washington State University; **Sylvia Nadler**, Retired Director, Pryor Leadership Program—William Jewell College; and **Judith Dilts**, Retired Associate Dean of Science and Mathematics—James Madison University

Erie Room, Second Floor

Type II: Institution-Level Interventions

Session 2.6: Shared Vision Framework: Problem Solving Using Team-Based Systems Thinking

College students live in a world where information is at their fingertips and algorithmic thinking is the norm. They actively engage in solving complex problems that often exceed their cognitive capacity. Systems thinking provides a framework to guide students to create explicit mental and experimental models of complex systems through a process of diagramming, researching, and reflecting. In this session, we will share a systems thinking approach to engage students in STEM courses in solving complex problems. Participants will explore the links between inclusive collaboration, systems thinking, and group model building by engaging in a team-based problem-solving activity. They will then collaboratively explore ways to apply this Shared Vision Framework to design learning experiences around complex problems of their own interests.

Christelle Sabatier, Senior Lecturer—Santa Clara University; and **Kyle Gipson**, Associate Professor—James Madison University

Columbus Room AB, Third Floor

Session 2.7 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type I: Individual Classroom/Project-Level Interventions

The Genomics Education Partnership: Challenges for Sustainability

The Genomics Education Partnership (GEP) is a faculty consortium dedicated to providing undergraduate research experiences in genomics. Since 2006, the GEP has provided genomics training to more than 100 faculty and thousands of students have contributed to understanding *Drosophila* evolution. Since the GEP originator, Sarah Elgin, is retiring, we are transitioning to a distributed leadership model. At the same time, we are seeking to expand and diversify the faculty involved in the GEP, as well as augment the faculty training opportunities available by creating an online training program. Such growing pains are not unique to the GEP. In this session, we hope to have a rich conversation about the challenges inherent in creating a sustainable and robust program to support student research, using the GEP as an example.

Anne Rosenwald, Professor of Biology—Georgetown University

Type II: Institution-Level Interventions

Integrating Polar Research into Classrooms via Computational Guided Inquiry

We used Computational Guided Inquiry (CGI) to introduce polar research to undergraduates in mainstream disciplinary courses. CGI tasks students with pursuing objectives using inquiry-compatible computational resources. Placing computing power in the hands of students creates opportunities for rich, in-class, inquiry-focused experiences and interactive, concept-oriented teacher-student interactions. We used real-world geophysical data from polar regions to: (1) confront students directly with real-world complexity, (2) use the topics of climate and climate change to engage student interest, and (3) make use of the intrinsically interdisciplinary nature of polar science spanning myriad physical and social sciences. Our assessment suggests this approach to student learning of disciplinary content results in heightened critical engagement, computational confidence, and climate literacy. *Attendees are encouraged to download Anaconda to maximize session participation.

Rachel Wade, Physics Faculty—Edmonds Community College, and **Lea Fortmann**, Assistant Professor of Economics—University of Puget Sound

*Huron Room, Second Floor***Session 2.8 PAIRED FACILITATED DISCUSSIONS**

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type I: Individual Classroom/Project-Level Interventions

Designing and Implementing Humanistic STEM Initiatives

Humanistic STEM (H-STEM) has the power to transform both STEM and humanities higher education. The presenters define H-STEM as the ability to blend technical competence in science, technology, engineering, and mathematics with interest in, and concern for, human affairs, welfare, values, or culture. Students are able to integrate ideas and issues from diverse academic disciplines in order to expand their capacity for analysis and critical thinking. The presenters will focus on evidence from the following initiatives: (1) infusion of H-STEM interventions into existing courses, and (2) recent delivery of the first course in a proposed H-STEM minor. This discussion will encourage participants to consider Humanistic STEM implementation on their own campuses from small, incremental course-based interventions, to complete interdisciplinary courses, to a full H-STEM minor.

Debra Bourdeau, Chair, Department of English, Humanities and Communication, and **Beverly Wood**, Assistant Professor of Mathematics—both of Embry-Riddle Aeronautical University

Type IV: STEM Education Research

Effective Strategies to Internationalize STEM Courses and Programs

In this interactive presentation, participants will learn how to integrate international and intercultural examples into their courses and degrees. Several approaches to internationalize courses and degrees will be presented, especially targeting the STEM curriculum. Strategies will be discussed through case studies and freely available online resources. The concepts covered in this presentation will allow instructors to internationalize their courses by focusing on teaching methods, learning outcomes, and assessment of these outcomes.

Parul Khurana, Associate Dean and Associate Professor of Biology, and **Hitesh Kathuria**, Assistant Vice President, University Academic Affairs—both of Indiana University

*Sheraton Ballroom 4 & 5, Fourth Floor***Session 2.9 PAIRED FACILITATED DISCUSSIONS**

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type IV: STEM Education Research

Teaching and Assessing Qualitative Reasoning Skills in STEM Courses

One of the core competencies outlined in the 2011 AAAS Vision and Change report is the ability for students to use quantitative reasoning to understand and interpret data. The report does not specify the need for students to develop qualitative reasoning, including logical and ethical reasoning skills. In this interactive session, we will present data from undergraduate biology students who were asked to evaluate the soundness and cogency of arguments and decipher whether an argument is fallacious or not. We will engage the audience to deliberate on the importance of teaching critical and ethical reasoning skills in STEM courses. We will present various classroom interventions used to encourage deductive and inductive reasoning and motivate students to develop logical frameworks.

Mays Imad, Professor of Biology and Coordinator of the Teaching and Learning Center, and **Shekeycha Ward**, Nursing Student—both of Pima Community College

Type II: Institution-Level Interventions

Science for All: The Liberal Art of Science Revisited

The revision of the 1990 AAAS document, *The Liberal Art of Science*, will be discussed. Participants will provide feedback on an outline of the new document, helping to frame out parts of the revision regarding

equity instruction and inclusion in STEM—especially basic STEM courses, scientific literacy, and the importance of science for all students. In addition, participants will be asked to reflect on a new model of STEM education that emphasizes integrating and scaffolding skills and essential content based on the convergent themes and recommendations made by major education reform efforts, including the College Board’s revision of all the AP science courses, Vision and Change for the biology community, AAC&U’s LEAP project, and several recent reports from the National Academies of Science.

Gordon Uno, *Professor of Plant Biology—University of Oklahoma*

12:30 P.M. – 2:00 P.M. LUNCH ON YOUR OWN

2:00 P.M. – 3:00 P.M. CONCURRENT SESSIONS

Sheraton Ballroom 2, Fourth Floor

Session 3.1 INNOVATION/IDEATION SESSION

This session includes the two separate presentations listed below.

Type I: Individual Classroom/Project-Level Interventions

Addressing the Equity Gap in Lower Division STEM Courses: A Case Study

This innovation session proposes integrating a community-based learning experience in a lower division course to address the equity gap among underserved students. A case study methodology will be employed to analyze program equity gaps at a medium-size Midwestern university. An introduction to information systems course is chosen for this case as some of the largest gaps among underserved students exist in this STEM field. This study aims to provide ideas and examples of ways to both enhance the learning experience for underserved students while concurrently developing benefits for community stakeholders.

Anna Land, *Assistant Professor of Supply Chain Management*, and **Andrew Ciganek**, *Chair of the Information Technology and Supply Chain Management Department—both of University of Wisconsin–Whitewater*

Type I: Individual Classroom/Project-Level Interventions

Mindset Analysis and Grade Component Correlations Key to Course Redesign

Applied Calculus had a continually increasing DFW rate, and students who completed the course had just a 57 percent graduation rate. Faculty consensus on a number of key components of the course, both with respect to documents and policies, enabled us to modestly lower the DFW rate and greatly improve the overall performance of students through a course redesign. Through this process, we found a strong link between student mindset, first-exam performance, and final course grades; this, in turn, informed the course redesign process. The combination of mindset analysis and determining course grade component correlations is crucial to ferreting out the issues in an individual course and/or across an entire department.

Deborah Gochenaur, *Associate Professor of Mathematics—Shippensburg University*

Type: IV: STEM Education Research **Full Participation through Empowering Interdisciplinary Scholarship**

We will describe our pilot workshop on “Empowering Interdisciplinary Teaching and Scholarship.”

Graduate student instructors from across the arts and sciences shared their skills and strategies to create learning environments that would engage the complex information necessary for full participation. Using common ground theory and interdisciplinary methods, nine diverse student teams developed their grounding concepts and definitions on day one and built specific course projects on day two. We will discuss the concept and strategies for implementing common ground exercises, review how that framework facilitates learning environments for STEM instructors by integrating science with humanistic

perspectives, and argue for the value of creating a more holistic understanding of social difference and social justice in achieving full participation.

David Lynn, Professor of Chemistry and Biology; **Kim Loudermilk**, Director of IDEAS (Interdisciplinary Exploration and Scholarship) Program; and **George Inglis**, Graduate Student, Graduate Division of Biological and Biomedical Sciences—all of Emory University

Sheraton Ballroom 1, Fourth Floor

Session 3.2 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type II: Institution-Level Interventions

Oppositional Mindset: In Search of Success

This session will present the work of an undergraduate research team to uncover what facilitates or inhibits student success. We are keenly interested in understanding a newly identified phenomenon we are calling “Oppositional Mindset.” Oppositional Mindset was first hypothesized during an undergraduate seminar class discussion on student success in Spring 2018. Oppositional Mindset is an implicit attitude that individuals possess as a result of experiencing degradation from another person, accompanied with a small success, that results in the degrading situation becoming a form of motivation for the individual. As we looked through the psychological literature, we found no evidence of anyone citing or researching this phenomenon. To date, we have completed four qualitative studies, each furthering our understanding of this phenomenon.

Bonnie Green, Professor of Psychology—East Stroudsburg University

Type IV: STEM Education Research

Map the Way to Better Thinking

Would you like your students to be able to take more effective notes or to be able to connect ideas more effectively? Growth mindset can be impacted if the student feels that they can improve using helpful strategies. We are focused on giving students strategies to improve their performance, specifically STEM-based courses, through better note-taking skills and flow charts/mind maps. Come join us in mapping out these strategies.

Jayme Wheeler, Instructor of Mathematics, and **Camille Pace**, Associate Professor—both of Georgia Highlands College

Type II: Institution-Level Interventions

Exploring and Addressing Fixed Mindset among STEM Faculty and Its Impact

As part of an NSF grant to increase underrepresented students’ retention/success in STEM, we sought to foster a STEM identity among those students. In conversation with faculty serving as mentors/advisors to these undergraduates, we encountered beliefs about student ability/performance that we explored in an interview study. This qualitative data set illuminates faculty perceptions and establishes the need to address often unexplored but highly consequential beliefs held by faculty, which can have a measurable and inequitable impact on student success. We will share interview data and the implications for STEM faculty development and student success.

Anne Kelsch, Director of Faculty and Staff Development—University of North Dakota

Michigan Room AB, Second Floor

Session 3.3 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type IV: STEM Education Research

Students as Agents of Change Promoting Success

This session highlights the importance of involving students as key partners of institutional change efforts in STEM. Presenters will share information about how students have become critical change agents to shift cultural practices and faculty perspectives. Session participants will discuss and generate ideas for how to involve students in institutional change efforts to bolster participation in STEM within their own institutional contexts. This interactive session will end with an opportunity for participants to discuss collaboratively working on research projects that examine students as institutional change agents.

Kadian Callahan, Assistant Dean for Faculty and Student Success and Associate Professor of Mathematics Education; **Scott Reese**, Assistant Dean for Curriculum and Associate Professor of Biology; and **Marla Bell**, Associate Dean for Student Success and Professor of Mathematics—all of Kennesaw State University

Type IV: STEM Education Research

High-Impact Areas for Change Centered around Large-Scale Curriculum Redesign

We will present an overview of an ongoing STEM curriculum redesign process at our institution that is currently two years into the process. The goals of this redesign program are to better prepare students for twenty-first century workforce opportunities, challenges, and demands. We will share and discuss unanticipated higher-level action recommendations that have come from departments working on this process, as well as how those suggested changes are being implemented. We will use a case-study approach to engage participants in this material and our results, including preliminary evaluation data from this process.

Keely Finkelstein, STEM Instruction Consultant—University of Texas at Austin

Columbus Room AB, Third Floor

Session 3.4 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type III: National-Level Interventions

Transforming General Biology: Empowering Collaborative Problem Solving

Inspired by the AAAS Vision & Change report, Rutgers University-New Brunswick implemented a large-scale transformation to its introductory general biology course sequence. A primary learning objective of the change was the development of students who are collaborative problem solvers. Significant barriers hindered achievement of this goal and, thus, programmatic change. By sharing the barriers we encountered, we hope to converse with others facing similar challenges to making significant educational changes. We have tools and approaches that have enabled us to achieve our goal with a very large and diverse student population and would like to have others benefit from our experience as well as to learn from the experiences of others. Collaboration was essential to our ability to effect change and we hope to exchange ideas with others similarly interested in educational transformation that meets the expectations of our changing educational landscape and includes and engages all student demographics.

Calvin Yu, Director of Assessment; **Gregg Transue**, Director of Introductory Biology Programs; **Christy Beal**, Assistant Teaching Professor; **Anne Keating**, Assistant Teaching Professor; and **Daniel Stern Cardinale**, Assistant Teaching Professor—all of Rutgers University—New Brunswick

Type II: Institution-Level Interventions

Gaining Deeper Understanding of Chemistry Concepts through Adaptable Modules

Herein, we present the active learning modules that our team has developed and implemented for large lecture courses—aiming to familiarize both introductory general chemistry students and those enrolled in general, organic, and biochemistry chemistry courses with real-world applications of chemistry through in-class activities and projects. A variety of adaptable modules will be presented

that can potentially be utilized across different STEM disciplines. These modules provide students with an opportunity to gain deeper understanding of chemistry concepts by creating personal, societal, and economic value to solve real world problems.

Asmira Alagic, Assistant Professor of Chemistry; **Christy Bagwill**, Assistant Professor of Chemistry; and **Daria Lazic-Sokic**, Instructor of Chemistry—all of Saint Louis University

Sheraton Ballroom 4 & 5, Fourth Floor

Type IV: STEM Education Research

Session 3.5: Fostering Inclusive Excellence across STEM at a Research University

In 2008, Brandeis University created the first Science Posse in the nation. Now in its tenth year, the Brandeis Science Posse program boasts a 97.5 percent graduation rate, an 82.5 percent retention rate in STEM (including science policy), and 70 percent of Scholars are on Dean's List. In summer 2017, Brandeis was awarded the highly coveted HHMI Inclusive Excellence Grant to reform our academic systems to foster a more inclusive learning environment not only for underrepresented students but for all STEM students. We will discuss our efforts in cohort mentoring, introductory STEM faculty learning communities, workshops aimed at changing the student culture, and a first-year math practicum series. Our presentation will include quantitative and qualitative research of our programs, followed by an interactive session.

Irv Epstein, University Professor and Henry F. Fischbach Professor of Chemistry; **Kim Godsoe**, Associate Provost for Academic Affairs; and **Melissa Kosinski-Collins**, Professor of Biology—all of Brandeis University

Sheraton Ballroom 3, Fourth Floor

Type II: Institution-Level Interventions

Session 3.6: Instructional-Teams Model Supports Reformed Teaching in Large STEM Classes

The Instructional-Teams Project is a professional-development program that supports evidence-based STEM instruction in large classes. Recognizing the complexity of teaching in such an environment, the project utilizes a team model that supports instructors through the functions of three specialized team roles that can be performed by graduate or undergraduate learning assistants: Instructional Manager, Learning Assistant, and Learning Researcher. Individuals in each of the roles (including the instructor) receive specialized professional development that focuses on supporting the implementation of high-quality instructional tasks and collecting formative-assessment data that can impact the instructor's decisions in real time and increase the quality of the learning experience for students. This model is robust enough to be used across several disciplines in STEM and beyond.

Lisa Elfring, Associate Vice Provost for Instruction and Assessment, and **Jonathan Cox**, Research Associate; and—both of University of Arizona

Erie Room, Second Floor

Type II: Institution-Level Interventions

Session 3.7: Integrating Principles of Engineering Design in Undergraduate Science Courses

Based on current reform efforts, there is a clear need to improve STEM education for the preparation of STEM professionals and teachers. The Next Generation Science Standards Framework indicates that all students develop competencies in engineering design, resulting in a conceptual shift toward the integration of engineering in science education. This workshop provides science faculty with an innovative instructional model and curricular tools for building undergraduate students' learning of science through engineering design. Participants will engage in a classroom-tested design experience and group discussions as a means of learning how to integrate engineering design into undergraduate science courses. Participants will gain insights into what engineering design entails, its role in undergraduate STEM education, and steps toward transforming practice to improve science learning of all students.

Brenda Capobianco, Professor of Science and Engineering Education; **Sanjay Rebello**, Professor of Physics and

Physics Education; and David Eichinger, Associate Professor of Biological Sciences and Science Education—all of Purdue University

Ontario Room, Second Floor

Type IV: STEM Education Research

Session 3.8: Is It OK to Ask? Instructor Openness to Questions and Student Help-Seeking

In this session, we will present findings from a study on the relationship between instructors' in-class communication behaviors and undergraduates' willingness to seek academic help. In the study, 268 undergraduates completed measures on their perception of instructor openness to questions and their approach to help-seeking in class. Findings suggested that the instructors' openness to questions is indeed related to students' willingness to seek help. Additionally, help-seeking mediated the relationship between perceived instructor openness and final grade. Following presentation of the study, we will open up a discussion of practices that can promote help-seeking, and session participants will have a chance to reflect on their own practices and set individual goals around student help-seeking.

Marina Micari, Director, Academic Support & Learning Advancement; and **Susanna Calkins**, Director of Faculty Initiatives, Searle Center for Advancing Learning and Teaching—both of Northwestern University

Huron Room, Second Floor

Type III: National-Level Interventions

Session 3.9: Building a Network of Community College Makerspaces

The California Community College Makerspace Initiative (CCC Maker) led a cohort of 24 community colleges in a three-year project to develop makerspaces, communities of practice, team internships, and curriculum. Using the CCC Maker data dashboard, publications, and stories from the field, the statewide project lead will present the guiding principles, processes, best practices, and impact of this innovative approach to teaching, learning, and preparation for STEAM careers of the future. Together these elements comprise a model for interdisciplinary collaboration and student success at every level, redefining what it means to be well educated in the twenty-first century.

Deborah Bird, Technical Assistance Provider—California Community College Makerspace Initiative

3:15 P.M. – 4:15 P.M. CONCURRENT SESSIONS

Columbus Room AB, Third Floor

Session 4.1 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type II: Institution-Level Interventions

"If They Knew Better, Would They Do Better?" — The BOSS Project

Nearly 50 percent of all U.S. undergraduates attend community colleges. However, existing research provides a limited understanding of community college STEM students. Building Opportunities for STEM Success (BOSS) is an NSF-supported multidisciplinary research project being conducted at Florida State College at Jacksonville. We were interested in determining if student performance and efficacy could be increased by teaching STEM-specific study skills as co-curricular content in STEM courses. Our multidisciplinary approach is being implemented in the following disciplines/courses: biology, chemistry, earth and space science, mathematics, engineering, and information technology.

Ivetta Abramyan, Professor of Earth Sciences—Florida State College at Jacksonville

Type III: National-Level Interventions

Exploring Undergraduate Transfer Student Pathways and Success in Microbiology

Transfer students from two-year colleges are more likely to be women, underrepresented minorities, low-income, older, and financially independent. These and other challenges translate to reduced access and

retention in STEM. Our microbiology program implemented an intervention of a hybrid online 2+2 track to test the hypothesis that distance education could increase accessibility, retention, and diversity of transfer students. A mixed methods approach was used to identify factors, explore pathways, and study outcomes for the three tracks: first time in college, on-campus, and online transfers. We conclude that while these interventions broadened participation and increased diversity, transfer students still face different challenges. Understanding unique pathways and challenges of transfer students can enhance strategies for student success and serve as a model in other STEM disciplines.

Alexandria Ardisone—*University of Florida*

Type II: Institution-Level Interventions

Plastic Pervasiveness and Pollution: Polymer Education for Preservice Teachers

This presentation will describe a current research project that embeds polymer concepts into a chemistry course for preservice elementary teachers. Examples will be given of how polymer concepts, which are often omitted from nonmajor chemistry courses, can be integrated seamlessly into an introductory chemistry laboratory curriculum based on the Next Generation Science Standards. Student assessment and reflection data will also be shared before the presenters lead session participants in a discussion of how polymer concepts, including recycling and the life cycle of materials, can be incorporated into existing introductory STEM courses as one way of combating the serious global issue of plastic pollution.

Amy Johnson, *Professor of Chemistry*, and **Victoria Hill**, *Graduate Student*—*both of Eastern Michigan University*

Sheraton Ballroom 4 & 5, Fourth Floor

Session 4.2 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type IV: STEM Education Research

Challenging and Motivating STEM Students through the Use of Pertinent Case Studies

How do we integrate societal aspects into our science teaching without compromising content, while also examining cultural aspects of science that we have assumed are not the purview of what we perceive as the “objectivity” of science? How do we challenge our students to consider the multiple perspectives linked to socio-scientific issues? We posit that using narratives to teach science in context addresses the growing need to prepare students for our rapidly changing world. Actively engaging students in intentionally chosen socio-scientific case studies broadens the relatability of the contexts and better reaches a wider demographic of students. This creates a learning environment that is accessible, motivating, thought-provoking, and collaborative and takes students beyond content.

Susan Gass, *Senior Instructor, Environmental Science Program*—*Dalhousie University*

Type II: Institution-Level Interventions

Using a 5E Lesson Format to Adapt Scientific Research into Course Lessons

This presentation will describe how we adapted our scientific research into a learning experience aligned with Vision and Change and the K-12 Next Generation Science Standards. We used the 5E lesson format to scaffold the creation of an active learning lesson, which will be described during the presentation. During this lesson students collected data, analyzed data, and constructed explanations about evolution. Using the 5E lesson format to adapt science research into teaching supported students in learning core concepts through engagement in science practices. The results of this exploratory study and the descriptions of the lesson design should be used to raise awareness of the 5E lesson format for future comparative studies to other active-learning pedagogies.

Robert Idsardi, *Assistant Professor of Biology Education*—*Eastern Washington University*

Type I: Individual Classroom/Project-Level Interventions

It's a Wrap: Using ClassWrappers to Promote Student Success

An active learning strategy designed to allow students the opportunity to immediately self-reflect on classroom instruction will be presented. The objective of this session is to introduce a learning strategy identified by the use of what has been termed "ClassWrappers." The presenters will describe how students utilize ClassWrappers to work in groups and apply concepts to identify their perceived strengths and weaknesses over material covered immediately following instruction. These ClassWrappers have been piloted across foundation-level math courses as part of a gateway course redesign. The intended audience for this presentation is any classroom instructor, especially those looking for ways to foster the use of metacognition and enhance self-directed learning. Feedback from students and instructors, as well as statistics gathered, indicate this strategy has been beneficial.

Sandra Anderson, Associate Professor of Mathematics, and **Tim Floyd**, Associate Professor of Mathematics—both of Georgia Highlands College

Huron Room, Second Floor

Session 4.3 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type III: National-Level Interventions

What Can STEM Do for the Liberal Arts?

The current emphasis on incorporating the humanities, social sciences, and arts into STEM programs to create well-rounded students who can think innovatively is a one-way street, consigning the Liberal Arts to the role of assisting STEM thinkers. How do we make this a two-way street? What can STEM approaches do for the liberal arts? Reflecting on how STEM approaches can engage with the liberal arts leads to further questions of how we can create academic spaces for both fields to collaborate equally in order to prepare students for future employment. While such a reciprocal approach opens up new possibilities, it also requires consideration of how such a paradigm shift fits into the higher education undergraduate curriculum.

Kristina DuRocher, Faculty Director of General Education—Kennesaw State University

Type II: Institution-Level Interventions

Humanities-Driven STEM: A New Approach for the STEM and Liberal Arts

Arts and humanities have often been an afterthought in STEM education. Developments with STEAM (Art), STREM (Reading), and STEMM (Music) have tried to address this by adding arts and humanities into STEM to increase problem solving, innovation, or creativity. This supplement leaves out many of the soft-skill development that arts and humanities provide. In a change of this approach, the Honors College at Texas Tech University has developed humanities-driven STEM courses that use arts and humanities as the basis of discussion of human progress and supplements with STEM principles through scientific discovery and engineering advancement. These courses have been instituted within a first-year experience program. Analysis of these courses and discussion of student and instructor feedback will be provided.

John Carrell, Assistant Professor of Engineering, and **Aliza Wong**, Associate Dean of the Honors College—both of Texas Tech University

Type II: Institution-Level Interventions

Assessing the Student-Centeredness of STEM Communications

As part of the APLU Student Experience Project, the University of Toledo is examining the ways psychosocial factors influence the motivation and persistence of historically underrepresented students in STEM, with the goal of developing and testing scalable interventions. As part of this work, we have undertaken an audit of key communications between the institution and STEM students, to assess how well these

documents convey student centeredness. Our innovation session will: (1) define the need to conduct such audits and revise language to be more student-centered, (2) broaden the scope of the kinds of communications that we should be examining (e.g., program acceptance and declination letters, course registration information, notification of academic holds), and (3) describe a basic audit process for assessing the student-centeredness of such communications.

Lesley Berhan, Associate Dean for Diversity, Inclusion and Community Engagement—University of Toledo

Michigan Room AB, Second Floor

Session 4.4 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type II: Institution-Level Interventions

Connecting to Careers: Bringing Real Industry Career Options to HSI Students

The connection between graduation and careers is something that becomes elusive to students who may not have otherwise been exposed to the college experience. Many of our students are first-generation and have been navigating their college experience on their own to find that upon graduation they are lost in terms of where to apply for work. If a student's plan is not graduate school, it is important to bridge this gap. An immersive enhancement course targeted towards students seeking jobs in STEM industries is proven to be effective in exposure to real-life workplace skills and networking opportunities. This one-week exposure to industry jobs gives students an idea of where they can apply for jobs, available internships, practical ideas of industry expectations, and networking connections with scientists.

Bindhu Alappat, Chair and Associate Professor of Chemistry; **Julia Wiester**, Assistant Professor of Chemistry; and **Susan Reyes**, Program Director for NSF Grant—all of Saint Xavier University

Type I: Individual Classroom/Project-Level Interventions

Leveraging Partnerships and Grants to Enhance STEM Teacher Prep Programs

The teacher shortage crisis is a national issue with the majority of schools reporting that STEM positions are the hardest to fill. Northeastern Illinois University (NIU) is addressing this need through a well-established partnership with a community college network and an interdisciplinary math and science education program that provides opportunities for students to become successful teachers of STEM. Alongside this program and through the long-standing partnership with the community college network, NIU was awarded two NSF grants that help address the teacher shortage and focus on the preparation of qualified STEM teachers. We will discuss how these projects and structures create a more diversified teacher pipeline and facilitate an engaged learning experience for pre-service teachers that we hope will translate into their future K-12 classrooms.

Rachel Adler, Associate Professor of Computer Science, and **Matthew Graham**, Associate Professor of Mathematics—both of Northeastern Illinois University

Erie Room, Second Floor

Session 4.5 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type I: Individual Classroom/Project-Level Interventions

"It's a Failure": Developing Communicative Self-Efficacy in Hostile STEM

Even when educational research demonstrates the positive outcomes of curricular innovation in STEM, the likelihood of a failure to implement that innovation still exists. We offer a case study that presents successful educational research that supports STEM innovation and three causes for why that innovation failed to transform the curriculum. The innovation involved teaching simultaneous and partnered engineering and communication courses. The aim was to encourage engineering undergraduates to develop agency as communicators and then to assess that agency using the concept of communicative

self-efficacy. The three causes for failing to implement that innovation were a failure of engagement, courage, and trust. Through a facilitated discussion of our success and failure, we expect participants to be able to identify kernel strategies for encouraging STEM transformation.

Rick Evans, Director, Engineering Communications Program—Cornell University

Type I: Individual Classroom/Project-Level Interventions

Speaking Science: An Early Program to Connect Research and Communication

There is an essential connection between science and communication, as scientists need to translate highly technical ideas or experimental results to share them with the broader community. To emphasize the benefit of undergraduate research and the important role of science communication, we developed Speaking Science, a four-day residential program for incoming students with a STEM interest. Participants were paired with a faculty mentor and spent two days in their active undergraduate research lab. They also attended two interactive workshops to develop relevant communication skills. Finally, they presented a poster based on their role in the research project to a general audience. Students reported short-term and long-term gains related to confidence in their ability to pursue science and to communicate scientific topics.

Laura Wysocki, Associate Professor of Chemistry—Wabash College

Ontario Room, Second Floor

Session 4.6 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type II: Institution-Level Interventions

Cultivating Relationships through the Integration of First-Year Lab Experiences

This session explores results from a three-year model of laboratory instruction, Project Synapse™, that synthesized biology, chemistry, and communication components. Study participants included a sample of first-year science majors at a STEM-focused university. Laboratory biology-chemistry integration was featured at natural intersections where disciplines used similar tools, such as microscopy, or areas where content naturally overlapped such as the biochemistry of photosynthesis. Student demographic and attitudinal survey results were analyzed using regressions and ANOVA methods. Qualitative methods were also implemented to more fully understand the student experience. Survey results suggest shifts in student study habits and willingness to interact with peers. Student interviews revealed that students found interactions with professors and peers an affirming aspect of the model.

Margery Gardner, Director of Teacher Preparation—Colgate University

Type IV: STEM Education Research

Which Interventions Are Needed for STEM Success?

Stanislaus State has several grant-funded programs for incoming freshmen and transfer STEM majors from underrepresented groups. Participants in these programs have stronger academic and psychosocial outcomes than non-participants, but which programs should be institutionalized when the grant dollars must be replaced by internal support? Are some programs more impactful than others, and are students who participate in two programs more successful than students who participate in only one? Come learn about innovative programming for STEM majors at Stanislaus State, and join a discussion that draws upon quantitative and qualitative data to engage with challenging issues that all public institutions face in an era of dwindling support for student success.

Harold Stanislaw, Professor of Psychology and STEM Success Evaluator—California State University—Stanislaus

Sheraton Ballroom 3, Fourth Floor

Type I: Individual Classroom/Project-Level Interventions

Session 4.7: Encouraging Scientific Identity through Exploration of “Possible Selves”

Many students do not persist in STEM majors and careers because they fail to experience a sense of belonging or build scientific identity early in their undergraduate studies. One potentially effective intervention mode may be to provide students with opportunities to visualize their “possible selves” through encounters with scientists whom they aspire to emulate, but with whom they also currently identify. We present the design and outcomes of a comprehensive program for STEM majors intended to encourage consideration of a wider array of possible selves through authentic scientific work, tiered mentoring, and direct interactions with science professionals. Through role-playing and interactive discussion, we invite participants to consider how they might design similar opportunities for students to develop scientific identity in their own institutional contexts.

Kristen Short, Associate Professor of Biology, and **Kathryn Davis**, Associate Professor of Chemistry—both of Manchester University

Sheraton Ballroom 2, Fourth Floor

Type II: Institution-Level Interventions

Session 4.8: Connecting and Coordinating Efforts to Increase Evidence-Based Teaching

The National Academies Roundtable on Systemic Change in Undergraduate STEM Education crosses disciplines/institution types and connects local, regional, and national efforts in undergraduate STEM education. One focus is on the adoption of evidence-based teaching practices, which remains a roadblock to student success and equitable achievement in STEM fields. This workshop will address an important gap: the lack of coordination and exchange of practices between discipline-based and campus-based faculty development efforts. The session will spark new ideas based on a framework and analysis developed by the program, share concrete (but heretofore siloed) practices, and engage participants in generative discussion about strategies that would better support faculty in the use of evidence-based teaching approaches. This workshop is part of the ongoing work of the National Academies Roundtable.

Kerry Brenner, Senior Program Officer—National Academies of Sciences, Engineering, and Medicine; **Cassandra Horii**, Founding Director—Caltech Center for Teaching, Learning, and Outreach and Past President—POD Network; and **Jim Swartz**, Dack Professor of Chemistry—Grinnell College

Sheraton Ballroom 1, Fourth Floor

Type I: Individual Classroom/Project-Level Interventions

Session 4.9: Transforming Setbacks into Successes: Helping Promising Underrepresented Students Thrive in Unfamiliar Territory

What happens when high-performing graduates of under-resourced high schools become viscerally aware that they are, indeed, a minority in college? Their performance sags, and they often feel a sense of cultural isolation. And how should STEM programs address this situation? Ignoring the performance disparities is negligent and addressing the cultural issues can be intimidatingly tricky. Solving this dilemma requires a delicate hand. This workshop shares an unexpected set of obstacles that were hindering underrepresented students from doing their best academic work in STEM courses. Participants will learn how to examine their own programs for similar barriers and obtain instantly usable methods for enhancing all students’ learning, with a particular emphasis on underrepresented students.

Leonard Geddes, Founder—The LearnWell Projects

4:30 P.M. – 5:30 P.M. CONCURRENT SESSIONS

Sheraton Ballroom 4 & 5, Fourth Floor

Session 5.1 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

*Type II: Institution-Level Interventions***Transforming STEM: A Call-Response Approach to Mentoring Students of Color**

Student retention, specifically from underrepresented groups, in undergraduate STEM programs is essential to the future of STEM and the future of small colleges and universities. This session describes the conceptualization and development of a STEM-based research mentoring program that intentionally emphasizes the culturally relevant values of communal work and collaboration at such an institution. With a college mission statement focused on social justice, community change, and connected learning, students are asked to answer the call for research that directly benefits their respective communities. This interdisciplinary program uses mentoring, peer support, active learning, and research projects to draw and retain underrepresented undergraduates in STEM fields. Strategies and challenges of this culturally informed approach, which is applicable to various institutional contexts, will be discussed.

Charlotte Frazier, Associate Professor of Psychology, and **Deirdre Donovan**, Assistant Professor of Mathematics—both of Lasell College

*Type I: Individual Classroom/Project-Level Interventions***Scholars and Leaders Program to Increase Science Student Success**

Role models are critical to increasing students from underrepresented groups who major in STEM fields and become employed in the STEM workforce. Yet role models from low-income and underrepresented minorities are challenging to obtain. Leadership development in this population is one strategy to increasing their number as these students become role models in their communities. The Scholars and Leaders Program (SLP) will enroll academically talented, low-income students to pursue science majors. SLP builds upon existing university programs and will implement additional components, including program orientation, faculty mentoring, experiential leadership activities, family engagement activities, and career-building. A mixed-method design and an in-depth qualitative analysis of student responses will be used to assess leadership self-efficacy and to identify components that most impact science student success.

Ben Whitlock, Professor of Biology; **Jacqueline Wittke-Thompson**, Associate Professor of Biology; and **Lisa Hedrick**, Professor of Biochemistry—all of University of St. Francis

*Type IV: STEM Education Research***Supporting Undergraduate STEM Student Success through Multilevel Mentoring**

This presentation features the University of Houston's (UH) innovative STEM PARENT Program, a multi-level mentoring support network, which aims to improve student retention in STEM fields, while addressing the national need for a diversified STEM workforce that represents the country's demographics. Unique to the STEM PARENT program are its many iterations of mentoring, including peer mentoring, parent mentoring, and the mentoring of underserved populations of students. Mentoring activities and strategies designed to build community, strengthen family-school and faculty-student relationships, and promote student success will be shared.

Hutchison Laveria, Professor of Curriculum and Instruction—University of Houston

Columbus Room AB, Third Floor

Session 5.2 INNOVATION/IDEATION SESSION

This session includes the two separate presentations listed below.

*Type I: Individual Classroom/Project-Level Interventions***What Good Can Come From Collaborations Between Biology and Writing Courses?**

We propose a framework aligning the shared emphasis of the non-major biology course and the first-year writing course on applying disciplinary knowledge to personal and public or societal contexts, notably through recognition of the body as both a physiological and rhetorical instrument. Biology students of all

abilities and socio-economic backgrounds are empowered to understand relationships between anatomical function, healthy aging, and their own bodies as they construct meaning in public discourse. This process encourages students to imagine the motivations, sensory experiences, and values that citizen science participants gain through engaging with the sites. In so doing, students achieve course learning outcomes around persuasive science communication, while contributing to their awareness of sciences role (and rhetorical power) in promoting the public good across barriers of economic or educational access.

Barbekka Hurtt, *Teaching Assistant Professor of Biology—University of Denver*

Type II: Institution-Level Interventions

IDEAS for Advancing Science Communication and Interdisciplinary Education

Oral communication training integrated into the research university structure and curriculum is needed so STEM students and researchers build their confidence and create engaging/meaningful connections with a variety of audiences. The research communication program at Northwestern University, supported by the IDEAS NSF-NRT Research Traineeship, has been addressing this problem. It is an eight-week workshop series, designed to enhance STEM researchers and students' communication skills across disciplines and backgrounds. Since its launch, 183 participants have completed the program (50 percent women), even though the number of women has been lower in the physical sciences, mathematics, and engineering disciplines. This presentation highlights the findings of this program and also explores qualitatively why this specific program workshop has supported these students and addressed diversity and inclusion in industry/academia.

Lois Trautvetter, *Professor and Director of Higher Education Administration and Policy*, and **Michelle Paulsen**, *Director, Outreach and Communication Programs—both of Northwestern University*

Sheraton Ballroom 3, Fourth Floor

Session 5.3 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type I: Individual Classroom/Project-Level Interventions

Developing Undergraduate Student Autonomy in Scientific Research

Undergraduate research is a high-impact practice that should be accessible to all students. The Research Skill Development (RSD) Framework can be used within a learning contract to scaffold undergraduate students in their development of greater autonomy in independent scientific research. The RSD Framework is a rubric of the various skills required to engage in research, evaluated by the level of autonomy exhibited by the student. Learning contracts are ideal for unique learning experiences, like undergraduate research. Combined, students can be included in the process of determining appropriate outcomes for their research project and can be evaluated based on their growth in selected research skills. This can promote greater inclusion and equitable evaluation of students at all levels of experience.

Stacy Amico-Ruvio, *Assistant Professor of Biology*, and **David Stewart**, *Assistant Professor of Chemistry—both of D'Youville College*

Type IV: STEM Education Research

Inculcating a Culture of Research Entrepreneurship

There are many interventions that have been very effective in exposing undergraduate students to research and scientific careers; however, few have tried to inculcate a culture of "research entrepreneurship." A multi-level program, named "A Student-Centered Entrepreneurship Development (ASCEND) and offering a training model to diversify the biomedical research workforce," has a theoretical framework that aims to inculcate a culture of research entrepreneurship in undergraduate research training. The ASCEND Entrepreneurial Research Training Model (ERTM) consists of these stages: Attraction and Inspiration, Ideation and Innovation, Implementation, and Growth. The Student Research Center

(SRC), a component of ASCEND, is a student-led organization, designed to be an interdisciplinary hub for attracting, training, and engaging undergraduate students into biomedical research, while supporting and guiding them through the stages of the ASCEND ERTM.

Payam Sheikhattari, Professor of Public Health—Morgan State University

Type II: Institution-Level Interventions

Global Engineering Experience as a Tool and Model for Teaching

Global engineering experience is an innovative approach and model to training future STEM professionals in addressing global societal challenges. Such an experience (1) encourages students to work in multidisciplinary, multicultural teams with a foreign collaborator; (2) challenges students to implement appropriate, cost-effective solutions for a developing country; (3) challenges students to incorporate sustainability in engineering design; and (4) challenges them to think creativity. This work presents results of a successful global engineering experience at a small liberal arts institution that was administered over a span of four years with over 100 engineering students participating in the experience.

Helen Muga, Assistant Professor—Baldwin Wallace University

Sheraton Ballroom 1, Fourth Floor

Session 5.4 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type I: Individual Classroom/Project-Level Interventions

Academic Cohorts: A Model to Achieve Equity in STEM

From 2008-2012, an examination of our institutional data revealed that black, Latino, and first-generation students were less likely to earn grades of B- or better in introductory STEM coursework compared to their peers. To address these equity gaps, we implemented an academic cohort program to better meet the needs of these students. An examination of six years of data (2013–19) have revealed the efficacy of our cohorts, which have been key to transforming our campus. This session is of interest to faculty and administrators interested in institutional change in STEM higher education. In this session, participants will learn about the features of our cohorts and how they might adopt a cohort model on their own campus to address equity gaps.

Dylan Worcester, Assistant Director, The Quantitative Skills Center—Pomona College

Type II: Institution-Level Interventions

Access and Equity: Quality Education for Minorities Network's Interventions

While historically black and tribal colleges and universities are about 3 percent of the colleges in the US, they receive less than 1 percent of all funds allocated to institutions of higher education for research and development. However, they continue to produce a significant number of minority engineers and STEM majors annually. For more than twenty years, Quality Education for Minorities (QEM) has provided capacity building and technical support to institutions to improve outcomes for minorities particularly in empirically-based broadening participation efforts in STEM education. This session will present summative findings from the QEM model of developing communities of practice, the theoretical underpinnings of QEM BP efforts, and evidence-based interventions applicable to institutions and STEM education researchers seeking to contribute to the national landscape of broadening participation research.

Ivory Toldson, President and CEO—Quality Education for Minorities Network, and **Erin Lynch**, Associate Provost of Scholarship, Research, and Innovation—Winston Salem State University

Ontario Room, Second Floor

Session 5.5 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type I: Individual Classroom/Project-Level Interventions

Professional Development to Support STEM Lab Teaching Assistants

This presentation will describe a systemic effort to implement institutional change to support undergraduate STEM lab teaching assistantship via a year-long professional development initiative. Particularly, we will provide an overview of the nature of the professional development structure, the activities utilized, and lessons learned. We will also seek to identify complexities and challenges that need to be addressed in developing teaching assistants' enactment of an operational curriculum.

Ruthmae Sears, Associate Professor of Mathematics Education—University of South Florida

Type I: Individual Classroom/Project-Level Interventions

A Transformative Capstone Course for Pre-Health Undergraduates

We have developed a capstone experience in which pre-health students integrate their knowledge from different courses in biomedical and social sciences to analyze clinical cases that contain a flawed patient-physician interaction. A service-learning component is integrated into the course to allow students to observe social-cultural concerns and understand barriers to health and wellness. This is a transformative experience which not only enhances students' higher order thinking skills, but also increases their awareness of social issues, such as physician bias, professionalism, and cultural competency, which are gaining the attention of medical professionals and educators nationwide. In this workshop, participants will work through a case and develop ways in which they can integrate service learning.

Khadijah Makky, Associate Professor of Biomedical Sciences, and **Judith Maloney**, Associate Professor of Biomedical Sciences—both of Marquette University

Sheraton Ballroom 2, Fourth Floor

Session 5.6 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type IV: STEM Education Research

Bridging the High-Tech Entrepreneurship Gap

High-tech entrepreneurship is considered the future of the workforce, a growth that is based on scientific and technical knowledge, which comes from STEM education. Creating entrepreneurial environments has also become a major driver in economic development policy along with minority entrepreneurship, which has also been viewed as an economic development strategy. However, underrepresented minorities (URM) have faced, and continue to face, structural and social network barriers that impede the pursuit of entrepreneurship. Using analysis of STEM programs aimed at increasing the numbers of URM pursuing STEM careers and secondary data sources on the characteristics of minority owned businesses, let us start a conversation to create strategies aimed at educating and promoting entrepreneurship among URM students pursuing STEM education.

Zoranna Jones, Director, STEM Scholar Program—Texas Christian University

Type I: Individual Classroom/Project-Level Interventions

Underrepresented Entrepreneurship: STEM Entrepreneurship Education

Small businesses with emphasis in science, technology, engineering, and math are catalytic in launching the United States' global presence and competitiveness into the twenty-first century through innovation and technology. The projected growth compared to non-STEM occupations is almost twice as high for STEM occupations, which further demonstrates the necessity of preparing more STEM workers for the needs gap. Higher education institutions play a crucial role in growing STEM education by preparing students through curriculum and graduating conversant learners of the profession. However, the lack of minority-owned STEM businesses impacts the expansion of research on ethnic-based illnesses, influences employment in minority communities, and requires further exploration towards improvement. This topic is

reconnoitered through results of a mixed-method study revealing influencers of minority STEM entrepreneurship for undergraduates.

Kamela Goodwyn, Associate Dean of Technology and Applied Sciences—Milwaukee Area Technical College

Michigan Room AV, Second Floor

Type II: Institution-Level Interventions

Session 5.7: The VIP Consortium and Institutional Change: 35 Institutions and Counting

Vertically Integrated Projects (VIP) provide a scalable, cost-effective, and sustainable model for undergraduate research. VIP Programs have been established at 35 institutions including large and small, public and private, minority serving institutions, and U.S. and international. The VIP Consortium was established in 2014 to foster collaboration and share effective practices. During its establishment, evaluators studied implementations across the consortium and paths toward institutionalization. This workshop will provide an overview of the VIP model, address the differing levels and which programs can be established (and their associated challenges/benefits), and provide suggestions and resources for program establishment. The presenters recognize the many differences among institutions and departments and will provide suggestions for adoption and adaptation of the model in a wide variety of settings.

Edward Coyle, Georgia Research Alliance Eminent Scholar; **Gordon Kingsley**, Associate Professor of Public Policy; **Julia Melkers**, Associate Professor of Public Policy; **Julie Sonnenberg-Klein**, Assistant Director, Vertically Integrated Projects Program—all of Georgia Institute of Technology

Huron Room, Second Floor

Type II: Institution-Level Interventions

Session 5.8: Getting Started with Mastery Grading

In a mastery grading system, grades are based on students' ability to demonstrate mastery of a well-defined list of learning objectives. Typically, students have multiple opportunities to meet these objectives and are not penalized for failures on previous attempts. In this workshop, we will describe the key components of a mastery grading system, highlighting how such a system supports the student learning cycle, promotes a growth mindset, and reinforces the value of productive failure. We will describe a range of approaches and will provide space for participants to begin to craft mastery grading components for their own courses, with facilitators providing feedback and sharing experiences of successes and challenges.

Rachel Weir, Professor of Mathematics; **Craig Dodge**, Assistant Professor of Mathematics; and **Alice Deckert**, Professor of Chemistry—all of Allegheny College

Erie Room, Second Floor

Type I: Individual Classroom/Project-Level Interventions

Session 5.9: Change Efforts to Improve Student Success in Foundational Math Courses

Studies have shown that student-centered instruction can help improve student success and persistence in STEM-related fields, yet implementing this on an institutional level can be difficult to achieve. Accordingly, it is important to understand how departments both initiate and sustain meaningful change. For this workshop, we engage participants in discussion about barriers to cultural change, providing evidence from case study data collected at six mathematics departments engaged in infusing active learning to improve teaching and learning in their precalculus and calculus courses. Findings focus on the initiation, implementation, and sustaining of educational innovations, department and institutional leadership, and departmental cultural change. Results from this study have the potential to inform other change efforts in a wide range of introductory STEM courses.

Howard Gobstein, Executive Vice President—Association of Public and Land-Grant Universities; **Chris Rasmussen**, Professor of Mathematics Education—San Diego State University; **Wendy Smith**, Associate

Director, Center for Science, Mathematics and Computer Education—University of Nebraska–Lincoln; and David Webb, Associate Professor of Mathematics Education—University of Colorado Boulder

Riverwalk A, First Floor

4:45 P.M. – 6:00 P.M. POSTER SESSIONS

Type I: Individual Classroom/Project-Level Interventions

Poster 54: Innovative Approaches to Transdisciplinary STEM Education in Vietnam

Samhitha Raj, *Founding Faculty—Fulbright University Vietnam*

Poster 55: To Poll or Not to Poll?

Heather Evans Anderson, *Assistant Professor of Health Science—Stetson University*

Poster 56: Increasing STEM Retention with Summer Bridge and College Success Courses

Joyce Stamm, *Professor of Biology*, and ***Adam Salminen***, *Professor of Mathematics—both of the University of Evansville*

Poster 57: Promoting a Socially Relevant Interdisciplinary Approach to Science

Thomas Kling, *Professor of Physics—Bridgewater State University*

Poster 58: Peer-Led Biology Workshops Increase Active Learning and Metacognition

Suann Yang, *Assistant Professor of Biology*; ***Jani Lewis***, *Associate Professor of Biology*; and ***Robert Feissner***, *Instructor of Biology—all of State University of New York College at Geneseo*

Poster 59: Implementation of a Capstone Project in First-Semester Organic Chemistry

Karen Culp-Linscott, *Pre-Pharmacy Program Director—Tri-County Technical College*

Poster 60: Test-Driving the Conclusion Assessment Rubric (CAR)

Tawnya Cary, *Visiting Assistant Professor of Biology—Beloit College*

Poster 61: Toward a Culturally Responsive Evaluation Plan for an NSF S-STEM Program

Rebekah Dupont, *Director, STEM Programs, Associate Professor of Mathematics—Augsburg University*

Poster 62: Passion-Driven Statistics

Lisa Dierker, *Walter Crowell University Professor of Social Sciences*, and ***Jennifer Rose***, *Director, Center for Pedagogical Innovation—both of Wesleyan University*

Poster 63: Student Career Decision Self-Efficacy Increases in Highly Structured Course

Rachel Kennison, *Associate Director, Center for Education, Innovation and Learning in the Sciences—University of California—Los Angeles*

Poster 64: Active Learning: Inducing Students to Engage and Retain

Aleksandra Zapata, *Instructor of Chemistry—Schreiner University*

Poster 65: Adapting CURE for a High-Enrollment Undergraduate Biology Lab Course

Veronique Brule, *Educational Developer for the Office of Science Education—McGill University*

Poster 66: A STEM First-Year Seminar to Increase Student Belonging

Mark Petzold, *Professor of Electrical Engineering*, and ***Melissa Hanzsek-Brill***, *Professor of Math Education—both of St. Cloud State University*

Poster 67: Lessons Learned: CUREs Beyond Cell and Molecular Biology

Matthew Hemm, Associate Professor of Biology; **Rommell Miranda**, Professor of Science Education; and **Trudymae Atuobi**, Project Assistant—all of Towson University

Poster 68: Yeast ORFan Gene Project: Finding a Place for ORFans to GO

Steve Johnston, Roger and Nadeane Hruby Professor in the Liberal Arts and Sciences—North Central College

Poster 69: Promoting Inquiry-Based Teaching in STEM: Professional Development for Teaching Assistants

Susan Stapleton, Special Assistant to the Provost, and **Jan Gabel-Goes**, Director; Office of Faculty Development—both of Western Michigan University

Poster 70: Cooperation and Reciprocity in Chemistry Learning

Meilin Huang, Assistant Professorial Lecturer in Chemistry—Saint Xavier College

Type II: Institution-Level Interventions

Poster 71: Building a Large-Scale Sustainable Engineering Faculty Development Program

Sarah Hoyt, Project Manager of the JTFD Grant Project—Arizona State University

Poster 72: Building Institutional Capacity for Student Success in STEM Gateway Courses

Tina Taylor-Ritzler, Professor of Psychology; **Jennifer Stockdale**, Director of Academic Success; **Barrington Price**, Vice President for Student Success and Engagement; and **Chad Rohman**, Interim Dean of Rosary College of Arts and Sciences—all Dominican University

Poster 73: Cooperative Advising—Two- and Four-Year College Teamwork Benefits Transfer Students

Teresa Jones-Wilson, Professor of Chemistry and Biochemistry, **Olivia Carducci**, Associate Professor of Mathematics, and **Bonnie Green**, Professor of Psychology—all of East Stroudsburg University

Poster 74: Engaging Departments in Transforming Teaching Evaluation

Sarah Andrews, Research Associate, Center for STEM Learning, and **Noah Finkelstein**, Professor of Physics and Co-Director of the Center for STEM Learning—all of the University of Colorado Boulder

Poster 75: STEM Student Success: An Ecosystem Approach to Strategic Planning

Ebru Korbek-Erdogmus, Assistant Dean; **Alexander Gritsinin**, Director of Strategic Initiatives; **Marshall Milner**, Executive Director of Science Training Programs—all of University of Massachusetts Boston

Poster 76: Assessment and Curricular Reform of STEM General Education Courses

Marc Levis-Fitzgerald, Director, Center for Educational Assessment—University of California—Los Angeles

Poster 77: A Collective Effort: Working to Retain Underrepresented First-Generation, Low-Income Students in STEM Disciplines

Camryn Bragg, Undergraduate Student, and **Marcel Elkouri**, Undergraduate Student—both of The College of Wooster

Poster 78: Mountaineer Connection: Connecting the Dots Between Hope and Achievement

Adrian Zapata, Assistant Professor of Chemistry/HSI-STEM Summer Bridge Coordinator—Schreiner University

Poster 79: A Multidisciplinary Faculty and Professional Staff Learning Community to Support Retention

Itzick Vatnick, Professor of Biology, Environmental Science and Sustainability, and Biochemistry; **Amy Yarlett**, Director of Exploratory Studies; and **Louise Liable-Sands**, Associate Professor of Chemistry—all of Widener University

Poster 80: The ASCN Systemic Change Institute: Planning with the Change Dashboard

Kate White, *Postdoctoral Research Associate—Western Michigan University*

Poster 81: Hidden Bridges of Collaborative Growth in Retention within STEM Disciplines

Andrew Novobilski, *Chief Research Officer and Associate Provost for Research and Engagement—University of North Georgia*

Poster 82: Bridging Diverse Disciplines: Engineers and Educators Expand STEM Pipeline

Mary Ann Jacobs, *Associate Professor of Education—Manhattan College*

Poster 83: Fostering Equity, Support, and Community for Underrepresented STEM Students

Sarah Kirk, *Associate Dean of Faculty Development and Professor of Chemistry*, and **Alison Fisher**, *Associate Professor of Chemistry—both of Willamette University*

Type III: National-Level Interventions

Poster 84: The Role of Community in Improving Inorganic Chemistry Education

Joanne Stewart, *Professor of Chemistry—Hope College*

Poster 85: Leading Change Together: Forming a Network of STEM Education Leaders

Emily Borda, *Director, Science, Math, And Technology Education (SMATE)—Western Washington University*; **Simbarashe Nkomo**, *Assistant Professor of Chemistry—Emory University*; **Stephanie Toering Peters**, *Professor and Chair of Biology—Wartburg College*; **Jessica Malisch**, *Assistant Professor of Biology—St. Mary's College of Maryland*; and **Susanne Nonewski**, *Distinguished University Lecturer in Chemistry—University of Toledo*

Poster 86: The Big Ten Summit on Advancing Women in STEM: From Diversity to Inclusion

Corina Hernandez, *Program Coordinator, Douglass Residential College*; **Elizabeth Gunn**, *Associate Dean of Academic and STEM Programs, Douglass Residential College*; and **Madinah Elamin**, *Director, Global Village—all of Rutgers University*

Poster 87: “Learning STEM by Making” to Prepare a Diverse STEM Workforce of the Future

Mohammed Qazi, *Professor of Mathematics—Tuskegee University*; and **Martha Escobar**, *Professor of Psychology—Oakland University*

Poster 88: From One Institution to Many: Data as a Next Step for STEM Education Reform

Nita Kedharnath, *Project Manager of Sloan Equity and Inclusion in STEM Introductory Courses Collaboration—University of Michigan*

Poster 89: STEM Pathways and Partnerships for a Diverse Digital Technologies Workforce

Janet Chen, *Director—Business Higher Education Forum*

Poster 90: A New Theoretical Approach to STEM WIN Courses

Weam Al-Tameemi, *Lecturer in Mathematics—Texas State University*

Poster 91: Northwest PULSE—Using Systems Thinking to Drive Departmental Change

William Davis, *Associate Dean for Undergraduate Education—Washington State University*; **Gary Reiness**, *Professor Emeritus—Lewis and Clark College*

Type IV: STEM Education Research

Poster 92: Scaffolding Course Based Undergraduate Research Experiences

Corin Slown, *Assistant Professor College of Science*, **Heather Haeger**, *Education Research Associate*

Undergraduate Research Opportunities Center, and Erin Stanfield, Lecturer College of Science, Cooperative Learning Center Science Learning Coordinator—all of California State University—Monterey Bay

Poster 93: Mindset, Locus of Control, and Learning in the Life Sciences

Jeffrey Maloy, Academic Administrator, Life Sciences Core Education, and Marc Levis-Fitzgerald, Director, Center for Educational Assessment—both of University of California—Los Angeles

Poster 94: The Second Time around: Revisiting Active Learning Strategies in Assessment

Karly Schmidt-Simard, Graduate Student Fellow, Center for Faculty Excellence—University of North Carolina at Chapel Hill

Poster 95: Success Coaching in a STEM-Based Scholarship Program

John Williams, Associate Professor of Biology—Albany State University

Poster 96: Effective Multiple-Choice Questions to Assess STEM Problem-Solving Skills

David Meier, Assistant Professor of Physics—United States Air Force Academy

Poster 97: Undergraduates' Epistemic Cognition for Evaluating Data Visualizations

Charlotte Bolch, PhD Candidate—University of Florida

Poster 98: Racialization, Self-Schemas, and STEM Participation Among Students of Color

Anna Lee, Associate Professor of Psychology—North Carolina A&T State University

Poster 99: Awareness and Use of Research-Based Instructional Strategies in STEM

Nane Apkarian, Postdoctoral Research Associate—Western Michigan University; Estrella Johnson, Assistant Professor of Mathematics—Virginia Tech; and Charles Henderson, Professor of Physics—Western Michigan University

Poster 100: Critical Soft Skills and the STEM Professional

Elizabeth Kranz, Program Chair, Applied Mathematics and Data Science—Post University

Poster 101: Did We Move the Needle? A Comparison of Faculty Use of Flipped Classroom

Laura Sullivan-Green, Department Chair and Associate Professor of Civil and Environmental Engineering—San Jose State University

Poster 102: African American Women Students and Graduation Persistence

Nina Hill, Executive PhD student in Urban and Higher Education—Jackson State University

Poster 103: Overcoming Advising Barriers to Retain STEM Majors

Michelle Peterson, Associate Professor of Biology and Interim Dean—University of the Virgin Islands

Poster 104: Early Impacts of Seminars and Mentoring in an Interdisciplinary S-STEM

Joseph Brobst, Research Assistant Professor, The Center for Educational Partnerships—Old Dominion University

Poster 105: Open Educational Resources and Learner Motivation: A Case Study in a STEM High School

Eiman Yassin, Student—International Christian University—Tokyo

SATURDAY, NOVEMBER 9, 2019

Promenade, Fourth Floor

7:00 A.M. – 11:00 A.M. CONFERENCE REGISTRATION

Promenade, Fourth Floor

7:00 A.M. – 8:00 A.M. BREAKFAST

8:00 A.M. – 9:00 A.M. CONCURRENT SESSIONS

Sheraton Ballroom 3, Fourth Floor

Type I: Individual Classroom/Project-Level Interventions

Session 6.1: Preparing Current and Future Faculty for Diverse Learners in STEM

This session will describe a model that provides faculty and graduate students a basis of inquiry into different teaching and learning styles and how to deal with a wide variety of diversities in the classroom (including ethnicity, language, age, educational background, relative numeracy, and literacy) —skills that current faculty and graduate students (future faculty) can implement in undergraduate classrooms. Faculty and graduate students were integrated into a high school extra-curricular program, Upward Bound, by teaching short courses and mentoring high school students in research internships. This model has been successfully implemented through a NSF INCLUDES Design and Development Pilot program that showed proof of concept.

Danielle Daniels, *Director of Diversity in STEM*; **Beth Olivares**, *Dean for Diversity and Executive Director of Kearns Center*; and **Anthony Plonczynski-Figueroa**, *Director of Operations—all of University of Rochester*

Sheraton Ballroom 2, Fourth Floor

Session 6.2 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type II: Institution-Level Interventions

Creating STEM Research Communities for First-Year and Transfer Students

The Learning Environment and Academic Research Network (LEARN) Consortium is a three-institution, NSF-sponsored collaboration to study and create research learning communities to impact STEM retention. Building upon a successful first-year student model (F-LEARN), we have expanded and adapted the model to include African American transfer students entering four-year institutions (T-LEARN). The three central components of this model include research engagement, tiered mentoring, and community building. Evaluation and assessment data currently in progress show signs of success, including increased retention, critical thinking skills, and overall student achievements. This session will review the development of this program at the University of Central Florida over ten years, and how the partnership with the two institutions has expanded our understanding of how to build STEM communities.

Kimberly Schneider, *Assistant Dean, Division of Teaching and Learning, and Director, Office of Undergraduate Research—University of Central Florida*

Type I: Individual Classroom/Project-Level Interventions

Creative Biofabrication and Collaborative Research in an Art School Context

Art schools offer unique contexts to explore Course-Based Undergraduate Research Experience (CURE) pedagogy for a cohort of primarily women and minority students. Integrating purposeful scientific research into undergraduate art studios allows students to collectively imagine solutions to real-world problems. The art school is not currently a recognized locus for significant STEM learning, though the Maryland Institute College of Art (MICA) intends to alter that narrative. MICA has launched a new sequence of courses focused on biofabrication. The most advanced course provided an opportunity to create biocement, or a biological material hospitable for oyster larvae. The proposed workshop will provide a

case study of the biocement research and invite participants to imagine opportunities at their institutions for collaborative projects that engage an interdisciplinary undergraduate team.

Tiffany Holmes, Vice Provost for Undergraduate Studies, and **Ryan Hoover**, Professor of Interdisciplinary Sculpture—both of Maryland Institute College of Art

Type II: Institution-Level Interventions

Student Engagement Using 3D Printed Manipulatives in Chemistry and Math

3D printing in higher education is emerging as an effective teaching tool in STEM disciplines. Student engagement using 3D printed manipulatives in subjects like chemistry and mathematics will be presented during this session. Our ideas and pedagogy for providing an active and experiential learning environment by using computational modeling, design, and 3D printing will be shared. Lessons to create 3D printed manipulatives for chemistry and mathematics courses, to grow understanding of, and interest in, the concepts being studied will be presented. The scientific and mathematical software used along with the 3D printed finished products will be shown.

Sharada Buddha, Associate Professor of Chemistry, and **Kristen Schreck**, Associate Professor and Chair of Mathematics—both of Saint Xavier University

Ontario Room, Second Floor

Session 6.3 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type I: Individual Classroom/Project-Level Interventions

Using Adaptive Learning in STEM Gateway Courses

This discussion will focus on results and lessons learned by Clark Atlanta University from piloting and scaling up adaptive learning technology in STEM gateway courses. Participants will examine the costs and benefits of adaptive learning, learn about its application and effectiveness in chemistry and mathematics gateway courses, explore the dashboards of two adaptive learning platforms (ALEKS and KNEWTON), and discover the differences in learning outcomes between student groups based on completion of modules and interventions beyond the classroom. At the same time, the presenters will engage participants in discussing results and challenges associated with the implementation of adaptive learning at their institutions.

Torina Lewis, Associate Professor of Mathematics; **Conrad Ingram**, Professor of Chemistry; and **Daniel Teodorescu**, Professor of Educational Leadership—all of Clark Atlanta University

Type I: Individual Classroom/Project-Level Interventions

Lessons Learned from Each Other: Creating Professional Learning Communities

Professional Learning Communities (PLCs) are shown to have a positive impact on teaching practices and student learning. At a small Midwestern public university, a PLC called the GREAT Falcon STEM Fellows program was designed to transform instruction in introductory science and mathematics courses required by STEM majors. Participation in this program represented multiple STEM disciplines and inspired further PLCs to be developed in individual departments. Faculty survey and interview data found that involvement in the program increased the level of active learning implemented in introductory STEM courses.

Jamie Schneider, Professor of Chemistry and Biotechnology; **Rebecca Haley**, Assistant Professor of Chemistry and Biotechnology; **Arriety Lowell**, Lecturer/Physics Lab Manager; and **Kathy Tomlinson**, Professor of Mathematics—all of University of Wisconsin–River Falls

Huron Room, Second Floor

Session 6.4 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

*Type II: Institution-Level Interventions***STEM Faculty of Color: Equity-Minded Retention and Recruitment**

Recently, national and institutional level conversations and efforts to address faculty diversity had a modest impact on increasing the recruitment and retention of STEM faculty of color. However, these efforts cannot be sustained without persistence, innovation, and equity-minded change in academic culture. Given the tremendous range of types of institutions in higher education and the differences in geographical locations, some strategies may work better than others for certain institutions. This session will provide a short survey of the literature, promote equity-minded discussions, and leave participants with recommendations aimed at improving recruitment and retention practices of STEM faculty of color.

Ebru Korbek-Erdogmus, Assistant Dean, Communications and Projects; **Marshall Milner**, Executive Director of Science Training Programs; and **Alexander Gritsinin**, Director of Strategic Initiatives—all of University of Massachusetts Boston

*Type I: Individual Classroom/Project-Level Interventions***A State of Emergency: Persisting as Women of Color in STEM**

Our work provides some concrete steps black and Hispanic women within STEM programs can take to persist as individuals, as a group, and as advocates of change within the academy. The presenters review available literature regarding barriers these women face towards success but, unlike much of the readily available literature, do not focus on how individual programs or universities can create systemic change. Instead, they will pull from literature and their own personal experiences to explore barriers to success current women of color in STEM face and give name and space to the personal challenges that these can cause especially when dealt with in isolation. Social exchange theory is used as an avenue to contextualize these experiences.

Shanalee Gallimore, Doctoral Student in Educational Leadership and Policy Studies—Indiana University Bloomington

Columbus Room AB, Third Floor

Session 6.5 PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

*Type III: National-Level Interventions***Deliberative Democracy: A Workshop in Coming to Consensus**

Calls to improve undergraduate science teaching have focused on utilization of student-centered active learning. Deliberative democracy (DD) pedagogy is focused on real-world scientific issues that tasks students with combining scientific knowledge, logical argumentation, and consensus decision making. This work introduced DD into large, majors' biology and chemistry courses. Student survey results indicate that DD positively influenced students' confidence in reading and discussing scientific topics; differential gender effects were also detected. Open-ended student responses indicate an overall positive perception of DD. Here we will present a workshop on designing, implementing, and assessing DD modules. Participants will be able to use this tool in their own classrooms to engage students in relevant scientific topics while encouraging collaboration and civic discourse skills.

Erin Shortlidge, Assistant Professor of Biology—Portland State University

*Type IV: STEM Education Research***Building Cross-Campus Collaborations for Excellence in K-12 STEM Outreach**

Higher education-supported K-12 STEM outreach is at the forefront of community engagement conversations as colleges and universities begin responding to the 2018 national call for creating networks of strategic cross-sector partnerships. In recognition of inequitable access to quality STEM education in the US, new initiatives and re-evaluation of cross-campus collaboration models are underway in higher

education institutions throughout the country. Our institution recently revisited the leadership model for its STEM Outreach Center to increase the capacity to better serve our regional K-12 community with evidence-based, mutually beneficial, and equitable practices. We will seed this discussion with our challenges and successes, and participants will engage in conversations about widely applicable and successful practices for building a sustainable campus community of K-12 STEM outreach.

Kerry Owens Cresawn, Director of the Center for STEM Education and Outreach; **Cynthia Bauerle**, Dean of the College of Science and Mathematics; and **Bob Kolvoord**, Dean of the College of Integrated Science and Engineering—all of James Madison University

Michigan Room AB, Second Floor

Type I: Individual Classroom/Project-Level Interventions

Session 6.6: Fostering Student Success: Creating a Culture of Faculty Ownership

Faculty are more likely to trust and act on information shared by their peers, supported with follow-up, and paired with continued access to resources. To facilitate this, The College of New Jersey's School of Science has embraced a strategy of institutional support for semi-formal dialogues. These fora, such as brown bag conversations, practical workshops, focused discussions on faculty search committees, and facilitated conversations at whole-school meetings, offer structured opportunities for faculty to share their own, tailored practices. While the school provides material support, such as food and logistics help, our faculty clearly own the specifics of the message. This strategy avoids "decoupling," where gaps form between formal policies/structures that are ceremonially adopted and actual organizational practices. This approach is well-suited for institutions transitioning from student cohort-focused to institutional-focused change initiatives.

Jeffrey Osborn, Dean of the School of Science; **J. Lynn Gazley**, Associate Professor of Sociology; **Benny Chan**, Professor of Chemistry; **Angela Capece**, Assistant Professor of Physics—all of The College of New Jersey

Sheraton Ballroom 1, Fourth Floor

Type II: Institution-Level Interventions

Session 6.7: PULSE: Catalyzing Change at the Department Level

The mission of the Partnership for Undergraduate Life Sciences Education (PULSE) is to provide academic departments with resources and training that promote alignment of undergraduate life sciences programs with best educational practices including those recommended in Vision and Change. In this session, the co-presenters will engage participants in components of three major PULSE initiatives: Regional Workshops, Ambassador Workshops, and the Recognition Program. We will also present data on the impact of these programs on catalyzing change.

Thomas Jack, Professor and Chair of Biological Science—Dartmouth College; and **Judy Awong-Taylor**, Professor of Biology—Georgia Gwinnett College

Erie Room, Second Floor

Type I: Individual Classroom/Project-Level Interventions

Session 6.8: Teaching Scientific Writing at Scale: Bins, Coaches, and Data

Scientific communication helps students learn to state problems clearly, present claims, summarize evidence to support those claims, and provide a clear rationale. Teaching this skill takes both time and ongoing dialogue with students, making it difficult to implement in 100-level coursework. We present a data-driven scalable model for teaching scientific writing that brings together instructor training, text annotation, automated writer support, bins-based grading, and holistic coaching. Workshop participants will get hands-on experience with our text annotation activity and bins-based grading training procedure. Participants will identify their potential barriers to local implementation, and—with the facilitators—explore ways to mitigate them.

A. Johnson, Teaching Professor of Biology—Wake Forest University

9:15 A.M. – 10:15 A.M. CONCURRENT SESSIONS

Michigan Room AB, Second Floor

Session 7.1 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type IV: STEM Education Research

Positive Learning Opportunities and Research Experiences in STEM

Saint Xavier University's (SXU) EXPLORE STEM project will provide academic resources, experiential learning opportunities, and financial support to deserving students who demonstrate an interest in science, to increase Hispanic representation in STEM. Student support efforts will be centralized in a STEM studio that will both provide a gathering place for students and host student/faculty career events and professional development opportunities. EXPLORE STEM will also coordinate targeted academic interventions at critical transition points, connecting undergraduates with opportunities for field-based experiential learning opportunities. By addressing both the social and academic challenges faced by many Hispanic undergraduate students majoring in STEM, SXU will increase retention and persistence rates, opening the door to graduate-level careers in STEM fields.

Bindhu Alappat, Chair and Associate Professor of Chemistry—Saint Xavier University

Type IV: STEM Education Research

Linguistic Barriers to STEM Education of Creole Speakers in St. Croix

Although English is the language of government and education in St. Croix, U.S.V.I., most of the population are native speakers of Crucian, an English-lexifier Creole. As with other Creoles, Crucian is stigmatized and its use in education discouraged, despite evidence that non-native language variety instruction negatively impacts student learning and performance on standardized tests. Here we describe an experiment where native speakers of Crucian were found to perform significantly better on a mathematics assessment after being instructed in Crucian rather than Standard English. We describe the future directions of this research including the use of eye-tracking technology to pinpoint the linguistic characteristics of examination items that are contributing to the persistent underperformance of Caribbean students on standardized tests in STEM.

Chris Plyley, Assistant Professor of Mathematics—University of the Virgin Islands; and **Angelica Hernandez**, PhD Candidate in Linguistics—Western University

Type III: National-Level Interventions

Developing Literacies in the STEM Fields Course

The Division of Academic Enhancement at the University of Georgia designed the Developing Literacies in the STEM Fields course to enable students to become stronger critical thinkers, more comfortable and participatory in active learning classroom environments, and proficient in the necessary communications skills, both written and oral, that are germane to STEM fields. In this course, students develop an enhanced understanding of data usage, interpretation, and literacy, in conjunction with the tools and skills necessary to determine reliability of a resource. Students are expected to develop a well-informed research project on a recent STEM-related discovery, producing a peer-reviewed written report and an oral presentation to the class on their report findings and suggested future research approaches.

Nicholas Colvard, STEM Literacy Lecturer, and **Chase Hagood**, Director of the Division of Academic Enhancement—both of University of Georgia

Sheraton Ballroom 2, Fourth Floor

Session 7.2 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

*Type IV: STEM Education Research***Diversity beyond Content: Examining Physical and Life Science Fields**

This session uses large-scale multi-institutional data to examine the experiences of diverse students within specific fields of the STEM conglomerate. Within specific STEM disciplines, we first examine a nuanced view of compositional diversity, then student engagement in culturally engaging coursework, and finally perceptions of institutional commitment to diversity. In doing this, we find some fields to be highly supportive of diversity, thus problematizing the STEM umbrella. In this session, we will discuss the idea that support for diversity in STEM fields can be improved by looking within. We will focus on practical behaviors faculty and staff can do to foster more support for diversity in STEM fields and how the cultures of STEM fields themselves shape the meaning of diversity in courses.

Allison BrckaLorenz, Associate Research Scientist, and **Christen Priddie**, Research Project Associate—both of the National Survey of Student Engagement; and **Heather Haeger**, Assessment and Educational Research Associate—California State University—Monterey Bay

*Type I: Individual Classroom/Project-Level Interventions***Increasing Retention: Building Skill, STEM Identity, and Cultural Capital**

STEM identity and cultural capital have recently emerged as important factors in student success in STEM fields. Programming aimed at increasing participation should thus include mechanisms by which these characteristics are introduced and cultivated through a situational approach. The Scots Science Scholars program at Maryville College employs a summer experience, dedicated first-year seminar, STEM event series, a STEM focused academic support center, and early exposure to and participation in research led by faculty, staff, and upper-level students to create and develop an identity and culture of STEM success among the program participants. We will discuss how program components have contributed to building a robust and productive STEM culture at Maryville College.

Maria Siopsis, Associate Professor of Mathematics, and **Angelia Gibson**, Associate Professor of Chemistry—both of Maryville College

*Type III: National-Level Interventions***Developing a Pre-Major Approach to Improving STEM Persistence and Success**

The Greater Equity, Access, and Readiness for Engineering and Technology (GEARSET) Program at the University of Toledo (UToledo) is designed to enhance the student learning, academic pathways, success, and professional preparation of students aspiring to engineering careers. By recruiting a diverse pool of students with demonstrated academic talent, and by facilitating a pathway to engineering and technology majors for students who must first complete coursework required to transfer from University College (UC), we also seek to increase the equity and diversity of the College of Engineering (COE) at the UToledo. Here we describe the design and development of GEARSET, a pre-engineering program within UC that provides students access to curricular and co-curricular support and the opportunity to shorten the time to transfer to the COE.

Lesley Berhan, Associate Dean for Diversity, Inclusion, and Community Engagement; and **Bryan Bosch**, Manager of Diversity, Inclusion, and Community Engagement—both of University of Toledo

*Sheraton Ballroom 3, Fourth Floor***Session 7.3: PAIRED FACILITATED DISCUSSIONS**

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

*Type II: Institution-Level Interventions***Developing a Modern Definition and Assessment Rubric for Scientific Reasoning**

From 2007-2009 the Association of American Colleges and Universities worked with over 100 faculty nationwide developing Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics to assess

essential learning outcomes. VALUE rubrics have been used nationwide for over a decade addressing sixteen outcomes, including problem solving and critical thinking, but were none specifically tailored to science outcomes. Upon undertaking a CORE general education revision at Montgomery County Community College, the assessment team has developed a rubric that evaluates a student based on being able to reason “scientifically.” The assessment of a scientifically literate person not only uses the scientific method correctly, but goes beyond that by demonstrating authentic science inquiry, knowledge, and understanding.

M. Bompadre, *Biology Assistant Professor*; **James Bretz**, *Dean of Science, Technology, Engineering, and Math*; **Tracy Kaiser-Goebel**, *Director of Educational Effectiveness and Communication Studies Instructor*—all of Montgomery County Community College

Type IV: STEM Education Research

Clearing the Path for Community College Transfer Students in STEM

This workshop will review Clear Path (CP), an NSF S-STEM funded initiative. CP is for STEM students transferring from Community College to a four-year university. Central to the success of CP is the facilitation of high-impact practices specifically designed to elevate identified developmental mechanisms associated with STEM student success. During this workshop, we will guide attendees through targeted developmental mechanisms (e.g., professional future sense of self, stress coping behaviors) and how to measure them. We will review targeted change geared at increasing the developmental mechanisms associated with student success, and how this has yielded improvements in student retention (92.2 percent), timeliness to graduation (average savings of more than one semester), and student aspiration in STEM, particularly for women, Latino/a, and Pell-eligible students.

Bonnie Green, *Professor of Psychology*; **Olivia Carducci**, *Professor of Mathematics*; and **T. Jones-Wilson**, *Professor of Chemistry*—all of East Stroudsburg University

Columbus Room AB, Third Floor

Session 7.4: PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type II: Institution-Level Interventions

Sustained Mentorship for Active Learning in the Undergraduate Classroom

This session describes the Promoting Active Learning and Mentoring (PALM) Network, a National Science Foundation-supported project dedicated to leveraging the expertise found in life science professional societies to provide long-term mentorship in developing active learning techniques in the classroom. PALM mentees work one-on-one with mentors that are seasoned in active learning strategies to observe classes, plan modifications for their own classes, and strategize the best active learning techniques that are suited to the needs of the particular class. Assessment via the Classroom Observation Protocol for Undergraduate STEM (COPUS) protocol (Smith et al., 2013) on pre-mentorship and post-mentorship videos of mentee teaching suggests that the long-term mentoring strategies brought forth by PALM are an effective and sustainable means to promote active learning techniques among undergraduate biology instructors.

Sue Wick, *Professor of Biology Teaching and Learning*—University of Minnesota Twin Cities; and **Michael Wolyniak**, *Elliott Associate Professor of Biology*—Hampden-Sydney College

Type I: Individual Classroom/Project-Level Interventions

Evolution of Peer Assisted Learning at a Primarily Undergraduate Institution

This discussion will focus on the implementation of Peer-to-Peer instruction in STEM disciplines including Chemistry, Math, Physics, and Neuroscience, especially the introductory courses. This includes aspects of an NSF funded grant project, focusing on Peer Led Team Learning (PLTL) and other initiatives that foster the development of communities of practice, such as the use of Learning Assistants in Studio Physics. This

discussion will highlight how these programs have evolved over time in response to student, faculty, and institutional needs, constraints, and attitudes to serve as a model for other institutions looking to implement such best practices. Factors important for successful implementation, such as student leader training and course integration, will also be emphasized.

Lisa Kroutil, Professor of Chemistry and Biotechnology and PLTL Coordinator; **Jamie Schneider**, Professor of Chemistry and Biotechnology; **Arriety Lowell**, Lecturer and Physics Lab Manager; **Nathan Wildenberg**, Peer Leader; **Kathy Tomlinson**, Professor of Mathematics; and **Glenn Spiczak**, Professor of Physics—all of University of Wisconsin–River Falls

Sheraton Ballroom 4&5, Fourth Floor

Session 7.5: PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type I: Individual Classroom/Project-Level Interventions

Imagining Relationally: A Critical Bridge between Theory and Practice

This session invites participants to engage with questions of moral reasoning, STEM instruction, and the philosophy of liberation to foster a shift in conventional approaches to ethics instruction. We argue that the quality of imagining relationally should be one of the core components when designing and developing curriculum and pedagogy. The capacity to ponder different realities, and to make bridges between modes of theory and praxis for liberatory purposes, relies on a quality that brings imaginal and relational capacities together. Participants will gain insight about ethics instruction informed by liberatory innovations, particularly in the ways that individual imagination and reflection on relation enhance ethical judgments.

Yousef Jalali, PhD Student, Engineering Education—Virginia Tech

Type II: Institution-Level Interventions

Scaling Up Classroom Undergraduate Research Experiences State-Wide

We will discuss progress on developing a state-wide undergraduate research consortium that aims to bring classroom-based undergraduate research experiences (CUREs) into community college classrooms across the state. While our state has a number of examples of CUREs, the distribution of these experiences in the various colleges and disciplines is not uniform. We see state-wide CURE consortium as a way to generate equitable opportunities for students, faculty (professional development, especially for adjunct faculty), and institutions (that may not have the resources to develop these opportunities). We will provide opportunities for participants to brainstorm scaling up CUREs, or similar other interventions, to the institution, regional, or state level.

Gita Bangera, Dean, RISE Learning Institute—Bellevue College; **Peter Williams**, Dean of Science, Technology, Engineering, and Mathematics—Clark College; and **Carli Schiffner**, Deputy Executive Director of Education—Washington State Board for Community and Technical Colleges

Huron Room, Second Floor

Session 7.6: PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type IV: STEM Education Research

The Tape Doesn't Lie: Recording TAs to Increase Teaching Training

The graduate teaching assistant training and first-year chemistry recitation program were created to help our first-year STEM courses, which are usually have a non-passing rate of 20-25 percent of entering students. We have designed recitation sections that are full of low stakes, collaborative, problem-solving exercises that will encourage students to freely articulate any conceptual misunderstandings or problem-solving-based queries. Key to the success of the recitation program is the preparation and observation of

the section leaders. We have recorded the teaching assistants twice during academic semesters to increase teaching performance and confidence. Important teaching pedagogy, such as helping struggling students, answering questions, and presentation skills, are highlighted.

Daniel Collins, Senior Lecturer of Chemistry—Texas A&M University

Type I: Individual Classroom/Project-Level Interventions

Professional Development on Inclusive Teaching for Graduate Students

Transforming instructional methods to incorporate diversity and inclusion is vital for promoting an inclusive culture of student learning. Novice instructors in STEM courses, including graduate teaching assistants (GTAs), often lack the pedagogical knowledge and experience to effectively implement inclusive instructional practices. Given the reliance on GTAs in STEM laboratory courses, in particular, providing GTAs with inclusive teaching-centered professional development is imperative for improving student learning. We present the structure and content of this professional development program and share outcomes in order to provide a framework for others designing and implementing similar programs. GTA participants reported increased knowledge of, and confidence in, inclusive teaching strategies and felt their participation allowed them to set goals and take action around implementing inclusive teaching strategies in their courses.

Meaghan Stein, Education Success and Retention Coordinator, College of Biological Sciences—University of Minnesota

Erie Room, Second Floor

Session 7.7: PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type II: Institution-Level Interventions

An Asset-Based Approach to Black Male STEM Majors' Math Experiences

There is a growing body of research literature exploring the experiences of high-achieving African American male STEM students. Their mathematics experiences can shed light on ways to enhance their persistence in STEM fields given the gatekeeping nature of the subject. In this asset-based case study, I document, analyze, and share the experiences of ten high-achieving African American male STEM majors at an urban research university. The analysis of their experiences indicates that the pedagogy in their undergraduate mathematics courses needs improvements and that undergraduate mathematics courses are taught with little to no connection to STEM fields. Recommendations for practice and future research are shared to enhance the mathematics-specific and STEM education environment for African American male students.

Christopher Jett, Associate Professor of Mathematics Education—University of West Georgia

Type I: Individual Classroom/Project-Level Interventions

Math Pathway Interventions and Graduation Rates

As a result of changes in the math pathways (based on major and degree sought), as well as changes in the state placement test in Texas, our regional four-year university has made multiple changes in courses offered as well as in course delivery and design. The university struggled with pass rates in introductory, college-level math courses, but is now seeing an upswing in student success in these courses. Of particular interest are interventions in advising by major, as well as the course structures offered for non-algebraic courses, which are terminal math courses for non-STEM majors. It is believed that the interventions in place will increase both pass rates and time to degree completion for these students.

Pamela Webster, Associate Professor of Mathematics—Texas A&M University—Commerce

Ontario Room, Second Floor

Session 7.8: PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Facilitated Discussion Type III: National-Level Interventions

Pitt's BE STEM Center – Improvement Science to Broaden Equity in STEM

To institutionalize efforts to increase racial and ethnic diversity in STEM fields, the University of Pittsburgh has created the Broadening Equity in STEM Center (BE STEM). BE STEM uses Improvement Science as the engine of learning and change within a Networked Improvement Community framework to focus expertise from a variety of sectors on a common challenge. This approach improves education at scale by building an evidence base about productive practices and knowledge of implementation processes to address persistent problems of practice and policy. BE STEM is using this approach to build an alliance of STEM precollege programs to increase college enrollment for minoritized students and to build a local network to support matriculated STEM students and university faculty and staff.

Alison Slinsky Legg, *Co-Director of the Broadening Equity in STEM Center and Director of Outreach Programs, Department of Biological Sciences*; **Alaine Allen**, *Co-Director of the Broadening Equity in STEM Center and Director K-12 Outreach and Community Engagement, Swanson School of Engineering*; **Julia Spears**, *Associate Vice Provost for Academic Innovation—all of University of Pittsburgh*

Type II: Institution-Level Interventions

STEM Higher Education Reform: Lessons Learned from a Peer Implementation Cluster

The STEM workforce in the US does not reflect the population demographics due to a consistent racial/ethnic inequality in STEM degree attainment. To combat this problem, HHMI, through its Inclusive Excellence (IE) Initiative, funded institutions to increase capacity for inclusion of students traditionally underrepresented in the sciences. Four IE institutions (i.e. Syracuse University, Roosevelt University, University of Illinois-Chicago, and Kalamazoo College) were assigned to a Peer Implementation Cluster. Our institutions implemented professional development activities for course redesign and inclusive pedagogy. Early indices of faculty participation indicate variable levels workshop attendance and engagement in course transformation. Important lessons have been learned from our efforts, and we will present difficulties encountered, as well as progress made.

George Langford, *Professor of Biology—Syracuse University*

Sheraton Ballroom 1, Fourth Floor

Type I: Individual Classroom/Project-Level Interventions

Session 7.9: Full STEM Ahead: Charging into the Open Educational Resource Revolution

During the past four years, Georgia Highlands College has adopted and created numerous open educational resources (OERs) for utilization in its STEM courses. In the process, the division has saved its students more than \$4 million dollars in textbook costs and increased student success across all demographics. Several courses have had tremendous success engaging students and increasing success, while a few others have faced significant challenges. In this presentation, we will describe what has and has not worked in this growing and ever-evolving environment of innovation and course redesign, perhaps offering a cautionary tale of what not to do in the implementation of OERs, and provide a glimpse of the promising future of open resource usage within STEM courses.

C. Henderson, *Professor of Biology*; **Sarah Coakley**, *Dean of Natural Sciences and Associate Professor of Chemistry*; **Erin Shufro**, *Chair of Natural Sciences and Assistant Professor of Chemistry—all of Georgia Highlands College*

10:30 A.M. – 11:30 A.M. CONCURRENT SESSIONS

Sheraton Ballroom 2, Fourth Floor

Session 8.1 INNOVATION/IDEATION SESSION

This session includes the three separate presentations listed below.

Type I: Individual Classroom/Project-Level Interventions

Advancing Integrative Learning through Transdisciplinary Communities

Bringing STEM and non-STEM students together to engage in curricular experiences is imperative as institutions look to produce graduates with competencies that will allow them to respond to complex problems with an understanding of technical and human implications. Our session will provide an overview of an institutional effort underway at Virginia Tech to create opportunities for students that are transdisciplinary in nature and are pedagogically designed for hands-on problem solving to encourage STEM and non-STEM collaboration. Lessons learned and promising practices will be shared so that other institutions can consider how they can draw on this model to develop transdisciplinary learning opportunities that engage STEM and non-STEM students collaboratively in the learning process.

Catherine Amelink, Assistant Vice Provost for Learning Systems Innovation and Effectiveness, and **Todd Nicewonger**, Research Associate, Office of the Vice Provost for Learning Systems Innovation and Effectiveness—both of Virginia Tech

Type I: Individual Classroom/Project-Level Interventions

Interdisciplinary Active Learning Approach that Fosters Equity and Inclusion

STEM education is dynamic and important for all majors. STEM instructors need to develop innovative practices to serve the diversity of students who need either the basics or in-depth knowledge of content. We have developed an interdisciplinary course that provides equity and inclusiveness. This course will allow students to see the interconnection and interrelationship between statistical methods across STEM disciplines. The effort will incorporate real-life case-study synthesis and experiments that derive from the use of scientific method to generate data that may be analyzed statistically for decision making. These applications are needed as students will encounter such in everyday life, most especially after graduation and as practitioners in their various fields. The course is intended for majors in sciences, social sciences, engineering, and public health.

Alicia Latten, Professor of Mathematics, and **Akinyele Oni**, Professor of Biology—both of Morgan State University

Type III: National-Level Interventions

Examining Climate Change through an Interdisciplinary Learning Community

This presentation provides an overview of pop-up learning communities (PLCs) on climate change held in 2017 and 2019 with general education students in chemistry, earth science, communications, and philosophy courses. The overall goal of the PLCs was to help students clearly and meaningfully connect the skills and contents learned in their general education courses with the real-world topic of climate change. Through interdisciplinary discussions and activities, the participants practiced engaging in dialogue (not debate) with their peers about this wicked societal problem. After describing the event implementation, as well as the assessment data collected, the facilitators will lead the session participants through an activity from the PLC and then through a discussion of how a PLC can be implemented in their own institutional context.

Amy Johnson, Professor of Chemistry, and **Mary Bautista**, Graduate Student—both of Eastern Michigan University

Michigan Room AB, Second Floor

Session 8.2: PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type IV: STEM Education Research

Fostering and Sustaining Instructional Improvements in STEM

This session engages participants in an examination and discussion of results from a retrospective, qualitative, longitudinal study of faculty's annual review teaching narratives. The purpose of the study was to examine how faculty descriptions of teaching and learning changed across a three-year period and to identify factors that may foster or hinder sustained instructional improvements across time. Session participants will generate ideas for designing a professional development program that recognizes and builds upon faculty's perspectives on teaching and learning to foster sustained instructional change. This session will be of interest to university leaders responsible for fostering or supporting sustained instructional improvements in STEM courses, especially with a goal of increasing student success, progression, retention, and graduation in STEM.

Kadian Callahan, *Assistant Dean for Faculty and Student Success, Associate Professor of Mathematics Education—Kennesaw State University*

Type II: Institution-Level Interventions

A Multidisciplinary Model and Applications for Data-Driven STEM Higher Ed

A systematic, dynamic model for STEM courses is developed from a multidisciplinary study of the development of the science of instructional design. The model is used to compare two different STEM economics classes with the goal of demonstrating “teacher as researcher” findings on instructional effectiveness. The model presents a platform for comparison of future instructional STEM research findings.

Christine Ries, *Professor of Economics—Georgia Institute of Technology*

Ontario Room, Second Floor

Session 8.3: PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type I: Individual Classroom/Project-Level Interventions

Community-Based STEM Experiential Learning

STEM education currently faces significant challenges related to retention and achievement. Here we describe how the Creative Science Inquiry Experience (CSIE) program at Eastern Michigan University uses experiential and Academic Service-Learning to create interventions that support high academic standards through increased student success, student academic career development and experiential learning, faculty professional development, institutionalization of key project components, and workforce training. Specifically, we specialize in course development using interdisciplinary teams of faculty and community/NGO/industry partners to recruit and retain STEM students and enhance student learning through community-based projects that are culturally relevant. Participants will share their own institutional experiences and strategies for recruiting and retaining their STEM majors, developing culturally relevant, community-based courses, and implementing such a program on their campuses.

Ellene Contis, *Professor of Chemistry, Director of CSIE Program; and Batoul Abdallah*, *Program Manager, CSIE Program—both of Eastern Michigan University*

Type IV: STEM Education Research

Strategies for Reforming Academic Models to Support Community Partnership

Ready for Take-Off is a student-driven documentary film project that raises public awareness about flight, mobility, and advancement for people with disabilities. It engages students and faculty of multiple New York Institute of Technology (NYIT) disciplines to produce a short documentary film, commemorating the fifth anniversary of a JetBlue flight for disabled high school students of the Henry Viscardi School of the Viscardi Center. Through service learning and extracurricular activities, this academic collaboration intends

to foster a sustainable community partnership with Viscardi and JetBlue that may continue through future socially-engaged activities for a variety of NYIT disciplines. The discussion will use this case study and addresses the question: how can we change longstanding institutional policies, procedures, and infrastructure to allow us to change our teaching practices and achieve innovative, interdisciplinary, hands-on, and community engaged projects?

Terry Nauheim, Associate Professor of Digital Art and Design; **Michael Hosenfeld**, Associate Professor of Digital Art and Design; **Paul DeMonte**, Adjunct Instructor of Communications; **Adrienne McNally**, Director of Experiential Education; and **Amy Bravo**, Senior Director of International and Experiential Learning—all of New York Institute of Technology

Huron Room, Second Floor

Session 8.4: PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type III: National-Level Interventions

Designing, Doing, and Describing Experiments Improves Scientific Literacy

To test the idea that course-based mini research experiences would improve scientific literacy, we developed inquiry-based modules for introductory biology laboratory courses. In each four-week module, students learn a measurement technique, analyze published experiments, design their own experiments, collect data, and present their results. The summaries written or oral presentations are designed to build students' graphing, analytical, and data presentation skills. Students improve at some skills after one three-module course (based on paired pre- and post-test scores on the validated Test of Scientific Literacy Skills), but they improve at all nine assessed skills after completing five modules over two courses. This modular approach proved effective at all scales, from 2 sections of 48 students total to 48 sections of 1,150 students total.

Ann Cheek, Instructional Associate Professor of Biology, and **Ana Medrano**, Instructional Associate Professor of Biology—both of University of Houston

Type IV: STEM Education Research

Getting the Most Out of a Single Writing Assignment: Using Writing-to-Learn

This discussion will walk participants through the design and implementation of Write-to-Learn (WTL) assignments and how participants can create their own prompts for a variety of disciplines and contexts. Presenters will break down the core, transferable characteristics of a strong WTL prompt, offering a set of guidelines for prompt-design, an introduction to rhetorical context building, and a discussion of the types of reasoning activated by WTL prompts. Participants will identify concepts central to student success in their respective courses and analyze the forms of scientific reasoning that students must apply to solve complex conceptual problems.

Ginger Shultz, Assistant Professor of Chemistry, **Anne Gere**, Professor of Education—both of University of Michigan; and **Ashley Karlin**, Assistant Professor of Writing—University of Southern California

Sheraton Ballroom 1, Fourth Floor

Session 8.5: PAIRED FACILITATED DISCUSSIONS

This session includes the two facilitated discussions below, to take place back to back. Each discussion will be 30 minutes.

Type II: Institution-Level Interventions

Enhancing Inclusive Mentoring through a Faculty Learning Community

Faculty must be aware of who their students are and the challenges they face inside and outside of the classroom to fully understand how to best support student success. Faculty Learning Communities (FLCs) provide an important opportunity to provide training and support for faculty to increase their effectiveness as teachers, advisors, and mentors. The development of a STEM mentoring FLC meant to build faculty

capacity around inclusive advising, mentoring, and teaching will be described and participants will engage in a case-study based discussion on a topic around supporting marginalized students. Assessment of faculty learning and changes of practice will be discussed along with ways participants can implement an FLC at their home institution.

Rachel Hirst, Associate Professor of Biology; **Louis Liotta**, Professor of Chemistry; and **Bronwyn Bleakley**, Associate Professor of Biology—all of Stonehill College

Type IV: STEM Education Research

Equipping Faculty for Inclusive, Student-Centered Teaching in STEM

We will describe a STEM faculty development program focused on inclusive, student-centered teaching practices. This program was designed to address common barriers to inclusive, student-centered instruction through: 1) sustained interactions with the cognitive science literature, 2) structured collaborations among faculty, 3) time to work on course materials and pedagogies during workshops and institutes, 4) sharing of strategies for student buy-in, and 5) planning time for faculty to take leadership in helping their departments adopt cultures and policies that value and reward inclusive, student-centered instruction. By sharing information and lessons learned about this program, we hope to provide a model for faculty professional development in STEM teaching that can be adapted to other college and university contexts.

Emily Borda, Professor of Chemistry and Science, Math, And Technology Education, and **Joann Otto**, Professor of Biology Emerita—both of Western Washington University

Erie Room, Second Floor

Type I: Individual Classroom/Project-Level Interventions

Session 8.6: Transforming STEM Higher Education through Scholarly Evaluation of Teaching

Transforming methods of evaluating teaching—so that faculty efforts at teaching and learning improvement are more systematically documented, recognized, and rewarded—has the potential to foster wider use of evidence-based and inclusive educational practices. This workshop will begin with brief remarks on the importance of transforming teaching evaluation and a summary of a new framework for scholarly approaches to teaching evaluation that the session facilitators are implementing in a multi-institutional project. Participants will then engage in small groups to review the tools and approaches that foster improved evaluation practices at their institutions and identify and troubleshoot potential challenges. The session will conclude with full group discussion of additional strategies for transforming teaching evaluation and how teaching might change if evaluation changes.

Noah Finkelstein, Professor of Physics and Co-Director Center for STEM Learning—University of Colorado Boulder; and **Doug Ward**, Associate Professor of Journalism and Acting Director, Center for Teaching Excellence—University of Kansas

Columbus Room AB, Third Floor

Type II: Institution-Level Interventions

Session 8.7: A Taxonomy to Increase the HIPness of an Undergraduate Research Experience

Undergraduate research, one of the original ten High-Impact Practices (HIPs) defined by Kuh (2008), provides many benefits for participating students. Kuh suggests that HIP experiences should incorporate eight essential conditions to make them effective and engaging; however, developing an engaging HIP research experience also requires incorporation of activities specific to research. To this end, a three-layer taxonomy was designed for workshop participants to use to self-evaluate a current or future research experience based on its “HIPness,” breadth of research activities, and depth of research activities. With each scoring, attendees will participate in small-group discussions to share their scores and responses to reflection questions. This will allow participants to share practices, brainstorm new ideas, and generally problem solve their HIPness and

research breadth and depth concerns.

Laura Lee, Associate Professor of Biology—University of Wisconsin–Stevens Point and **Abbey Fischer**, Assistant Professor of Chemistry—University of Wisconsin–Eau Claire

Sheraton Ballroom 4 & 5, Fourth Floor

11:45 A.M. – 1:00 P.M. PROJECT KALEIDOSCOPE 30TH ANNIVERSARY ADDRESS

Introduction and Remarks: **Kelly Mack**, Vice President for Undergraduate STEM Education and Executive Director, Project Kaleidoscope Executive Director

The Soul of Leadership in STEM Educational Transformation

This closing plenary will attempt to bridge the gap that often exists between analytical sciences and spiritual insights, with a special focus on leadership. Leadership by its nature is a value-based, spiritual enterprise that requires a clear understanding of the inner workings of human beings as much as the outer workings of science and systems. If academic leaders are to transform STEM education so that it is more accessible, engaging, and viable to a more diverse student population, then they must infuse the disciplines and their institutions with spiritual and emotional intelligence about learning, pedagogy, and people. The soul of the academy is not at risk because of what philosophers and social scientists fail to do, but also because of what mathematicians, engineers, and other STEM leaders sometimes choose to ignore. This presentation will suggest ways for rethinking our role as academic leaders and using a holistic leadership approach for transforming STEM education.

David Hall, President—University of the Virgin Islands