



# SMTI NSEC 2016 NATIONAL CONFERENCE

Program Guide

June 8-9, 2016

Hotel Contessa in San Antonio

Center Roles in Improving Undergraduate STEM Education



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**NSEC**

Network of STEM Education Centers

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## SMTI NSEC 2016 National Conference

**Wednesday, June 8, 2016**

Detailed Schedule

6:45 AM	Registration
7:00 AM-8:30 AM	Breakfast in Cypress Ballroom
8:30 AM-9:00 AM	<b>Plenary in Contessa Ballroom</b> <a href="#">Welcome</a> <ul style="list-style-type: none"> <li>Noah Finkelstein, Professor of Physics; Director of the Center for STEM Learning; and President's Teaching Scholar, University of Colorado at Boulder</li> <li>Kacy Redd, Director of Science and Mathematics Education Policy, APLU</li> </ul>
9:00 AM-10:00 AM	<b>Keynote Address in Contessa Ballroom</b> <ul style="list-style-type: none"> <li>Shirley Malcom, Head of Education and Human Resources Programs (EHR), American Association for the Advancement of Science (AAAS), and committee chair of the National Academies' <i>Barriers and Opportunities for 2-Year and 4-Year STEM Degrees</i></li> </ul>
10:00 AM - 10:20 PM	<b>Rapid Talks in Contessa Ballroom</b> <b>Effective Partnerships</b> <ul style="list-style-type: none"> <li><a href="#">College of Computing and Informatics (CCI) Business Partners</a> - Maryalicia Johnson, University of North Carolina at Charlotte</li> <li><a href="#">Teachers in Industry</a> - Bruce Johnson, The University of Arizona</li> </ul>
10:20 AM-11:05 AM	<b>Concurrent Sessions I</b>
Room: Anaqua	<a href="#">Promoting Student Engagement in a New Active Learning STEM Classroom Building</a> - William Martin, Jennifer Momsen, Jeffrey Boyer, and Paul Kelter, North Dakota State University
Room: Cedar	<a href="#">UC Berkeley Science and Math Initiative</a> - Katherine L. Reid, George Johnson, Edward Ham, and Elisa Stone, University of California Berkeley
Room: Laurel	<a href="#">A Cross-Campus Collaboration Data Team Supporting Undergraduate STEM Education Reform</a> - Donna Llewellyn, Boise State University
Room: Magnolia	<a href="#">The Learning Assistant Model: Promoting Transformation of Instructional Practices in Large-Enrollment STEM Courses</a> - Laurel Hartley, University of Colorado Denver; Laird Kramer, Florida International

11:05 AM – 11:15 AM Break

**11:15 AM-12:00 PM Concurrent Sessions II**

Room: Anaqua	<a href="#">Enhancing Student Success in Biology, Chemistry, and Physics by Transforming the Faculty Culture</a> - Howard E. Jackson and Kathleen Koenig, University of Cincinnati
Room: Cedar	Connecting Universities with K-12 Teachers to Develop NGSS Curriculum - Julius Su and James Maloney, California Institute of Technology; Eddie Partida, Claremont Graduate University
Room: Laurel	<a href="#">A Novel Assessment Tool For Measuring Student Values And Experiences</a> - Gili Marbach-Ad, University of Maryland
Room: Magnolia	<a href="#">Beyond the STEM Pipeline: An Ecosystem of Partnerships</a> - Debbie DeRoma, Charles De Leone, and Edward Price, California State University San Marcos

**12:00 PM-1:15 PM Lunch in Cypress Ballroom****1:15 PM-1:45 PM Roundtables I**

Roundtable 1	A Collaborative Model for Creating “Next Generation” STEM Teacher Preparation Programs - Ed Geary, Western Washington University
Roundtable 2	Supporting Departmental Transformation through Campus-Wide Initiatives – Lessons Learned from WSU-WIDER and SSTEPs Efforts in Collaboration with the WSU Physics Department - Andrew Feig, Matt Ouellett, and Karen Myhr, Wayne State University
Roundtable 3	Considerations for the Evaluation of Large-Scale, State-Level STEM Initiatives - Nathan W. Moon, Georgia Institute of Technology
Roundtable 4	Non-Tenure Track Faculty as Key STEM Educators - Dabney Dixon, Georgia State University
Roundtable 5	Undergraduate Impact on a University’s Recruitment and Retention Initiative - Susan G. Magliaro and Casey Bailey, Virginia Tech
Roundtable 6	Collaborating at the Centers: CTLs and STEM Centers Continuing Dialogue - Andrea Beach, Western Michigan University; Mathew L. Ouellett, Wayne State University
Roundtable 7	Designing Support Programs to Increase Retention and Graduation Rates Among STEM College Students - Cynthia Y. Lester, Georgia State University / Perimeter College
Roundtable 8	Improving Student Motivation, Engagement and Learning by Integrating Student

	Participation in Science Research Across the Curriculum - W. Robert Midden and Eric Worch, Bowling Green State University
Roundtable 9	Preparing Teachers in STEM Fields: The Impact of Project and Problem-Based Learning in Teacher Education - Emily Bonner and Guadalupe Carmona, The University of Texas at San Antonio
Roundtable 10	STEM Research Center: Creating Research and Evaluation Collaborations across Campus - Loran Carleton Parker and Wilella D. Burgess, Purdue University
Roundtable 11	The Effects of a Science Learning Progression Model in a Secondary Science Teacher Preparation Program - Kimberly A. Staples, Kansas State University
Roundtable 12	<a href="#">The Wichita State University STEM Professional Partnership Program</a> - Shirley Lefever-Davis, Ashlie Jack, Mara Alagic, and SoonChun Lee, Wichita State University

1:50 PM-2:20 PM	Roundtables II
Roundtable 1	Supporting Departmental Transformation through Campus-Wide Initiatives – Lessons Learned from WSU-WIDER and SSTEPs Efforts in Collaboration with the WSU Physics Department - Andrew Feig, Matt Ouellett, and Karen Myhr, Wayne State University
Roundtable 2	Considerations for the Evaluation of Large-Scale, State-Level STEM Initiatives - Nathan W. Moon, Georgia Institute of Technology
Roundtable 3	Non-Tenure Track Faculty as Key STEM Educators - Dabney Dixon, Georgia State University
Roundtable 4	Creating an Undergraduate Research Experience Ecosystem at a Research University - Wilella D. Burgess and Loran Carleton Parker, Purdue University
Roundtable 5	A Collaborative Effort to Develop Middle School Preservice Teachers' Mathematical Content Knowledge - Ruthmae Sears and Fernando Burgos, University of South Florida
Roundtable 6	Building A Statewide Network of STEM Centers to Improve Undergraduate STEM Education - Louis Nadelson, Utah State University; Tami Goetz, Utah Governor's Office of Economic Development
Roundtable 7	Improving Student Motivation, Engagement and Learning by Integrating Student Participation in Science Research across the Curriculum - W. Robert Midden and Eric Worch, Bowling Green State University
Roundtable 8	<a href="#">Noyce Teacher Scholarship Programs: Challenges, Opportunities, and Outcomes</a> -

	Laura Frost, Florida Gulf Coast University; Alice Steimle, University of Mississippi
Roundtable 9	Quality Education: Developing STEM Endorsements through Competency-Based Badging Program - Robert Mayes, Georgia Southern University
Roundtable 10	STEM Research Center: Creating Research and Evaluation Collaborations across Campus - Loran Carleton Parker and Wilella D. Burgess, Purdue University
Roundtable 11	Strategic Alignment for University-Wide Impact and Outcomes - Liesl Baum and Susan G. Magliaro, Virginia Tech
Roundtable 12	<a href="#">The Wichita State University STEM Professional Partnership Program</a> - Shirley Lefever-Davis, Ashlie Jack, Mara Alagic, and SoonChun Lee, Wichita State University

2:20 PM-2:40 PM

**Networking Break**

2:40 PM-3:10 PM	Roundtables III
Roundtable 1	A Collaborative Model for Creating “Next Generation” STEM Teacher Preparation Programs - Ed Geary, Western Washington University
Roundtable 2	Developing Scholarly STEM Teachers through a SoTL Faculty Fellowship - Shawn Nordell, Washington University in St. Louis
Roundtable 3	UTeach National Initiative – Long-Term Sustainability: Lessons Learned from the Field - Pamela Romero and Mike Degraff, University of Texas at Austin
Roundtable 4	Undergraduate Impact on a University’s Recruitment and Retention Initiative - Susan G. Magliaro and Casey Bailey, Virginia Tech
Roundtable 5	Collaborating at the Centers: CTLs and STEM Centers Continuing Dialogue - Andrea Beach, Western Michigan University; Mathew L. Ouellett, Wayne State University
Roundtable 6	Designing Support Programs to Increase Retention and Graduation Rates among STEM College Students - Cynthia Y. Lester, Georgia State University / Perimeter College
Roundtable 7	Engaging Faculty in Understanding and Using How People Learn, Learning Progressions, and Formative Assessments to Transform their STEM Undergraduate Classrooms - Shannon Warren, Western Washington University
Roundtable 8	Lessons from the Transfer Academy - Joseph Kulhanek and Carmen Fies, The University of Texas at San Antonio
Roundtable 9	Preparing Teachers in STEM Fields: The Impact of Project and Problem-Based

	Learning in Teacher Education - Emily Bonner and Guadalupe Carmona, The University of Texas at San Antonio
Roundtable 10	The Effects of a Science Learning Progression Model in a Secondary Science Teacher Preparation Program - Kimberly A. Staples, Kansas State University
Roundtable 11	The Vermont STEM Collaborative - Regina Toolin, University of Vermont

3:15 PM-3:45 PM	Roundtables IV
Roundtable 1	Developing Scholarly STEM Teachers through a SoTL Faculty Fellowship - Shawn Nordell, Washington University in St. Louis
Roundtable 2	Creating an Undergraduate Research Experience Ecosystem at a Research University - Wilella D. Burgess and Loran Carleton Parker, Purdue University
Roundtable 3	Building a Statewide Network of STEM Centers to Improve Undergraduate STEM Education - Louis Nadelson, Utah State University; Tami Goetz, Utah Governor's Office of Economic Development
Roundtable 4	Strategic Alignment for University-Wide Impact and Outcomes - Liesl Baum and Susan G. Magliaro, Virginia Tech
Roundtable 5	A Collaborative Effort to Develop Middle School Preservice Teachers' Mathematical Content Knowledge - Ruthmae Sears and Fernando Burgos, University of South Florida
Roundtable 6	The Vermont STEM Collaborative - Regina Toolin, University of Vermont
Roundtable 7	Engaging Faculty in Understanding and Using How People Learn, Learning Progressions, and Formative Assessments to Transform their STEM Undergraduate Classrooms - Shannon Warren, Western Washington University
Roundtable 8	Lessons from the Transfer Academy - Joseph Kulhanek and Carmen Fies, The University of Texas at San Antonio
Roundtable 9	<a href="#">Noyce Teacher Scholarship Programs: Challenges, Opportunities, and Outcomes</a> - Laura Frost, Florida Gulf Coast University; Alice Steimle, University of Mississippi
Roundtable 10	Quality Education: Developing STEM Endorsements through Competency-Based Badging Program - Robert Mayes, Georgia Southern University
Roundtable 11	UTeach National Initiative – Long-Term Sustainability: Lessons Learned from the Field - Pamela Romero and Mike Degraff, University of Texas at Austin

3:45 PM-4:45 PM	Poster Session and Networking
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Poster 1	Alabama Alliance for Students with Disabilities in STEM (AASD-STEM): An Evidence-Based Bridge Model - Brittany McCullough and Overtoun Jenda, Auburn University
Poster 2	STEM@CSUSM: Broadening K12 and Undergraduate STEM Participation - Debbie DeRoma, Edward Price, and Charles DeLeone, California State University, San Marcos
Poster 3	Quality Education: Developing STEM Endorsements through Competency-based Badging Program - Robert Mayes, Georgia Southern University
Poster 4	A New Integrated Science Education and Research Facility at the University of Utah - Jordan Gerton, University of Utah
Poster 5	Extended Professional Development for New and Hopeful Faculty - Cynthia Ghent, Towson University
Poster 6	Supporting STEM Teacher Learning in Mathematical Discourse - Lynn Hodge, The University of Tennessee
Poster 7	Statewide Collaboration Effort by University of North Dakota STEM Initiative - Robert Pawloski, University of North Dakota
Poster 8	<a href="#">Mathematics as a First Step Toward Success in STEM (FirstSTEP)</a> - Tom Cheatham, Middle Tennessee State University
Poster 9	I-CUBED, RISE and BUILD Programs at Xavier University of Louisiana - Tiera S. Coston, Kendall Eskine, and Maryam Foroozesh, Xavier University of Louisiana
Poster 10	Towson University Center for STEM Excellence: Integrating STEM Undergraduates into K-12 Community Outreach - Mary Stapleton, Towson University
Poster 11	Dispersed to the Wind: Follow up Findings for Ten Years of Grant-Funded STEM Teachers - Helen Meyer, University of Cincinnati
Poster 12	Interdisciplinary STEM Education Initiative at Wichita State University - SoonChun Lee, Wichita State University
Poster 13	Evaluation of WSU Use of Evidence-Based Methods in STEM Instruction - Mathew Ouellett, Wayne State University
Poster 14	<a href="#">Talking About Leaving Revisited: A Multi-Component Research Study Exploring Factors Influencing Undergraduates Switching from STEM Majors</a> - Anne-Barrie Hunter, University of Colorado Boulder
Poster 15	Glyphosate as an Interdisciplinary Teaching Tool for Freshman Science Labs - Trish Hartzell and Martina Ederer, University of Idaho
Poster 16	AAU STEM Education Initiative: A Multi-Strategy Approach to Active Learning - Shawn Nordell, Washington University in St. Louis
Poster 17	Academy for Teacher Excellence: Expansive Learning as Innovative STEM Informal Learning Opportunities - Lorena Claeys, Belinda Bustos Flores, and Karina Guevara-Lares, The University of Texas at San Antonio

Poster 18	Supporting Non-tenure Track Faculty: Possibilities and Successes - Dabney Dixon, Georgia State University
Poster 19	Models of Program-Scale Change from the InTeGrate STEP Center - Cailin Huyck Orr and Cathryn A. Manduca, SERC at Carleton College
Poster 20	Tapping Community Expertise: Online Resources from the Science Education Resource Center Higher Education Portal - Cathryn A. Manduca, Science Education Resource Center
Poster 21	Promoting Undergraduate Success in Science and Math at the University of Utah through a Multi-Faceted Approach - Emily Gaines, The University of Utah
Poster 22	Alternative Models for Evaluating the Implementation and Effectiveness of Programs to Improve STEM Teacher Preparation and Development - Hersh Waxman, Jaqueline R. Stillisano, and Kim B Wright, Texas A&M University
Poster 23	A Research-Based Foundation for Change Initiatives Using Instructional Development Teams - Andrea Beach, Western Michigan University
Poster 24	<a href="#">Enhancing Engineering Undergraduate Education through Faculty Learning Communities</a> - Tershia Pinder-Grover, University of Michigan
Poster 25	Engaging Industry, Government and Education to Build STEM Career Pathways in Hawai'i – John Rand, University of Hawai'i

4:45 PM-5:45 PM	Research Action Clusters and Significant Interest Groups (SIGs)
Room: Magnolia	<b>Developing a Unified Disciplinary Based Education Research Community</b> <b>RAC members:</b> Scott Franklin, Director, CASTLE Center for Advancing Science/Math Teaching, Learning & Evaluation, Rochester Institute of Technology
Room: Cedar	<b>Inventory of Statewide STEM Networks/Partnerships</b> <b>RAC members:</b> Susan G. Magliaro, VT-STEM-Virginia Tech (Lead); Jeremy Ernst, Associate Director for the VT School of Education's Office of Educational Research and Outreach; Jan Morrison, Executive Director, Teaching Institute for Excellence in STEM (TIES)
Room: Anaqua	<b>Collaborative Around Research Experiences for Teachers (CARET)</b> <b>RAC members:</b> John Keller and Brian Paavo, Cal Poly; Renee Schwartz, Georgia State University; Larry Horvath, Eric Hsu, & Jamie Chan, San Francisco State University; Sanlyn Buxner and Bruce Johnson, University of Arizona; Bryan Rebar, University of Oregon, Jordan Gerton, Holly Godsey, Emily Gaines, and Jessica Dwyer, University of Utah; Edward Ham, Elisa Stone, George Johnson, and Kate Reid, UC Berkeley; and Mara Alagic, Soon Chun Lee, and Greg Novacek, Wichita State University
SIG	<b>Quality Education: Developing STEM Endorsements through Competency-</b>



SIG

**based Badging Program** - Robert Mayes, Georgia Southern University**Moving NSEC Forward** - Noah Finkelstein, University of Colorado at Boulder;  
Kacy Redd, APLU**Thursday, June 9, 2016**

7:00 AM - 8:00 AM

**Breakfast in Cypress Ballroom**

8:00 AM - 8:30 AM

**Rapid Talks in Contessa Ballroom****Increasing Access**

- [BreakThru: The Georgia STEM Accessibility Alliance \(GSAA\)](#) - Nathan W. Moon, Georgia Institute of Technology
- [Institutional Impact of Scaling-up Course-Embedded Undergraduate Research Experiences \(CUREs\)](#) - Judy Awong-Taylor, Georgia Gwinnett College

8:30 AM - 9:30 AM

**Plenary in Contessa Ballroom**[Emerging Administrative Positions that Impact Undergraduate Education](#)

- **MJ Bishop**, Director of the William E. Kirwan Center for Academic Innovation, University System of Maryland
- **Nancy S. Shapiro**, Associate Vice-Chancellor for Academic Affairs and Special Assistant to Chancellor, University System of Maryland

9:40 AM - 10:25 AM

**Concurrent Sessions III**

Room: Anaqua

[STEM Center Faculty Affiliate Programs: Models, Benefits, and Challenges](#) - Sharon Locke, Southern Illinois University Edwardsville; Laura Frost, Florida Gulf Coast University

Room: Cedar

A Trio of Tools for Preparing STEM Teachers that Provides a Rich Source of Data and Facilitates Extensive Analysis of Teaching Episodes - Craig Berg and Michael Steele, University of Wisconsin-Milwaukee

Room: Laurel

[Testing the Combined Effect of Learning Space and Faculty Perceptions of Self-Efficacy to Use Student-Centered Practices on Teaching Experiences and Student Engagement](#) - Loran Carleton Parker, Wilella D. Burgess, and Lindley McDavid, Purdue University

Room: Magnolia

[Mathematics as a First Step Toward Success in STEM \(FirstSTEP\)](#) - Tom Cheatham, Middle Tennessee State University

10:25 AM – 10:35 AM

**Break**

10:35 AM - 11:20 AM	<b>Concurrent Sessions IV</b>
Room: Anaqua	<a href="#">Increasing Success in Calculus with Placement Exams and Online Tutoring</a> - Jennifer Whitfield and Timothy P. Scott, Texas A&M University
Room: Cedar	<a href="#">Cultivating a STEM Learning Ecosystem</a> - Gerald Solomon, Samueli Foundation/STEM Funders Network
Room: Laurel	<a href="#">Transforming STEM Education through Teacher Training</a> - Howard E. Jackson, Helen Meyer, and Anant Kukreti, University of Cincinnati
Room: Magnolia	<a href="#">A Familiar(ity) Problem: Assessing the Impact of Prerequisites and Content Familiarity on Student Learning</a> - Brian K. Sato, University of California, Irvine
11:30 AM - 12:30 PM	<b>Rapid Talks in Contessa Ballroom</b> <b>Faculty Learning Communities and the Learning Assistants Program</b> <ul style="list-style-type: none"> <li>• <a href="#">Learning Assistant Program</a> - Jillana Finnegan, Boise State University</li> <li>• <a href="#">Active Learning Pedagogy Support: Disciplinary Faculty Learning Communities Supported by Learning Assistants</a> - Charles De Leone and Edward Price, California State University-San Marcos</li> <li>• <a href="#">UA-AAU STEM Collaborative Learning Spaces Project</a> - Lisa Elfring, The University of Arizona</li> <li>• <a href="#">An Education Research Professional Learning Community for STEM Faculty</a> - Louis Nadelson, Utah State University</li> <li>• <a href="#">STEM Professional Academy to Reinvigorate the Culture of Teaching (SPARCT)</a> - Laura Frost, Florida Gulf Coast University</li> </ul>
12:30 PM - 1:30 PM	<b>Lunch</b>
1:30 PM – 2:15 PM	<b>Research Action Clusters and Significant Interest Groups (SIGs)</b>
Room: Magnolia	Developing a Unified Disciplinary Based Education Research Community
Room: Cedar	Inventory of Statewide STEM Networks/Partnerships
Room: Anaqua	Collaborative Around Research Experiences for Teachers (CARET)
SIG	Moving NSEC Forward
2:25 PM - 3:00 PM	<b>Wrap Up</b>



**Shirley Malcom** is head of Education and Human Resources Programs at AAAS. In this position she works to improve the quality and increase access to education and careers in STEM as well as to enhance public science literacy. Dr. Malcom is a trustee of Caltech and a regent of Morgan State University. She is a former member of the National Science Board, the policymaking body of the National Science Foundation, and served on President Clinton's Committee of Advisors on Science and Technology. Malcom, a native of Birmingham, Alabama, received her PhD in ecology from The Pennsylvania State University, masters in zoology from UCLA and bachelor's with distinction in zoology from the University of Washington. She holds 16 honorary degrees. Malcom chaired the NAS Committee on Barriers and Opportunities to 2-Year and 4-Year STEM Degree Completion. She serves on the boards of the Heinz Endowments, Public Agenda, the National Math-Science Initiative and Digital Promise. She is co-chair of the Gender Advisory Board of the UN Commission on S&T for Development and Gender InSITE, a global initiative to deploy S&T to improve the lives and status of girls and women. In 2003, Dr. Malcom received the Public Welfare Medal of the National Academy of Sciences, the highest award given by the Academy.



**M.J. Bishop** is inaugural director of the University System of Maryland's William E. Kirwan Center for Academic Innovation, which was established in 2013 to enhance and promote USM's position as a national leader in higher education academic innovation. The Center conducts research on best practices, disseminates findings, offers professional development opportunities for institutional faculty and administrators, and supports the 12 public institutions that are part of the system as they continue to expand innovative academic practices. Prior to coming to USM, Dr. Bishop was Associate Professor and Director of the Lehigh University College of Education's Teaching, Learning, and Technology Program where, in

addition to being responsible for the institution's graduate programs in instructional technology, she also played a leadership role in guiding the general and special education teacher preparation programs through a curricular overhaul to address the new Pennsylvania Department of Education (PDE) guidelines for teacher certification. While at Lehigh, Dr. Bishop received several awards for her research and teaching including the 2013 Stabler Award for Excellence in Teaching for leading students to "excellence in their chosen field" as well as "excellence as human beings and as leaders of society."



**Nancy S. Shapiro** is Associate Vice Chancellor for Education and Outreach and Special Assistant to the Chancellor. She directs the University System of Maryland P-20 Partnership for Teaching and Learning, developing collaborations that foster critical partnerships and learning communities to improve the quality of teaching and learning for Maryland's teachers and students. Her work with the Academic Transformation Course Redesign initiative led to the establishment of the USM Center for Academic Innovation. She has authored numerous books and articles on creating and sustaining learning communities and P-20 partnership work. Most recently,

Dr. Shapiro is leading the \$3 Million U.S. Department of Education *First in the World* Maryland

Mathematics Reform Initiative which will introduce a new higher education statistics curriculum for students in select majors in Maryland. Dr. Shapiro graduated Phi Beta Kappa from Brandeis University, and earned her Ph. D. in Curriculum and Instruction from the University of Maryland.



**Noah Finkelstein** is a Professor of Physics at the University of Colorado Boulder and conducts research in physics education, which has resulted in over 120 publications. He serves as a PI of the Physics Education Research (PER) group at Colorado and is also a Director of the national-scale Center for STEM Learning on campus, which has become one of eight national demonstration sites for the Association of American Universities' (AAU) STEM Education Initiative. Finkelstein is also co-director of the Network of STEM Education Centers (NSEC), an organization of campus-based centers that serve as catalysts for educational transformation in STEM. He is increasingly involved in education policy. In 2010, he testified before the US Congress on the state of STEM education at the undergraduate and graduate levels. He serves on many national boards including chairing both the American Physical Society's Committee on Education and PER Topical Group. He serves on the Board of Trustees for the Higher Learning Commission, is a Technical Advisor to the AAU, and is very involved in the Association of Public and Land-grant Universities' efforts in STEM education. He is a Fellow of the American Physical Society, and a Presidential Teaching Scholar and the inaugural Timmerhaus Teaching Ambassador for the University of Colorado system.



**Kacy Redd** is the director of science and mathematics education policy at the Association of Public and Land-grant Universities (APLU). APLU is a higher education association in Washington, DC, with a membership of 235 public research universities in the US, Canada, and Mexico. She co-directs the Network of STEM Education Centers (NSEC), which currently links 135 STEM Education Centers (SEC) at 114 institutions (from 226 SECs at 169 institutions identified to date). NSEC is funded by the National Science Foundation (NSF #1524832) and has received funding from the Alfred P. Sloan Foundation. Dr. Redd also manages APLU's Science and Mathematics Teaching Imperative (SMTI), a commitment by 132 public research universities to improve science and mathematics teacher preparation. She serves as staff lead for APLU's Research Intensive Committee, a committee of 15 presidents of RU1 institutions, and for the Task Force on Laboratory Safety. Redd received her PhD in neuroscience from Columbia University, where she was funded by a HHMI Predoctoral Fellowship.

### **Keynote Address in Contessa Ballroom**

**Shirley Malcom**, Head of Education and Human Resources Programs (EHR), American Association for the Advancement of Science (AAAS), and committee chair of the National Academies' *Barriers and Opportunities for 2-Year and 4-Year STEM Degrees*

### **Welcome**

**Noah Finkelstein**, Professor of Physics; Director of the Center for STEM Learning; and President's Teaching Scholar, University of Colorado at Boulder

**Kacy Redd**, Director of Science and Mathematics Education Policy, APLU

### **Emerging Administrative Positions that Impact Undergraduate Education**

**MJ Bishop**, Director of the William E. Kirwan Center for Academic Innovation, University System of Maryland

**Nancy S. Shapiro**, Associate Vice-Chancellor for Academic Affairs and Special Assistant to Chancellor, University System of Maryland

### **Effective Partnerships**

- [College of Computing and Informatics \(CCI\) Business Partners](#) - Maryalicia Johnson, University of North Carolina at Charlotte
- [Teachers in Industry](#) - Bruce Johnson, The University of Arizona

### **Increasing Access**

- [BreakThru: The Georgia STEM Accessibility Alliance \(GSAA\)](#) - Nathan W. Moon, Georgia Institute of Technology
- [Institutional Impact of Scaling-up Course-Embedded Undergraduate Research Experiences \(CUREs\)](#) - Judy Awong-Taylor, Georgia Gwinnett College

### **Faculty Learning Communities and the Learning Assistants Program**

- [Learning Assistant Program](#) - Jillana Finnegan, Boise State University
- [Active Learning Pedagogy Support: Disciplinary Faculty Learning Communities Supported by Learning Assistants](#) - Charles De Leone and Edward Price, California State University-San Marcos
- [UA-AAU STEM Collaborative Learning Spaces Project](#) - Lisa Elfring, The University of Arizona
- [An Education Research Professional Learning Community for STEM Faculty](#) - Louis Nadelson, Utah State University
- [STEM Professional Academy to Reinvigorate the Culture of Teaching \(SPARCT\)](#) - Laura Frost, Florida Gulf Coast University

**Collaborative Around Research Experiences for Teachers (CARET)**

**Time:** Wednesday, June 8, 2016, at 4:45 PM & Thursday, June 9, 2016, at 1:30 PM

**Location:** Anaqua

**RAC members:** John Keller and Brian Paavo, Cal Poly; Renee Schwartz, Georgia State University; Larry Horvath, Eric Hsu, and Jamie Chan, San Francisco State University; Sanlyn Buxner and Bruce Johnson, University of Arizona; Bryan Rebar, University of Oregon, Jordan Gerton, Holly Godsey, Emily Gaines, and Jessica Dwyer, University of Utah; Edward Ham, Elisa Stone, George Johnson, and Kate Reid, UC Berkeley; and Mara Alagic, Soon Chun Lee, and Greg Novacek, Wichita State University

**Abstract:** Studies have demonstrated the value of undergraduate research as a high impact practice for both retention in STEM and addressing achievement gap issues (Eagan, et al., 2013; Committee on Science, Engineering, and Public Policy, 2011). A number of NSEC institutions are engaged in providing research experiences for undergraduates and graduate students pursuing careers in K-12 teaching. Limited research exists to demonstrate the generalizable impacts of these programs on teacher recruitment, preparation, and retention, in part because of limited cohort sizes of individual programs. In addition, opportunities do not widely exist to bring together coordinators of teacher-researcher programs for sharing of programmatic goals and structures or developing collaborative research investigations into the impacts these types of programs.

This proposal will promote cross-institutional collaboration involving research and assessment into commonalities, differences, and impacts of teacher-researcher programs, and will also contribute to the body of knowledge around research experiences for undergraduates.

We anticipate at least three outcomes and deliverables from this RAC:

1. We will advance preliminary work into common metrics that can be used across teacher-researcher programs for cross-institutional research into the impact of research experiences on future teachers and teaching.
2. We will submit a proposal for an NSF collaborative grant and or pursue foundation support to grow and sustain the efforts of CARET beyond its current budding stage of development.
3. We will develop a white paper on demonstrated and proposed impacts of teacher-researcher efforts on classroom teaching and retention.

**Developing a Unified Disciplinary Based Education Research Community****Time:** Wednesday, June 8, 2016, at 4:45 PM & Thursday, June 9, 2016, at 1:30 PM**Location:** Magnolia**RAC members:** Scott Franklin, Director, CASTLE Center for Advancing Science/Math Teaching, Learning & Evaluation, Rochester Institute of Technology

**Abstract:** Discipline-based Education Research (DBER) is a core component of many STEM Education Centers, driving programmatic and research activities. To date there has been little interaction between DBER communities within each STEM discipline. For example, there is no DBER conference or journal, but rather separate conferences and journals for biology, chemistry, engineering, geosciences, mathematics, and physics education. We believe that there is tremendous advantage and synergy to be gained through the formation of a single DBER community. This interdisciplinary community would exist not just to share results, methodology and ideas across the existing communities, but also to recognize and build a new discipline rooted in the intrinsic compatibility of the DBER research areas.

STEM Education Centers that encompass multiple disciplinary education groups are ideal entities to chart the future of DBER and organize this new community. We therefore propose a Research Action Cluster that brings together members of these STEM Education Centers, along with critical advocates from individual DBER areas, to develop a strategic vision for the community, and benchmark action items in areas of community (e.g. conferences), collaborative and interdisciplinary research, and advocacy. RAC members will convene for a weekend workshop to develop the initial vision and rationale for moving forward on developing this community. Specific plan elements to develop include:

- Vision & Rationale for a unified DBER community
- Promising research directions for a unified community
- Opportunities for institutional, local and national advocacy that support DBER
- Novel funding opportunities for interdisciplinary endeavors
- Developing a DBER conference



**Inventory of Statewide STEM Networks/Partnerships**

**Time:** Wednesday, June 8, 2016, at 4:45 PM & Thursday, June 9, 2016, at 1:30 PM

**Location:** Cedar

**RAC members:** Susan G. Magliaro, VT-STEM-Virginia Tech (Lead); Jeremy Ernst, Associate Director for the VT School of Education's Office of Educational Research and Outreach; Jan Morrison, Executive Director, Teaching Institute for Excellence in STEM (TIES)

**Abstract:** Across the United States, individual states are creating mechanisms to advance high quality STEM education to attract more people into STEM careers, advance economic development, catalyze innovative thinking and action, and create a more informed citizenry. Often these mechanisms are networks or partnerships that include entities such as K-12 schools, higher education, businesses, community agencies, government agencies, museums, etc. Many states (e.g., Georgia, and North Carolina) have had a "STEM network" for many years, and are now redesigning it to meet current needs. While there is stand-alone documentation of these networks, there is really no resource that analyzes the elements of the network, articulates the considerations for the development of a network, or summarizes the relative successes and challenges regarding development, maintenance, or sustainability, hence, causing inefficiencies in time, potential missed information, and missed opportunities to create potential effective partnerships.

The purpose of this project is to address the following goals and activities:

1. Conduct an inventory of the STEM statewide or regional networks or partnerships that are available in each state and territory in the US.
2. Analyze the features of each of these entities to determine the key elements (such as type of network, mission and goals, funding, staffing, evaluation plan, etc.)
3. Develop an inventory of identified networks, organized as profiles based on a template developed from the common features across entities.
4. Analyze issues that impact successes and challenges; and, "lessons learned" from the field.
5. Create directory of STEM leaders in each state/territory who are willing to collaborate or consult with others regarding development of their own networks/partnerships.

[College of Computing and Informatics \(CCI\) Business Partners  
Conference presentation](#)

**Time:** Wednesday, June 8, 2016, at 10:00 AM

**Location:** Contessa Ballroom

**Speaker:** Maryalicia Johnson, University of North Carolina at Charlotte

**Abstract:** UNC Charlotte has the largest number of IT students in the Carolina's and one of the largest in the nation through the College of Computing and Informatics (CCI). CCI is a recognized leader in utilizing industry partners to build T-Shaped talent at scale. In 2016, CCI was recognized at the National Academy of Sciences during the 2016 T-Summit for "Developing T-Shaped Talent at Scale". Currently, the CCI Business Partners program has nearly 50 companies that work hand-in-hand with the College to provide career prep and workforce readiness to the students. Students work with the Business Partner companies/employers to practice professional development skills, and the result is a robust IT talent pipeline to support the economic development of the whole region.

[Presentation](#)

[Teachers in Industry](#)

**Time:** Wednesday, June 8, 2016, at 10:00 AM

**Location:** Contessa Ballroom

**Speaker:** Bruce Johnson, The University of Arizona

**Abstract:** Teachers in Industry is a partnership between the University of Arizona College of Education, Tucson Values Teachers, Southern Arizona Leadership Council, and more than 40 industry partners along with Arizona school districts, schools, and teachers. We offer teachers a combination of paid summer work experiences in Arizona businesses and industries and intensive coursework leading to either professional development credits or a master's degree focused on STEM education. The purposes of Teachers in Industry are to 1) increase teacher retention rates and 2) to equip teachers with experiences needed to prepare their students for the 21st century workforce.

[BreakThru: The Georgia STEM Accessibility Alliance \(GSAA\)](#)

**Time:** Thursday, June 9, 2016, at 8:00 AM

**Location:** Contessa Ballroom

**Speaker:** Nathan W. Moon, Georgia Institute of Technology

**Abstract:** BreakThru is a five-year National Science Foundation (NSF) funded project to broaden the participation of students with disabilities in secondary and postsecondary STEM education. People with disabilities comprise 19% of the U.S. population, but less than 10% of its employed scientists and engineers. Students with disabilities represent only 10% of undergraduate, 7% of graduate, and 1% of doctoral-level STEM majors. Key barriers include the challenge of persistence in STEM, issues of inaccessible pedagogy, and negative attitudes. GSAA has sought to investigate the uses of online—especially virtual—mentoring to assist retention and persistence of students in STEM degrees and across

critical educational junctures. GSAA had three stated goals: (1) Increase the number of secondary students with disabilities enrolling in STEM postsecondary classes and majors; (2) Increase the retention and graduation of postsecondary students with disabilities in STEM majors; (3) Increase the successful entry of postsecondary students with disabilities into STEM graduate programs or the STEM workforce.

[Presentation](#)

### [\*\*Institutional Impact of Scaling-up Course-Embedded Undergraduate Research Experiences \(CUREs\)\*\*](#)

**Time:** Thursday, June 9, 2016, at 8:00 AM

**Location:** Contessa Ballroom

**Speaker:** Judy Awong-Taylor, Georgia Gwinnett College

**Abstract:** Georgia Gwinnett College was established in 2006 as a public liberal arts institution with a mission to provide open access to all high school graduates regardless of SAT scores. In 2011, The School of Science and Technology (SST) implemented a program for enhancing student engagement and learning in all STEM disciplines. GGC's Four-year Undergraduate Research and Creative Experience (4YrURCE) program is based upon a discipline-specific course-embedded research model which scaffolds multiple research and creative experiences for all STEM majors during all four years of matriculation. Each Course-embedded Undergraduate Research Experience (CURE) provides a scaffolding of research skills, creative abilities, and core content knowledge (STEM competencies).

[Presentation](#)

### [\*\*Learning Assistant Program\*\*](#)

**Time:** Thursday, June 9, 2016, at 11:30 AM

**Location:** Contessa Ballroom

**Speaker:** Jillana Finnegan, Boise State University

**Abstract:** The Learning Assistant (LA) program at Boise State University matches peer leaders with a specific STEM course and instructor to support both the faculty and students. The Learning Assistant supports faculty in implementing active learning strategies in class and facilitates peer study groups outside of class. Our program focuses on recruiting, selecting, and training peer leaders for exceptional communication and facilitation skills.

[Presentation](#)

### [\*\*Active Learning Pedagogy Support: Disciplinary Faculty Learning Communities Supported by Learning Assistants\*\*](#)

**Time:** Thursday, June 9, 2016, at 11:30 AM

**Location:** Contessa Ballroom

**Speaker:** Charles De Leone and Edward Price, California State University-San Marcos

**Abstract:** The Active Learning Pedagogy Support (ALPS) program supports faculty development, course transformation, and cross-campus coordination by creating discipline-based faculty learning communities and supporting them with Learning Assistants. In ALPS, faculty groups are convened to (i) explore evidence based instructional practices, (ii) plan the implementation of such practices in participants' classes, and (iii) implement these practices with the help of undergraduate Learning Assistants. Initiated at California State University San Marcos (CSUSM) and Palomar Community College (Palomar), the project has supported ALPS cohorts in mathematics and chemistry. In addition to improving the student success rates in targeted classes, the ALPS faculty interactions have increased the cross-campus awareness of content and pedagogy in the classroom. This has resulted in more consistency in course curricula, some standardization of equipment, sharing of resources, and exploration of campus-specific active learning approaches. The ALPS program was developed as part of the NSF-funded STEM Talent Expansion Program (STEP) project "Increasing STEM Talent through Regional Partnerships, Recruiting, and Retention," DUE-1068477.

[Presentation](#)

#### [UA-AAU STEM Collaborative Learning Spaces Project](#)

**Time:** Thursday, June 9, 2016, at 11:30 AM

**Location:** Contessa Ballroom

**Speaker:** Lisa Elfring, The University of Arizona

**Abstract:** The Collaborative Learning Spaces Project (CLSP), an extension of the UA AAU Undergraduate STEM Education Project, is a university-wide collaborative effort at the University of Arizona to develop classroom environments that are more suitable for active learning pedagogies than traditional lecture halls. Instructors and their teaching teams who are using these rooms receive training and participate in faculty learning communities (FLCs) to explore best practices and innovative ideas for use of these spaces. The goals of the program are: (1) to create space in libraries, as well as existing centrally-scheduled classroom buildings, that could be used to promote active-learning strategies in a variety of disciplines; (2) engage faculty who use active-learning strategies in professional learning communities to share and explore best practices in the redesigned classrooms; and (3) collect data on student engagement and on faculty practices in the redesigned teaching spaces.

[Presentation](#)

#### [An Education Research Professional Learning Community for STEM Faculty](#)

**Time:** Thursday, June 9, 2016, at 11:30 AM

**Location:** Contessa Ballroom

**Speaker:** Louis Nadelson, Utah State University

**Abstract:** To address the need to increase STEM faculty member expertise in STEM education research, I developed a faculty community of practice (FCP) focused on increasing knowledge and experience in STEM education research. The STEM Education Research Scholars Group (SERSG) met every other week

during the academic year to study and engage in education research. The participants applied to be part of the group (eight scholars per cohort), which was facilitated by an expert educational researcher, and committed to engage in both individual and group STEM education research projects. At the end of the fourth year, I conducted an exploratory study of the program outcomes and influences by surveying the 31 program alumni. From the 21 former scholars that participated in my study, I found that SERSG involvement had substantial impact on the participants' collaborations and perceptions of STEM education research. In the report, I detail my findings, discuss the results, explore some implications, and offer some possible directions for future research.

[Presentation](#)

### [STEM Professional Academy to Reinvigorate the Culture of Teaching \(SPARCT\)](#)

**Time:** Thursday, June 9, 2016, at 11:30 AM

**Location:** Contessa Ballroom

**Speaker:** Laura Frost, Florida Gulf Coast University

**Abstract:** A multidisciplinary STEM faculty professional development program called STEM Professional Academy to Reinvigorate the Culture of Teaching (SPARCT) is completing its second year at Florida Gulf Coast University. This program seeks to increase the use and effectiveness of evidence-based practices in the introductory STEM classroom, develop professional peer observations, and enhance student learning in introductory STEM courses through STEM faculty projects in the scholarship of teaching and learning (SoTL). SPARCT includes a 36-hour summer STEM academy and a commitment to a faculty learning community during the subsequent academic year. One year of SPARCT has been completed. We chronicled faculty development progress through video interviews with participants, student retention, interest, and confidence in SPARCT participant classes, and faculty feedback on programming.

**The Learning Assistant Model: Promoting Transformation of Instructional Practices in Large-Enrollment STEM Courses****Time:** Wednesday, June 8, 2016, at 10:20 AM**Location:** Magnolia**Speakers:** Laurel Hartley, University of Colorado Denver; Laird Kramer, Florida International University**Additional Authors:** Hagit Korneich Leshem and Robert Talbot

**Abstract:** The Learning Assistant model places talented undergraduates with faculty for the purpose of promoting use of reformed pedagogies. Faculty and Learning Assistants work closely together to plan, implement, and assess course activities in a variety of settings including lecture, laboratory, and recitation. There is evidence that the Learning Assistant Model promotes 1) improved student learning of both LAs and students enrolled in LA supported courses, 2) sustained course reform efforts within departments, 3) institutional change through engagement of faculty and administrators, and 4) recruitment of high performing STEM majors into secondary teaching careers. Our research program is currently observing, characterizing, and interpreting the active learning methods employed in a large sample of LA supported and non-LA supported science courses. Our goal is to describe \*how\* implementing the LA model affects classroom instruction and how changes in instruction relate to changes in student learning.

**A Cross-Campus Collaboration Data Team Supporting Undergraduate STEM Education Reform****Time:** Wednesday, June 8, 2016, at 10:20 AM**Location:** Laurel**Speaker:** Donna Llewellyn, Boise State University**Additional Authors:** Doug Bullock, Jocelyn Cullers, Brittnee Earl, Pat Pyke, and Nick Warcholak, Boise State University

**Abstract:** Collaboration among the Institute for STEM and Diversity Initiatives, Institutional Research, and the NSF WIDER PERSIST Leadership Team (DUE #- 1347830) at Boise State University has led to the formation of a "Data Team." The primary goal of the Data Team is to improve the quality and increase the accessibility of data for administrators and faculty in order to use assessment measures to inform STEM education reform efforts and consequently student success and retention in STEM disciplines. A significant accomplishment resulting from the collaboration and cooperation of the Data Team has been the development of two reports; one focuses on student retention in each college and department and the other report examines student success in a course sequence. Both reports are now being used by multiple groups across campus.

**UC Berkeley Science and Math Initiative****Time:** Wednesday, June 8, 2016, at 10:20 AM**Location:** Cedar**Speakers:** Katherine L. Reid, George Johnson, Edward Ham, and Elisa Stone, University of California Berkeley

**Abstract:** UC Berkeley's Science and Math Initiative (BSMI) prepares undergraduates for K-12 math and science classrooms (Cal Teach) and provides professional development for Bay Area public school teachers (Math for America Berkeley). A variety of partnerships including Bay Area public schools, Oakland Zoo, San Francisco Exploratorium, and the Lawrence Berkeley National Lab, and programs, including BERET (Berkeley Engineering Research Experiences for Teachers) and Summer Research Institute have been incorporated to develop a multifaceted program to increase the number and quality of science and math teachers who enter and remain in the classroom. We will present programmatic data that document successes and remaining challenges in guiding pre-service and experienced teacher development in the following areas: inquiry practices in math/science teaching, development of CCSS math and NGSS science & engineering practices, math/science content for both pre- and in-service teachers, equity in urban schools, and improved access to STEM learning for all students.

**Promoting Student Engagement in a New Active learning STEM Classroom Building****Time:** Wednesday, June 8, 2016, at 10:20 AM**Location:** Anaqua**Speakers:** William Martin, Jennifer Momsen, Jeffrey Boyer, and Paul Kelter, North Dakota State University

**Abstract:** Our new 109,000 square-foot STEM classroom facility was configured strictly for active learning-based instruction. The three-story technology-rich building contains two SCALE-UP (TEAL) classrooms that hold 135 and 99 students, respectively; several rooms with rolling ("node") chairs; others with moveable tables; instructional labs; and a large lecture hall with graduated seating levels oriented so every other row can turn to face the row directly behind it. With administrative support, faculty teams established ongoing, intensive, collaborative professional development to ensure that the instructional facilities are utilized for their designed purpose of promoting student-centered instruction in and beyond our STEM disciplines. Campus initiatives—including Learning Assistants and the NSF-funded ND-Gateways professional development projects—bridge research and practice. This session will focus on how the facilities are being used synergistically to improve learning and teaching across STEM disciplines and beyond. Specifically, we will discuss campus impact on (a) professional development, (b) physical infrastructure, and (c) research on teaching and learning.



**Enhancing Student Success in Biology, Chemistry, and Physics by Transforming the Faculty Culture****Time:** Wednesday, June 8, 2016, at 11:15 AM**Location:** Anaqua**Speakers:** Howard E. Jackson and Kathleen Koenig, University of Cincinnati**Additional Author:** Leigh M. Smith

**Abstract:** We present a change model that reflects recent literature and report initial results of implementing several change strategies intended to provide a sustainable environment for enhanced student learning. The major goal of this effort, supported by a NSF-IUSE grant (#1431350), is to change the faculty culture across three STEM departments including Biology, Chemistry, and Physics, in a way that directly enhances student learning and student success. One key to the effort is the use of Teaching and Learning Liaisons, faculty within departments who have received special training and are prepared to encourage and support the department and individual faculty members incorporating research-based instructional strategies. The effort is organized with a vertical integration of leadership across department heads, the Dean, and the Provost, and the explicit acknowledgement that change happens locally. This session will highlight the specific activities at each of these levels and the resulting changes that have been observed.

**Beyond the STEM Pipeline: An Ecosystem of Partnerships****Time:** Wednesday, June 8, 2016, at 11:15 AM**Location:** Magnolia**Speakers:** Debbie DeRoma, Charles De Leone, and Edward Price, California State University San Marcos**Additional Authors:** Daniel Sourbeer, Interim Assistant Superintendent/Vice President, Instructional Services, Palomar College

**Abstract:** Undergraduate STEM education takes place in a complex ecosystem including K12 schools, two-year colleges, and four-year universities. A linear K-16 pipeline model does not adequately characterize the experiences of many students, particularly those from underrepresented groups or first generation college students. As students move between institutions, discontinuities and inconsistencies can create barriers to success. Strategic partnerships can address these challenges by helping create coherent, interconnected pathways. The STEM Center at California State University San Marcos (CSUSM) has been the locus for a multi-year effort to build such partnerships with Palomar College, a nearby two-year college, and local K12 schools. Results include increased numbers of CSUSM STEM majors, improvements in two-year students' STEM preparedness, increased numbers of transfers, improved success of these transfers within CSUSM STEM programs, and greater interest and awareness of STEM education among local K12 students and teachers.

**[A Novel Assessment Tool For Measuring Student Values and Experiences](#)****Time:** Wednesday, June 8, 2016, at 11:15 AM**Location:** Laurel**Speakers:** Gili Marbach-Ad, University of Maryland**Additional Authors:** Carly Rietschel and Kaci Thompson, University of Maryland, College Park

**Abstract:** We present a novel assessment tool for measuring biology students' values and experiences across their undergraduate degree program. Our Survey of Teaching Beliefs and Practices for Undergraduates (STEP-U) assesses to what extent students value skills needed for the workplace (e.g., ability to work in groups), as well as student experiences with teaching practices purported to promote such skills (e.g., groupwork). The survey was validated through factor analyses in a large sample of biology seniors (n=1389) and through response process analyses (four interviewees). The STEP-U skills items were characterized by two underlying factors: Retention (i.e., memorization) and Transfer (i.e., analysis and application). Multiple linear regression models allowed us to examine relationships between classroom experiences, values, and student demographics. These analyses showed that greater experience with teaching practices was associated with increased value for corresponding skills. This tool can be used by departments to evaluate student experiences and values.

**Connecting Universities with K-12 Teachers to Develop NGSS Curriculum****Time:** Wednesday, June 8, 2016, at 11:15 AM**Location:** Cedar**Speakers:** Julius Su and James Maloney, California Institute of Technology; Eddie Partida, Claremont Graduate University

**Abstract:** We discuss a partnership between a research university (Caltech) and a teacher preparation program (Claremont Graduate University) to create events where scientists, engineers, industry experts, and other community affiliates gather regularly to aid teachers in creating NGSS (Next Generation Science Standards) aligned curriculum. Over the last year and a half, Caltech has hosted four Community Science Events, where K-12 teachers attend a faculty seminar; a lesson showcase by teachers; and 30-40 activities and demonstrations performed by volunteers. The activities and demonstrations span all grade levels and are selected to emphasize the practice of science and hands-on learning. Each event attracts ~60-120 K-12 teachers and ~40-70 volunteers. In this session, we will discuss the evolution of the format of these events, iterating from research data gathered by CGU; the use of collaborative technologies to facilitate knowledge sharing; and the benefits of curriculum development and teacher professional development performed as a community.

**Testing the Combined Effect of Learning Space and Faculty Perceptions of Self-Efficacy to Use Student-Centered Practices on Teaching Experiences and Student Engagement****Time:** Thursday, June 9, 2016, at 9:40 AM**Location:** Laurel**Speakers:** Loran Carleton Parker, Wilella D. Burgess, and Lindley McDavid, Purdue University**Additional Authors:** Tomalee Doan, Associate Dean for Academic Affairs, Purdue University; Brooke Robertshaw, Assistant Professor and Assessment Librarian, Oregon State University

**Abstract:** Active-learning spaces are designed to increase learning by supporting the use of student-centered practices. It is often assumed that instructors who are effective in traditional spaces will be just as, or even more, effective in active-learning spaces. Current research operates on this assumption, and relies on the perceptions of students and the experience of a few, select instructors to examine the interplay between space and pedagogy. To address these limitations, we examined faculty perceptions of (N=148) self-efficacy for student-centered practices, teaching experiences, and student engagement in active- and traditional-learning spaces. The results indicate that space, in and of itself, is not sufficient to support student-centered practices, and challenges the assumption that faculty who are highly effective in traditional learning spaces will be equally successful in active learning spaces. These findings have implications for developing effective classroom space assignment policies and for scaffolding instructor transition between spaces through learning space-specific training.

**Mathematics as a First Step Toward Success in STEM (FirstSTEP)****Time:** Thursday, June 9, 2016, at 9:40 AM**Location:** Magnolia**Speaker:** Tom Cheatham, Middle Tennessee State University**Additional Authors:** Ginger Rowell, Chris Stephens, and Don Nelson, Middle Tennessee State University

**Abstract:** In Tennessee far too many (70% in 2015) entering STEM majors do not meet the ACT benchmark for mathematics. This means that most entering freshmen have about a 25% chance of passing college algebra with a grade of "C" or better. Without an intervention, these students are likely to leave the STEM pipeline. At MTSU we have been experimenting, with support from an NSF STEP award, with interventions that may help students with poor mathematics preparation succeed in their chosen STEM major. Interventions include (1) a 2-week mathematics bridge boot camp before freshman year; (2) intrusive advising and counseling during years 1-2; (3) required tutoring in mathematics courses; (4) the use of metacognition; (5) engagement in a 3-week early team research experience; (6) active learning pedagogies in pre-calculus; and (7) 4-day, pre-semester boot camp for pre-calculus and calculus 1. Six years of data will be described.

**STEM Center Faculty Affiliate Programs: Models, Benefits, and Challenges****Time:** Thursday, June 9, 2016, at 9:40 AM**Location:** Anaqua**Speakers:** Sharon Locke, Southern Illinois University Edwardsville; Laura Frost, Florida Gulf Coast University

**Abstract:** This session will be an active discussion of existing models of faculty affiliation programs used by STEM centers to promote institutional improvement in various areas of STEM education. The presenters will describe a Faculty Fellow program and a Faculty Associate program and the successes and challenges of each approach. Session participants will share their own experiences and effective approaches for developing broad faculty engagement in center activities.

**A Trio of Tools for Preparing STEM Teachers that Provides a Rich Source of Data and Facilitates Extensive Analysis of Teaching Episodes****Time:** Thursday, June 9, 2016, at 9:40 AM**Location:** Cedar**Speakers:** Craig Berg and Michael Steele, University of Wisconsin-Milwaukee

**Abstract:** Teaching is complex and the research is clear that the teacher is the most important factor that affects learning. Preparing future teachers how to teach effectively and engaging learners at high levels involves many and often complex tasks that sequence knowledge and awareness, practice, observation and data collection, followed by analysis and reflection. Observations of teaching episodes and data analysis involve both qualitative (used most often) and quantitative (to a lesser extent). In this session we will describe how we utilize three different technologies to provide practice teaching in a virtual environment, then provide qualitative observations using after action review software, and quantitative data collection using an app that provides robust measures of teacher questioning and responding, classroom activity and student engagement. The presenters will demonstrate how the three tools work together to achieve robust feedback and thereby growth in teaching skills.

**A Familiar(ity) Problem: Assessing the Impact of Prerequisites and Content Familiarity on Student Learning****Time:** Thursday, June 9, 2016, at 10:35 AM**Location:** Magnolia**Speaker:** Brian K. Sato, University of California, Irvine**Additional Authors:** Justin F. Shaffer, Jennifer V. Dang, Amanda K. Lee, Samantha J. Dacanay, Usman Alam, and Pavan Kadandale, University of California, Irvine

**Abstract:** The assumption that prerequisites improve future learning is rarely assessed. We developed a novel familiarity scale and used this to determine whether concepts introduced in a prerequisite improved later student learning (in two biology disciplines). If content familiarity mattered, it would be expected that exam scores on topics covered in the prerequisite would be higher than scores on novel topics. We found this to be partially true for concepts covered in depth in the prerequisite. However, scores for concepts briefly discussed were indistinguishable from performance on topics not taught in the prerequisite. These results imply that merely “covering” topics in a prerequisite does not result in future gains, and that content may be removed. We have used this data to transform large introductory biology courses with multiple instructors into more student-centered, high structure formats with documented learning gains in the transformed courses.

**Cultivating a STEM Learning Ecosystem****Time:** Thursday, June 9, 2016, at 10:35 AM**Location:** Cedar**Speaker:** Gerald Solomon, Samueli Foundation/STEM Funders Network

**Abstract:** The 27 foundations of STEM Funders Network (SFN), have for 5 years tested the concept of cultivating community-based STEM learning ecosystems. In 2015, with the support of Clinton Global, OSTP, DOE, NRC and others, launched a national initiative to scale lessons learned to 27 communities around the country. The STEM Learning Ecosystem provides for an overarching architecture which consists of representatives from all learning platforms, in and out of school, business, and post-secondary, to focus on the continuum of STEM learning from pre-K to post-secondary to workforce. The session will focus on several core concepts: 1) Quality professional development, 2) Partnership development and Education system alignment with industry and 3) Insuring community voice. The session will share research data from these 27 STEM Ecosystem communities. Attendees will walk away with an understanding of the evidence and research supporting the STEM Ecosystem, as well as how they can directly engage.

**Increasing Success in Calculus with Placement Exams and Online Tutoring****Time:** Thursday, June 9, 2016, at 10:35 AM**Location:** Anaqua**Speakers:** Jennifer Whitfield and Timothy P. Scott, Texas A&M University

**Abstract:** The Department of Mathematics at Texas A&M University was funded by NSF to develop a multi-faceted program that increases success and retention rates in the science, technology, engineering and mathematics (STEM) disciplines, specifically those disciplines requiring the engineering mathematics sequence (Calculus 1-3 and Differential Equations). All students start by taking a Math Placement Exam (MPE) that helps identify the type of calculus course (Calculus I or Precalculus) that best suits the individual student. For the students that do not meet or surpass the cutoff score on the MPE, the math department offers several remediation and intervention options, all online, to help improve the student's mathematical skills that are necessary for success in calculus. Students can enroll in synchronous online sessions and work in small groups with real-time tutors via web conferencing software that provides a virtual classroom. This session will give the details and results of the remediation and intervention programs.

**Transforming STEM Education through Teacher Training****Time:** Thursday, June 9, 2016, at 10:35 AM**Location:** Laurel**Speakers:** Howard E. Jackson, Helen Meyer, and Anant Kukreti, University of Cincinnati

**Abstract:** The University of Cincinnati recognizes that the best way to improve undergraduate STEM education is by investing in math, science, engineering, and technology (STEM) secondary teachers. UC leverages the work of several complementary programs in order to maximize their impact. This session will highlight the findings of these related UC programs. One program, CEEMS, works intensively with teachers over a two-year period to develop and implement units of instruction addressing academic standards through engineering design challenges. Three other programs serving in-service and pre-service teachers participate in some of the CEEMS coursework and professional development, thus creating a cadre of teachers who are confident and competent integrating STEM activities into their classrooms. A fifth project addresses the need for information technology curriculum within high schools. Finally, UC will continue to magnify its impact through a recently funded grant to develop and support mentor STEM secondary teachers within a large urban district.

**STEM Research Center: Creating Research and Evaluation Collaborations across Campus**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 1:50 PM

**Speakers:** Loran Carleton Parker and Wilella D. Burgess, Purdue University

**Additional Authors:** Weiling Li, James Lehman, Ann Bessenbacher, and Lindley McDavid, Discovery Learning Research Center, Purdue University

**Abstract:** As a STEM research center, we are interested in both developing and researching the impact of undergraduate education programs. In our research and evaluation roles we have been able to build strong partnerships and collaborations across campus that enhance and enable our work. We've collaborated with our teaching and learning center to examine faculty development models through a research project funded by the U.S. Department of Education. We've gained access to previously unavailable or difficult to attain research data and study participants through collaborations with our institutional assessment office and libraries. This roundtable will give an overview of our research and evaluation portfolio, describe the benefits and challenges of creating such partnerships, and detail our lessons learned over the past 10 years of research and evaluation.

**Improving Student Motivation, Engagement and Learning by Integrating Student Participation in Science Research Across the Curriculum**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 1:50 PM

**Speakers:** W. Robert Midden and Eric Worch, Bowling Green State University

**Abstract:** We will summarize a project supported by a \$7M NSF MSP grant to transform student learning in grades 3---8 of two medium---size school districts. A coalition of scientists affiliated with higher education institutions, government agencies and non---profit organizations is led by the STEM Center at Bowling Green State University. Student participation in real science research projects directed by professional scientists (Citizen Science Research) is being integrated as the core context for learning across the curriculum, aligned with Ohio learning standards. Research is being conducted to determine how grades 3---8 student participation in real science research projects that have important potential benefits for their local communities affects student motivation, engagement, and academic achievement. We will explain how this project arose from findings at the undergraduate level involving student participation in real science research integrated into classroom instruction, and how it will inform further development for undergraduate STEM education.



**The Wichita State University STEM Professional Partnership Program**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 1:50 PM

**Speakers:** Shirley Lefever-Davis, Ashlie Jack, Mara Alagic, and SoonChun Lee, Wichita State University

**Abstract:** The Wichita State University STEM Professional Partnership Program (SP3), is a professional learning opportunity for elementary teachers. The SP3 is designed to equip elementary teachers with knowledge and skills to teach science/math using an integrated STEM (iSTEM) instructional approach and to translate these skills into teaching practice. The PL model for SP3 consists of three components: (1) PL for Peer-Instructional Coaches: 4-day training for select experienced teachers to improve their capacity for developing and implementing iSTEM teaching and skills in distance instructional coaching, (2) PL for Elementary Teachers: an intensive eight-day summer institute, which provides novice/new teachers with iSTEM knowledge and skills through instruction and opportunities for practice with feedback through distance instructional coaching, and (3) Distance Instructional Coaching: a minimum of six distance instructional coaching sessions during the school year, which supports the application of knowledge and skills with guided practice in an authentic classroom.

**Supporting Departmental Transformation Through Campus-Wide Initiatives – Lessons Learned from WSU-WIDER and SSTEPs Efforts in Collaboration with the WSU Physics Department**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 1:50 PM

**Speakers:** Andrew Feig, Matt Ouellett, and Karen Myhr, Wayne State University

**Abstract:** As part of our institutional change efforts through WSU-WIDER and SSTEPs projects, we have been working with a team from our Physics Department to revise 4 classes in the introductory physics sequence (algebra-and calculus-based Physics 1 and 2). The project involves mentoring the faculty team to effectively train and incorporate Peer Learning Assistants into the course structure and to shift toward student-centered, evidence-based classroom pedagogies. We will discuss the way in which we have monitored changes in student learning, student attitudes toward physics and longitudinal progression through the physics curriculum of student cohorts. These data are being used to support and reinforce faculty determination to persist with the project and help them see the effect of their efforts. We will focus the discussion on what it takes to support the disciplinary teams in terms of faculty professional development and data collection.

**Considerations for the Evaluation of Large-Scale, State-Level STEM Initiatives**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 1:50 PM

**Speaker:** Nathan W. Moon, Georgia Institute of Technology

**Abstract:** Many states have implemented large-scale STEM initiatives to realize system-wide improvements in secondary and postsecondary education through programmatic efforts such as undergraduate research programs and faculty learning communities. These intervention and support-

based initiatives frequently involve multiple colleges and universities to improve STEM education outcomes, including degree completion or increased K-12 science and mathematics teacher production. While such initiatives are expected to have an important impact nationally, knowledge about their evaluation remains limited. This proposed roundtable discussion draws upon efforts within the University System of Georgia to consider how such initiatives may be evaluated. Among the questions to be considered: What is the current state of practices in selecting and applying indicators of effectiveness in large-scale STEM initiatives? How do such practices parallel and diverge from accepted evaluation practices? What indicators may help determine efficacy of large-scale STEM initiatives and inform promising practices for evaluation?

### **Non-Tenure Track Faculty as Key STEM Educators**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 1:50 PM

**Speaker:** Dabney Dixon, Georgia State University

**Abstract:** For many academic institutions in the United States, the faculty model is increasingly differentiated. Ehrenberg (J. Econ. Perspect., 2012) reports that non-tenure-track (NTT) faculty increased between 1995 and 2007 from 24% to 35% at public doctoral institutions and from 18% to 46% at private non-profit doctoral. Supporting NTT STEM Faculty is, therefore, key to institutional success. We will describe structural ways to provide resources to enhance NTT faculty personal development, professional advancement, research productivity, mentoring skills, and opportunities for innovation. Group discussions will allow participants the opportunity to share issues and begin to strategize change on their home campuses. This session is intended as an opportunity to hear the concerns that emerge at institutions with this model and discuss how these concerns can be addressed.

### **Designing Support Programs to Increase Retention and Graduation Rates among STEM College Students**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 2:40 PM

**Speaker:** Cynthia Y. Lester, Georgia State University / Perimeter College

**Abstract:** Since its inception in 2012 the Georgia State University Perimeter College (PC) STEM Initiatives Office has dedicated itself to making STEM a living acronym. As part of these efforts, four grant-funded student support programs emerged and impact each year nearly 300+ 2-year college students, who have chosen a STEM discipline. Program scholars benefit from Academic Excellence Workshops; intrusive academic advising; assistance with the transfer process to a 4-year institution; career advising; and, linkages with professional organizations. Students also engage in undergraduate research; visit 4-year institutions and local industries; and, partner with area K-12 schools to help build interest in STEM education and careers. The convener will share results from the programs; discuss how they have been utilized to improve retention, transfer, and graduation rates especially among under-represented

groups; and how they have introduced a culture of undergraduate research. Discussion will also include the challenges of sustainability, access, and institutionalization.

### **A Collaborative Model for Creating “Next Generation” STEM Teacher Preparation Programs**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 2:40 PM

**Speaker:** Ed Geary, Western Washington University

**Additional Authors:** Roxane Ronca, Western Washington University; Julie Antilla and Stamatis Vokos, Seattle Pacific University; Jenny Dechaine and Anne Egger, Central Washington University; Kathy Baldwin, Eastern Washington University; Tamara Nelson, Washington State University

**Abstract:** A consortium of 2- and 4-year Washington State Colleges and Universities in partnership with Washington’s Office of the Superintendent of Public Instruction, the Teachers of Teachers of Science, and other key stakeholders, is currently working to improve science learning for all Washington State students by creating a new vision for STEM teacher preparation in Washington State aligned with the Next Generation Science Standards (NGSS). This roundtable will provide opportunities for participants to discuss and explore a collaborative model for: (1) strengthening elementary and secondary STEM Teacher Preparation courses and curricula, (2) aligning STEM teacher preparation programs with the NGSS, (3) implementing STEM Teacher Preparation program improvements across an entire state, (4) building stronger collaborations between Institutions of Higher Education, K-12 schools, government agencies, Non-Governmental Organizations, and STEM businesses, (5) creating new teacher endorsements in Computer Science and Engineering, and (6) increasing the diversity of the STEM teaching workforce.

### **The Effects of a Science Learning Progression Model in a Secondary Science Teacher Preparation Program**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 2:40 PM

**Speaker:** Kimberly A. Staples, Kansas State University

**Abstract:** This study reports the effects of implementing an innovative clinical practicum designed to prepare secondary science teachers to examine learning progressions in K-12 diverse classrooms. In collaboration with Professional Development Schools, teacher candidates design and implement instruction emphasizing science and engineering practices across grades, K-5, 6-8, and 9-12. The Learning Progression Model (LPM) is a reflective experience, which provides opportunities to assess and evaluate progression of sophistication in biology, chemistry, physics, earth and space science conceptual understanding. Qualitative data were collected and analyzed from videos of lessons, observations by the university supervisor and cooperating teachers, and reflections. Post-instruction debriefings reveal alternative conceptions in candidates’ views of elementary student ability to master rigorous science content. The LPM also increases pre-service teacher understanding of three-dimensional teaching and learning as called for in the Next Generation Science Standards.

**Undergraduate Impact on a University's Recruitment and Retention Initiative**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 2:40 PM

**Speakers:** Susan G. Magliaro and Casey Bailey, Virginia Tech

**Abstract:** In its seventh year, Kindergarten-to-College (K2C) is one of Virginia's Tech primary recruitment and retention initiatives to engage children from Title I schools in STEM education. K2C includes professional development for teachers and counselors regarding college and career readiness, direct engagement with children and their parents to inspire a college pathway, and, most importantly, engagement with 200 undergraduates in any given year to serve as the ambassadors and teachers. Undergraduates plan and enact hands-on the STEM activities with participants, and guide and supervise the children during on-campus visits. The undergraduates' experiences are part of their programs of study related to engagement, research, and coursework. The purpose of this roundtable is to share our program, data, and impact on the university and P-12 settings, and engage participants in a conversation about the development of a nationwide study of the impact of these types of programs on college student recruitment and retention.

**Collaborating at the Centers: CTLs and STEM Centers Continuing Dialogue**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 2:40 PM

**Speakers:** Andrea Beach, Western Michigan University; Mathew L. Ouellett, Wayne State University

**Abstract:** In 2015, the POD Network of faculty developers and the APLU SMTI STEM Education Center leaders initiated a conversation about how centers for teaching and learning (CTLs) and STEM Education Centers (SECs) can work together to further the aims of improving undergraduate education. In a collaborative conference, they explored shared goals, unique strengths, potential synergies, and possible future research. This roundtable discussion will use the report from that conference as a starting point to discuss ways that STEM Centers focused on undergraduate education can collaborate with the CTLs on their campuses and in their regions. Topics will include possible programming, funding opportunities, and research collaborations.

**Preparing Teachers in STEM Fields: The Impact of Project and Problem-Based Learning in Teacher Education**

**Time:** Wednesday, June 8, 2016, at 1:15 PM & 2:40 PM

**Speakers:** Emily Bonner and Guadalupe Carmona, The University of Texas at San Antonio

**Abstract:** The University of Texas at San Antonio, a Hispanic-serving Institution, has implemented several teacher preparation programs and centers aimed at improving STEM education at all levels in K-20. In this session, we will discuss two of these efforts and how they inform one another, and how we design them to improve STEM education in high-need local schools. First, we will present student outcomes related to our community-focused mathematics methods course for elementary school

teachers. This program focuses on developing pre-service teachers' conceptual understandings of STEM fields, particularly through mathematics, while partnering with local schools to provide in-depth field experiences related to problem-based and project-based learning (PBL). Second, we will discuss our STEM Center for teachers, a partnership effort (with local schools) which provided sustained professional development for local science and mathematics teachers to engage students in PBL. We will highlight the ways in which engaging with teachers at all levels and partnering with local schools contributes to quality teacher preparation programs as they incorporate research-based practices shown to generate student meaningful learning in STEM. This session will focus on partnerships with K-12 schools, and the ways in which STEM-focused teacher preparation programs inform one another while improving teaching practices in high-need schools.

### **Strategic Alignment for University-Wide Impact and Outcomes**

**Time:** Wednesday, June 8, 2016, at 1:50 PM & 3:15 PM

**Speakers:** Liesl Baum and Susan G. Magliaro, Virginia Tech

**Abstract:** In an effort to improve the quality of research and practice at the university, the Center for Research in SEAD Education has approached a unique position within the university through a partnership with the Institute for Creativity, Arts, and Technology and the Office for the Vice President of Research and Innovation. This partnership will seek to strategically align research proposals and evaluation plans for university-wide PK-12 STEM- and SEAD-based research projects. The center aims to complement existing colleges, departments and programs by providing formalized mechanisms for rigorous evaluation of programs and projects. In this roundtable, we will discuss how we seek to establish partnerships within and beyond the university, strengthen alignment with partners through needs assessments, design of evaluation plans, and communicate broader impacts across networks.

### **Building a Statewide Network of STEM Centers to Improve Undergraduate STEM Education**

**Time:** Wednesday, June 8, 2016, at 1:50 PM & 3:15 PM

**Speakers:** Louis Nadelson, Utah State University; Tami Goetz, STEM Action Center, Utah Governor's Office of Economic Development

**Abstract:** Supporting, promoting and sustaining a culture of innovation and change within an institution is a complex process that requires attention to multiple facets of personal, institutional, and societal influences. The process becomes exponentially more complex when the institution is a state (Utah) and the stakeholders are K-12 school districts, institutions of higher education, informal education organizations, government and business and industry.

**A Collaborative Effort to Develop Middle School Preservice Teachers' Mathematical Content Knowledge**

**Time:** Wednesday, June 8, 2016, at 1:50 PM & 3:15 PM

**Speakers:** Ruthmae Sears and Fernando Burgos, University of South Florida

**Abstract:** This presentation will describe a collaborative effort between a mathematics educator and mathematicians, who sought to develop preservice middle school teachers' mathematics content knowledge. The faculty members sought to develop preservice teachers' understanding of elementary mathematical concepts, and cultivate habits of mind that embodies desired mathematical practices and processes, thus they engaged in co-planning and co-teaching initiatives over a two year period. Therefore, this presentation will describe the nature of the collaboration, changes made to instructional norms and syllabi, and the complexities faced in seeking to develop preservice teachers' mathematical knowledge needed for teaching.

**Creating an Undergraduate Research Experience Ecosystem at a Research University**

**Time:** Wednesday, June 8, 2016, at 1:50 PM & 3:15 PM

**Speakers:** Wilella D. Burgess and Loran Carleton Parker, Purdue University

**Additional Authors:** James Lehman, Lisa Kirkham, Ann Bessenbacher, and Amy Childress, Discovery Learning Research Center, Purdue University

**Abstract:** As a STEM education research center, we have been developing and researching UREs for over a decade. The overwhelming evidence of the positive influence of experiential learning and mentoring relationships on student development has sparked an interest by our institution in increasing the number of students who complete undergraduate research. While our institution currently boasts a wide array of student URE opportunities, the current landscape is varied, grassroots, and without a central organizing body. Rather than bring all UREs under one central authority, we are advocating for creating a linked, coherent network of undergraduate research experiences. The benefits of such a structure are flexibility, experimentation, and shared knowledge. To begin creating an ecosystem we are: 1) creating a community of practice to foster collaborations and share knowledge across campus, 2) creating an online portal for matching URE mentors and mentees across campus, and 3) conducting research on UREs to develop best practices for URE pathways through the ecosystem.

**Noyce Teacher Scholarship Programs: Challenges, Opportunities, and Outcomes**

**Time:** Wednesday, June 8, 2016, at 1:50 PM & 3:15 PM

**Speakers:** Laura Frost, Florida Gulf Coast University; Alice Steimle, University of Mississippi

**Abstract:** The ability to recruit, maintain, and track NSF-Noyce Scholarship recipients has many challenges and opportunities. The facilitators of the session both have NSF-Noyce Teacher Scholarship administered through their STEM Center. One was recently awarded, the other has been running for

four years. We invite participants to discuss 1) strategies for recruitment of STEM majors interested in K-12 teaching, 2) best practices for tracking students post-graduation, 3) outcomes of successful programs, or 4) other elements, challenges, and opportunities regarding administration of this program.

**Quality Education: Developing STEM Endorsements through Competency-Based Badging Program**

**Time:** Wednesday, June 8, 2016, at 1:50 PM & 3:15 PM

**Speaker:** Robert Mayes, Georgia Southern University

**Abstract:** The Institute for Interdisciplinary STEM Education (i2STEMe) at Georgia Southern University is collaborating with the Georgia Professional Standards Commission and the Georgia Department of Education to develop an Interdisciplinary STEM Endorsement Program for K-12 teachers. The innovative program offers online badging modules which are competency-based and engage teachers in job-embedded demonstrations giving evidence of mastery in practice. The online badges provide access to meta-data consisting of artifacts indicating competency in teaching interdisciplinary STEM. Badging is a national movement to replace college course units and degrees as a means of teacher advancement and professional development. The i2STEMe is partnering with the College of Education to incorporate interdisciplinary STEM teaching and learning into the new Bachelor of Science in Education degree programs being launched in fall 2017. The Interdisciplinary STEM badging effort has the potential to impact preservice and inservice STEM teachers, as well as college faculty.

**Developing Scholarly STEM Teachers through a SoTL Faculty Fellowship**

**Time:** Wednesday, June 8, 2016, at 2:40 PM & 3:15 PM

**Speaker:** Shawn Nordell, Washington University in St. Louis

**Additional Authors:** Gina Frey, Beth Fisher, and Denise Leonard, The Teaching Center, Washington University in St. Louis; and Erin Solomon, Center for Integrative Research on Cognition, Learning, and Education, Washington University in St. Louis

**Abstract:** Calls for widespread adoption of active learning and other evidence-based approaches into STEM curricula create the opportunity for faculty to engage in the scholarship of teaching and learning (SoTL). We describe the AAU-supported development of a two-year SoTL faculty fellowship program at Washington University in St. Louis. A collaboration between The Teaching Center and the Center for the Integrative Research on Cognition, Learning, and Education (CIRCLE), the CIRCLE Fellows Program provides a structure to support Washington University STEM faculty in developing, implementing, and evaluating active learning strategies. Teaching Center expertise on evidence-based teaching practices combined with CIRCLE expertise on assessment practices help faculty take creative leaps in their pedagogical approaches. Fellows participate in a diverse Community of Practice on integrating active learning where they engage in collegial support and discuss evidence-based teaching methods. We will discuss implementation as well as aspects of the program that are transferable to other institutions.



**The Vermont STEM Collaborative**

**Time:** Wednesday, June 8, 2016, at 2:40 PM & 3:15 PM

**Speaker:** Regina Toolin, University of Vermont

**Abstract:** The Vermont STEM Collaborative seeks to address important issues and questions in K-16 STEM education through a professional network that seeks as its mission to “coordinate, energize, and advance STEM learning and career opportunities across Vermont that foster sustained curiosity and learning.” VSTEM comprises a network of over 70 professionals including formal and informal STEM educators, school administrators, state agency representatives, university faculty and STEM businesses partners. VSTEM’s long-term goals is to increase capacity for STEM learning and to foster collegial relationships amongst faculty, administrators, teachers, students and businesses and VT AOE and state government representatives and agencies. In this roundtable presentation, the organization and structure of the VSTEM Collaborative with a focus on recent initiatives established by the collaborative will be discussed. Of particular interest will be a presentation of the VSTEM Collaborative website that includes the Vermont Commons or online clearinghouse of STEM education resources available in Vermont.

**UTeach National Initiative – Long-Term Sustainability: Lessons Learned from the Field**

**Time:** Wednesday, June 8, 2016, at 2:40 PM & 3:15 PM

**Speakers:** Pamela Romero and Mike Degraff, University of Texas at Austin

**Abstract:** The UTeach Institute partners with 44 universities to support and evaluate the implementation of UTeach, a nationally recognized STEM secondary educator preparation program developed at the University of Texas. By 2016, the Institute will have completed a three-year post-grant assessment of 13 programs to document how UTeach programs have evolved since the grant-funded period ended in 2012. While the UTeach Institute has continued to track program graduates as they enter the teaching profession, we have not systematically collected information since 2012. The discussion will focus on understanding long-term program sustainability and institutionalization within the context of fidelity, adaptation, and complexity.

The Institute has reviewed 54 critical components and over 200 indicators to assess fidelity of implementation to the UTeach model’s elements. An accurate picture will help us examine our evaluation support and our theories about the relative importance of different UTeach model components.

**Lessons from the Transfer Academy**

**Time:** Wednesday, June 8, 2016, at 2:40 PM & 3:15 PM

**Speakers:** Joseph Kulhanek and Carmen Fies, The University of Texas at San Antonio

**Abstract:** Broadening Participation Strand: The Transfer Academy at the University of Texas at San Antonio (UTSA) aims to increase the participation of ethnic minorities and women in STEM fields. Originally focusing on only engineering transfer students (in form of the Transfer Academy for Tomorrow's Engineers, or TATE), the program welcomed its first cohort in 2012. At the time of this writing, the Transfer Academy extended support to four cohorts and a total of 58 students who transferred to UTSA. As of 2016, the Transfer Academy offers two different foci, engineering and chemistry. As is the case for the engineering students, the program for the chemistry students (the Academy for Chemistry Transfer Students, or ACTS) will consist of a Summer Bridging Institute and a mentoring program that includes faculty, staff, and peers.

**Engaging Faculty in Understanding and Using How People Learn, Learning Progressions, and Formative Assessments to Transform Their STEM Undergraduate Classrooms**

**Time:** Wednesday, June 8, 2016, at 2:40 PM & 3:15 PM

**Speaker:** Shannon Warren, Western Washington University

**Abstract:** "Change at the Core" (C-Core) is a multi-disciplinary project working to transform undergraduate STEM education at one university and two 2-year colleges. C-Core's primary goal is to improve all students' engagement, learning, and success in STEM by creating a critical mass of STEM faculty who regularly use a student-centered approach to teaching. Sixty faculty, from across all STEM disciplines are currently collaborating to improve STEM teaching and learning in their courses. Initially disciplinary faculty teams focused on reforming entire courses/course sequences, but the emphasis has shifted in the past year to reforming units of instruction. Faculty are now creating unit learning progressions to identify big ideas, designing learning targets and success criteria, and developing formative assessment tasks aligned with the learning target. Our workshop will introduce the learning progression and formative assessment frameworks and consider how the frameworks can guide education reform efforts in participants' own contexts.

**Alabama Alliance for Students with Disabilities in STEM (AASD-STEM): An Evidence-Based Bridge Model**

**Time:** Wednesday, June 8, at 3:45 PM

**Location:** Poster 1

**Speakers:** Brittany McCullough and Overtoun Jenda, Auburn University

**Abstract:** The Alabama Alliance for Students with Disabilities in STEM (AASD-STEM) is an evidence-based bridge model to prepare and retain students with disabilities at the postsecondary level. Funded by a National Science Foundation (NSF) grant, the goals of the alliance are to increase the quality and quantity of students with disabilities in STEM fields. Through mentoring, group meetings, cluster groups, tutoring, and research opportunities, the Alliance provides academic and social support to undergraduate and graduate students with disabilities pursuing STEM degrees. A "Students Enabling Students" association is also part of the alliance activities, helping promote self-advocacy among students with disabilities and increasing awareness about disability issues across each campus in the Alliance. Participating students have shown increased self-efficacy and intention to persist in STEM,

higher levels of interest and confidence in conducting research, and more frequent engagement in self-advocacy behaviors.

**STEM@CSUSM: Broadening K12 and Undergraduate STEM Participation****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 2**Speakers:** Debbie DeRoma, Edward Price and Charles DeLeone, California State University, San Marcos

**Abstract:** Broadening STEM participation is a national concern, yet many universities struggle to increase diversity in STEM disciplines. At CSUSM, STEM majors have grown steadily, both in number and diversity of students. From 2011 to 2015, the number of majors has nearly doubled, with 42% of STEM students coming from underrepresented minority groups. This growth coincides with the implementation of a university-based STEM outreach and recruiting effort. Established in 2012 with NSF STEP funding, the CSUSM STEM Ambassador program aims to (i) enrich STEM education efforts within the surrounding K-12 communities, (ii) increase the general awareness of CSUSM STEM programs among K12 students and educators, and (iii) increase student enrollment and diversity in these programs. The program is based on the rationale that providing local youth with STEM experiences and connections to ethnically diverse near-peer mentors who are positive role models will foster linkages between the university and the K-12 community.

**Quality Education: Developing STEM Endorsements through Competency-Based Badging Program****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 3**Speakers:** Robert Mayes, Georgia Southern University

**Abstract:** The Institute for Interdisciplinary STEM Education (i2STEMe) at Georgia Southern University is collaborating with the Georgia Professional Standards Commission and the Georgia Department of Education to develop an Interdisciplinary STEM Endorsement Program for K-12 teachers. The innovative program offers online badging modules which are competency-based and engage teachers in job-embedded demonstrations giving evidence of mastery in practice. The online badges provide access to meta-data consisting of artifacts indicating competency in teaching interdisciplinary STEM. Badging is a national movement to replace college course units and degrees as a means of teacher advancement and professional development. The i2STEMe is partnering with the College of Education to incorporate interdisciplinary STEM teaching and learning into the new Bachelor of Science in Education degree programs being launched in fall 2017. The Interdisciplinary STEM badging effort has the potential to impact preservice and inservice STEM teachers, as well as college faculty.

**A New Integrated Science Education and Research Facility at the University of Utah****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 4**Speaker:** Jordan Gerton, University of Utah

**Additional Authors:** Holly Godsey, University of Utah; Crocker Science Center Design Team; College of Science Dean's Office; and College of Science Integrated Curriculum Committee

**Abstract:** In January 2018, the College of Science at the University of Utah will open the doors to the new Crocker Science Center in a remodeled and expanded historic building in the heart of campus. The vision of the CSC is to provide innovative, interdisciplinary opportunities in science and mathematics through the integration of teaching, learning and research. The building will house highly adaptable teaching laboratories for cohort-based undergraduate inquiry and research experiences; flexible classrooms for student-centered instruction such as studio approaches; interdisciplinary advising and tutoring; a technology incubator for industry-supported undergraduate team projects and translational research; state-of-art research laboratories in cell and genome science including robust research core facilities; a statistical science research center; the Center for Science and Mathematics Education; and numerous experiential environments meant to shed light on the various interfaces inherent in the study and practice of science.

### **Extended Professional Development for New and Hopeful Faculty**

**Time:** Wednesday, June 8, at 3:45 PM

**Location:** Poster 5

**Speaker:** Cynthia Ghent, Towson University

**Abstract:** New academic faculty arrive to their new positions well grounded in their content. Their level of teaching experience, however, varies greatly. Some only have experience as graduate teaching assistants, while others have taught entire courses on their own. While research productivity is important to earning tenure and promotions, good teaching is highly valued. To support this, we have offered two programs of sustained, long term professional development. For four years, the Department of Biological Sciences partnered with local Schools of Medicine in a Teaching Fellows program, which provided pedagogical seminars and teaching opportunities for doctoral students and post-docs. In addition, last year, the Fisher College of Science and Mathematics instituted a year-long seminar series, focusing on pedagogy and teacher-related topics, that all new tenure track faculty (and interested lecturers) attended. Insights from both programs will be shared.

### **Supporting STEM Teacher Learning in Mathematical Discourse**

**Time:** Wednesday, June 8, at 3:45 PM

**Location:** Poster 6

**Speaker:** Lynn Hodge, The University of Tennessee

**Additional Authors:** Michael Lawson and Ashley Walther, The University of Tennessee; Gale Stanley, Campbell County Schools

**Abstract:** This study describes and examines the development, implementation, and initial impact of the Math Counts Institute (MCI) on growing teachers in the domains of mathematics content and pedagogy. Participants of the MCI were 68 elementary and middle school teachers and instructional coaches who completed 60 hours of professional development in which half of the hours were focused on the

unpacking activities and resources relating to high-leverage mathematics content and the other half on the high-leverage mathematics practices used to teach mathematics. During the MCI, participants completed pre- and post- measures of mathematics content and pedagogy and a self-report survey of teacher experiences during the institute. The data were analyzed using mixed methods quantitatively using mixed factor ANOVA and dependent t-tests, and qualitatively using open and in vivo coding to produce a thematic analysis. This analysis indicated that the institute was successful in accomplishing its design goals, both quantitatively and qualitatively. In addition, the design and implementation of the institute was welcomed and viewed useful by the participants during the institute. Implications for mathematics professional development and future work with the MCI are also discussed.

### **Statewide Collaboration Effort by University of North Dakota STEM Initiative**

**Time:** Wednesday, June 8, at 3:45 PM

**Location:** Poster 7

**Speaker:** Robert Pawloski, University of North Dakota

**Abstract:** The University of North Dakota (UND) STEM Initiative was formed in October 2014. The Initiative Work Group meets monthly and consists of an interdisciplinary team of faculty/staff providing broad representation from STEM resources and outreach programs across UND campus. In October 2015, with support from NSF DRK-12 Award #1552135, the Initiative partnered with three key North Dakota organizations – ND Science Teachers Association, ND Council of Teachers of Mathematics and the ND STEM Network – to plan the inaugural North Dakota Collaborative STEM Conference for April 21-23, 2016. The conference was attended by 650 professionals – primarily North Dakota teachers, but also representatives from higher education, business and industry, and governmental agencies with common interest in advocating STEM Education. Conference topics included integration of the Arts and STEM (STEAM), engineering design concepts, and computational thinking (computer science). This poster highlights outcome data collected from over 250 respondents to the post conference survey.

### **Mathematics as a First Step Toward Success in STEM (FirstSTEP)**

**Time:** Wednesday, June 8, at 3:45 PM

**Location:** Poster 8

**Speaker:** Tom Cheatham, Middle Tennessee State University

**Additional Authors:** Ginger Rowell, Chris Stephens and Don Nelson, Middle Tennessee State University

**Abstract:** In Tennessee far too many (70% in 2015) entering STEM majors do not meet the ACT benchmark for mathematics. This means that most entering freshmen have about a 25% chance of passing college algebra with a grade of “C” or better. Without an intervention, these students are likely to leave the STEM pipeline. At MTSU we have been experimenting, with support from an NSF STEP award, with interventions that may help students with poor mathematics preparation succeed in their chosen STEM major. Interventions include (1) a 2-week mathematics bridge boot camp before freshman year; (2) intrusive advising and counseling during years 1-2; (3) required tutoring in mathematics courses; (4) the use of metacognition; (5) engagement in a 3-week early team research experience; (6)

active learning pedagogies in pre-calculus; and (7) 4-day, pre-semester boot camp for pre-calculus and calculus 1. Six years of data will be described.

**I-CUBED, RISE and BUILD Programs at Xavier University of Louisiana****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 9**Speakers:** Tiera S. Coston, Kendall Eskine and Maryam Foroozesh, Xavier University of Louisiana

**Abstract:** The I-CUBED, RISE, and BUILD Programs support a variety of initiatives that address those factors that hinder the success of underrepresented minority students in STEM majors. The curricular modification/development projects supported by I-CUBED and RISE are focused on improving freshman- and sophomore-level STEM courses, respectively. BUILD involves junior- and senior-level course development/modification designed to give students the knowledge, skills and mindset they need to become successful biomedical researchers. This program also provides needed resources to faculty, including support to improve faculty skills in teaching, advising, and mentoring undergraduate students. There is a more unified approach to the development and refinement of freshman- and sophomore-level STEM courses and intra- and inter-departmental communication and collaboration have increased among STEM faculty. In addition to individual courses showing positive results related to retention of STEM students, overall assessment has demonstrated improved retention of STEM students since the integration of curricular modifications and other activities.

**Towson University Center for STEM Excellence: Integrating STEM Undergraduates into K-12 Community Outreach****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 10**Speaker:** Mary Stapleton, Towson University

**Abstract:** The Towson University Center for STEM Excellence (TUCSE) provides outreach programs to Maryland's K-12 schools. Our SciTech Student Learning Lab is a field trip destination for students in grades 3-12 and our Maryland Loaner Lab program loans secondary science teachers the equipment, reagents and curriculum they need to engage their students in inquiry-based science investigations in their own classrooms. TUCSE also regularly offers professional development to in-service science teachers. Recently, TUCSE has begun focusing on integrating our K-12 outreach efforts with our pre-service teacher preparation programs. These efforts are simultaneously improving the educational experience of our undergraduates while also serving the K-12 STEM community. We will describe our integration efforts, offering models for how other institutions of higher education can leverage partnerships with their local K-12 communities to improve undergraduate STEM education.

**Dispersed to the Wind: Follow up Findings for 10yrs of Grant Funded STEM Teachers****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 11**Speaker:** Helen Meyer, University of Cincinnati

**Abstract:** The poster describes the results of tracking and surveying program completers from the UC's secondary science and mathematics teacher education programs who received grant funding for initial licensure between the years of 2005 and 2015. Background data for the full cohort of grant funded completers is provided to understand who entered the program (n = 110). A brief discussion of strategies for locating early completers follows. Background information about the survey about experience teaching which was sent to all completers with contact information (n=93) is next. This is followed by limitations, then results discussed in thematic trends. Implications about the importance of knowing the outcomes of grant investments in pre-service licensing as well as structural and organizational barriers which make programming tracking completers overtime difficult, let alone drawing conclusions about their preparation based on student outcomes.

**Interdisciplinary STEM Education Initiative at Wichita State University****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 12**Speakers:** SoonChun Lee, Wichita State University

**Additional Authors:** Mara Alagic, Daniel Bergman, Fuchang Liu, Brenna Haines and Greg Novacek, Wichita State University

**Abstract:** Interdisciplinary STEM Initiative (iSTEM) in the College of Education at Wichita State University has made a significant contribution to the pre- /in-service teacher education in various ways. Some



examples are Synergistic Physical Experiment & Interactive Simulation - Apprenticeship (SPEIS-A) Program, Professional Partnership Program (SP3), provision of resources for STEM educators, and pre-service teachers' participation in STEM events. In the project funded by University Research Creative Award (URCA), the results from the pre- /post-tests and surveys showed the students have significantly improved their science knowledge and self-efficacy in teaching STEM. For the general STEM knowledge test, developed by the faculty, there was again a statistically significant increase between the pre- and post-test. The STEM initiative implementation includes collaboration with Fairmount Center for Science/Mathematics Education, development of Interdisciplinary STEM Education Certificate, STEM outreach for K-12 teachers and students in Kansas, and proposals for NSF and IES programs. For details, see [www.wichita.edu/iSTEM](http://www.wichita.edu/iSTEM).

### **Evaluation of WSU Use of Evidence-Based Methods in STEM Instruction**

**Time:** Wednesday, June 8, at 3:45 PM

**Location:** Poster 13

**Speaker:** Mathew Ouellett, Wayne State University

**Abstract:** Wayne State University is an urban research university with a broad access mission. Our access mission creates challenges and opportunities, as many of our students are first-generation or non-traditional students from diverse backgrounds and enter the university varying levels of prior preparation. Through a National Science Foundation WIDER grant, we have piloted and planned interventions to improve STEM teaching at Wayne State University aimed at helping more of our students enter STEM careers. By leveraging both bottom-up and top-down approaches, we have initiated transformation projects in a number of key science departments. With the recently funded NSF IUSE grant, we are now in the midst of a campus-wide transformation of STEM teaching to bring more evidence-based teaching methods into the classroom. We are soliciting buy-in from various departments by offering generous subgrants to departments to engage in transforming foundational courses in science and engineering.

### **Talking about Leaving Revisited: A Multi-Component Research Study Exploring Factors Influencing Undergraduates Switching from STEM Majors**

**Time:** Wednesday, June 8, at 3:45 PM

**Location:** Poster 14

**Speaker:** Anne-Barrie Hunter, University of Colorado Boulder

**Additional Authors:** Heather Thiry, Dana Holland, Raquel Harper and Elaine Seymour, University of Colorado Boulder

**Abstract:** By 2020, almost two-thirds of jobs in STEM will require a bachelor's degree or higher. While current research indicates increased student interest in STEM, the rate at which students leave STEM majors remains high and only about 40 percent of students entering college intending to major in a STEM field complete a STEM degree. This substantial loss of interest in STEM underlies a national imperative to retain students in STEM majors: If colleges and universities retained 10% of students who

leave STEM majors, the U.S. could achieve its future national workforce needs (PCAST, 2012). Replicating and augmenting the study that produced Talking about Leaving: Why Undergraduates Leave the Sciences (Seymour & Hewitt, 1997), this study seeks to identify factors currently influencing undergraduate decisions to switch from a STEM major and what has (or has not) changed over the past two decades that prompt students to leave their STEM majors.

**Glyphosate as an Interdisciplinary Teaching Tool for Freshman Science Labs****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 15**Speakers:** Trish Hartzell and Martina Ederer, University of Idaho**Additional Author:** Melinda Hamilton, University of Idaho Moscow

**Abstract:** Glyphosate, the active ingredient in Roundup, is the #1 herbicide in the world. It is increasingly important in agriculture as more Roundup-Ready crops are planted, yet it is the subject of environmental and health concerns. The UI Idaho HHMI-funded BRAINS program uses Roundup as a tool to teach freshman how to work as interdisciplinary teams to address complex problems. Roundup is inexpensive and readily available making it ideal for use in freshman labs. Students spend half of the semester developing laboratory skills. This builds confidence and enables students to learn to think critically. They put these skills to use in the second half of the semester as they design experiments to examine the impacts of glyphosate on soil quality, microbial communities, invertebrates, and plant germination and growth. Students also explore the effects that GMO plants that sequester Roundup have on the food web and the human gut microbiome.

**AAU STEM Education Initiative: A Multi-Strategy Approach to Active Learning****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 16**Speaker:** Shawn Nordell, Washington University in St. Louis

**Additional Authors:** Regina Frey, Mark McDaniel, Kathryn Miller, Kurt Thoroughman and Erin Solomon, Washington University in St. Louis

**Abstract:** Washington University's Association of American Universities Initiative—a joint project of The Teaching Center, The Center for Integrative Research on Cognition, Learning, and Education (CIRCLE), and the University's STEM departments—is helping to establish a collaborative culture and foundation of active-learning pedagogies and scholarly teaching at the university. Our AAU initiative has four components: curriculum development, faculty development, university cultural change, and evaluation. Each component contains multiple projects, all of which are designed to increase the amount and quality of active-learning instruction in STEM, with a focus on large introductory courses. Currently in our third year, we have increased the number of faculty, courses, and departments implementing active learning during each year of the project and are collecting and analyzing data on the impact of active learning on students' performance and attitudes. We have also formed a community of practice for our instructors and created a faculty mentoring program.

**Academy for Teacher Excellence: Expansive Learning as Innovative STEM Informal Learning Opportunities****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 17**Speakers:** Lorena Claeys, Belinda Bustos Flores and Karina Guevara-Lares, The University of Texas at San Antonio

**Abstract:** The Academy for Teacher Excellence (ATE) in the College of Education and Human Development has established a research-based model for improving and increasing undergraduate STEM education through informal learning opportunities such as La Clase Mágica (Magical Class-Bicultural-Bilingual Technology based) (Flores, Vásquez & Clark, 2014), Nepohualtitzin-Ethnomatematics (Prieto, Claeys, & Lara Gonzalez, 2015) and Robotics clubs (Schutze, Claeys, Flores, & Sczeck, 2014) as expansive/service learning opportunities in teacher preparation and STEM related majors. Participating undergraduate students get hands-on experiences working with young learners in elementary and middle schools that are highly populated by Latino and English learners. As a result, undergraduate students' community and field experiences are connected to the local needs to strengthen the STEM knowledge and skills of future educators and to promote STEM education and STEM related fields to address the national need to increase the ethnic and gender representation of professionals in STEM education.

**Supporting Non-Tenure Track Faculty: Possibilities and Successes****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 18**Speaker:** Dabney Dixon, Georgia State University

**Abstract:** The number of non-tenure track faculty in the United States is increasing, especially at larger institutions. The increase is due to many factors including responses to surges in enrollment, filling positions at the last minute, lower cost, replacing faculty on leave, filling positions in new programs, and hiring to teach lower-level courses. Recent studies have indicated the strength of NTT faculty in terms both of student appreciation and of the quality of teaching. It is vital that these faculty members have significant support and appreciation. We describe structural ways to provide resources to enhance NTT faculty personal development, professional advancement, research productivity, mentoring skills, and opportunities for innovation. These structural changes can be useful for both NTT and TT faculty members. Support of NTT faculty should be a significant part of the effort maintain and increase the quality of post-secondary STEM education.

**Models of Program-Scale Change from the InTeGrate STEP Center****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 19**Speakers:** Cailin Huyck Orr and Cathryn A. Manduca, SERC at Carleton College**Additional Author:** Carol Baldassari, Endicott College

**Abstract:** Broadening access to STEM education and improving outcomes for all students requires finding solutions to a series of challenges at the individual and institutional scale. The process of overcoming barriers and creating incentives and rewards is likely to be context specific and influenced by the history and structure of the institution. However, successful programs may have common elements that can be documented and made transferrable to new institutions. As part of the 5-year NSF-funded Stem Talent Expansion Program Center InTeGrate, we have been supporting 16 instances of implementing institutional change at institutions of different types across the country with the goal of broadening participation in STEM. These programs are based off of the guiding principles of the InTeGrate center and many employ curricular materials built by InTeGrate partners. The individual programs are each publishing their project structure and findings to the InTeGrate website as a community resource: <http://serc.carleton.edu/integrate/programs/implementation/index.html>

**Tapping Community Expertise: Online Resources from the Science Education Resource Center Higher Education Portal****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 20**Speaker:** Cathryn A. Manduca, Science Education Resource Center**Additional Authors:** Monica Z. Bruckner and Cailin Huyck Orr, Science Education Resource Center at Carleton College

**Abstract:** The Science Education Resource Center (SERC) endeavors to connect theory to classroom practice to improve STEM education through partnerships with an extensive network of projects. Collaborating with instructors, institutions, and national organizations, SERC hosts one of the world's largest collections of pedagogic resources, which are designed to support educators, disseminate knowledge, and engage the community. SERC has partnered with over 100 education projects, engaging participants from over 1,000 higher education institutions, K-12 curriculum developers, and teachers. The Higher Ed Portal provides access to these resources, including those from Pedagogy in Action, which describes the why/when/how for over 50 pedagogies that incorporate active learning and features collections of classroom-ready examples. Additionally, the Traveling Workshops Program, led by a team of leaders immersed in geoscience education, provides departments customizable opportunities to strengthen their courses and programs of study with workshops that come to them. See the Higher Ed Portal for more: <http://serc.carleton.edu/highered/index.html>

**Promoting Undergraduate Success in Science and Math at the University of Utah Through a Multi-Faceted Approach****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 21**Speaker:** Emily Gaines, University of Utah**Additional Authors:** Holly Godsey, Tino Nyawelo and Jordan Gerton, University of Utah

**Abstract:** The University of Utah's Center for Science and Mathematics Education (CSME) uses a combination of well-established and pilot programs to enhance undergraduate retention and success in STEM. CSME programs include initiatives for faculty, instructors, and students, with the goals of: 1) promoting evidence-based instructional techniques, 2) supporting best practices in curriculum structure, and 3) providing cohort-based experiences that support students in their undergraduate education and workforce preparation. Specifically, CSME projects include integrated curriculum development and curriculum reform; professional development for faculty, instructors, and teaching assistants through education-related presentations, workshops, and working groups; transition programs for undergraduate students entering and/or transferring to the University; and cohort-based internships, research opportunities, and teaching experiences for undergraduates.

**Alternative Models for Evaluating the Implementation and Effectiveness of Programs to Improve STEM Teacher Preparation and Development****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 22**Speakers:** Hersh Waxman, Jaqueline R. Stillisano, and Kim B Wright, Texas A&M University

**Abstract:** The number of programs designed to enhance preservice teachers' STEM knowledge and instructional skills has increased in recent years in response to the need to improve PreK-12 STEM education. Very few systematic approaches or models, however, have been developed or utilized to evaluate the implementation and effectiveness of these programs. This paper addresses the previous concern by describing four appropriate models for evaluating the implementation and effectiveness of STEM programs in K-12 schools: (a) experimental model, (b) logic model, (c) AEIOU model, and (d) classroom observation model. The strengths and weaknesses of each of these models are described, as well as the critical issues and assumptions associated with the respective approaches of each. We will also include examples from recent evaluations we've completed using these different models.

**A Research-Based Foundation for Change Initiatives Using Instructional Development Teams****Time:** Wednesday, June 8, at 3:45 PM**Location:** Poster 23**Speaker:** Andrea Beach, Western Michigan University

**Abstract:** Many recent grant-funded instructional improvement projects (e.g., AAU's STEM initiative, NSF WIDER and IUUSE, HHMI Undergraduate STEM program) are moving away from change strategies focused on individuals and towards strategies focused on the department and institution levels. They

are engaging teams of faculty, graduate students, and post-graduate researchers to collaboratively redesign content and instructional approaches in STEM undergraduate courses. If these team-based approaches will be prominent among the change strategies of future initiatives, the STEM education community needs a better understanding of how they best work for particular goals and outcomes, what kind of leadership and facilitation is necessary keep them vital and on-task, and what kinds of relationships, communication, and collaborative work are necessary for them to reach their goals. This poster presents the initial work of an NSF-funded project aimed at identifying and categorizing the current team-based approaches and connecting their practices with organizational and change theory.

### Enhancing Engineering Undergraduate Education through Faculty Learning Communities

**Time:** Wednesday, June 8, at 3:45 PM

**Location:** Poster 24

**Speaker:** Tershia Pinder-Grover, University of Michigan

**Abstract:** The Center for Research on Learning and Teaching in Engineering has engaged in a variety of initiatives to support undergraduate education through faculty development. Nearly 50 faculty have participated in the Teaching Circle for Large Engineering Courses, which is a learning community focused on providing a safe environment where engineering faculty can share ideas and discover evidence-based best practices on topics such as rapport, active learning, student motivation, etc. The program has been successful in influencing participants' teaching through faculty self-reports and objective observations by trained consultants.

### **Engaging Industry, Government and Education to Build STEM Career Pathways in Hawai'i**

**Time:** Wednesday, June 8, at 3:45 PM

**Location:** Poster 25

**Speaker:** John Rand, University of Hawaii

**Additional Authors:** Jean Isip Schneider, University of Hawai'i

**Abstract:** The University of Hawai'i, Office of STEM Education is engaging Hawai'i industry to construct career pathways to grow Hawai'i's STEM workforce. This effort is supported by UH strategic directives:

1. Hawai'i Graduation Initiative - increase the number working age adults with two- or four-year college degrees to 55% by the year 2025; and the
2. Hawai'i Innovation Initiative - build a thriving innovation, research, education and training enterprise that will develop a third major economic sector for the state, create high-quality living-wage jobs, and addresses the challenges and opportunities faced by Hawai'i and the world.

Working in partnership with K-12 and business leaders from the Hawaii Business Roundtable and Chamber of Commerce of Hawaii, STEM industry sector strategies are being developed in biotechnology, cybersecurity, manufacturing, information technology, food security, and engineering. Using labor market information and employers, government and education partnerships, UH is developing K-20 to STEM career pathways.

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**And all of the participants who have decided  
to show up and make a difference.**